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Indigenous Plant Utilization and Farming System of *Garo* Tribe in North-East Bangladesh: a Means of Sustainable Biodiversity Conservation

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Abstract

A special type of indigenous knowledge on plants utilization and farming system was explored by the *Garo* tribe community in the North-East region of Bangladesh, which correspond to the severe dependence on homestead forest. Results show that the *Garo* are totally dependent on the natural resources and that the extent of their dependency is faithfully reflected in their ethno-botanical knowledge. Dependencies that the study addressed focused on various aspects of food, fruit, energy, timber and health care on plants products. *Garo* tribe community in Bangladesh followed agrosilvipastoral system in their homesteads. They have indigenous hunting procedure to trap the animal in the forest. A total of 9 foods, 15 fruits, 12 energy-producing and 11 timber species was found and recorded that the *Garo* used in their daily life. Moreover, *Garo* used 23 medicinal plants species and have vast indigenous knowledge about using herbal medicine in daily health care practices. The *Garo* women do mostly the household activities, managing homestead forest and helping agricultural field where men perform all hard working activities like ploughing, cutting trees, digging the soil, preparation of horticultural and agricultural land, hunting, etc. The overall quality of life of the *Garo* could be considerably upgraded if ethno-botanical issues and their own indigenous knowledge will complement with scientific knowledge. The findings of the study conclude that the conservation of the indigenous knowledge of the *Garo* tribe related to plants utilization can also be turned to good account in forest conservation and is an important tool in this tribal area of Bangladesh.

Key Words: agroforestry, indigenous knowledge, food habit, fruit consumption, medicinal plants, gender role

Introduction

The *Garos* are one of the well-known ethnic communities of the Indian subcontinent. Their present population around the world is approximately half a million; most of them are living in Northeastern India mainly in *Garo* hills (Chowdhury 2007). Nowadays, about one-fifth of the total population of the *Garos* lives in Bangladesh which constitute less than one percent of the total population of the country. *Garos* are mostly known to the outside world for their matrilineal social organization especially for their distinct kinship system (Burling 1997). The people who are

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known as *Garo* to outsides prefer to call themselves *Achik* (the Hilly *Garos* prefer to call themselves *'Achik'*) and *Mandis* (plain land *Garos* called themselves '*Mandi'*) but all these people are known as '*Garo*' to the outsiders (Bleie 2005). In fact, in Bangladesh most of the *Garos* are living in the plain lands. They have their own language, culture, shared history and experiences. Their mother tongue is *Garo*, which belongs to the *Bodo* group of Tibeto-Burman stock (Burling 1997). Traditionally, *Garos* have many festivals and ceremonies which are mostly connected with various phases of cultivation and harvesting as they are agriculture based, but in earlier days they had (it is said) some cruel beliefs and practices, such as human head hunting and others which have now stopped (Chowdhury 2007). *Garos*' main festivals are: *Wangala, Rangchugala, Agalmaka, Michitata, Gitchingpong* and recently the Celebration of Christmas (Banglapedia 2006). Today most of the *Garos* are Christian. Bal (2000), describes, 'Today Christianity is of great importance to the *Garo* community and more than ninety percent of the *Garos* proudly consider themselves Christian'.

Garos are concentrated mainly in Tangail, Mymensingh, Netrokona and Jamalpur district of Bangladesh. *Garos* have their own indigenous knowledge to manage natural resources for their livelihoods. The main livelihood activities of *Garos* are agricultural practices in the plain land, homestead and in the forest land. Once they were accustomed to *Jhum* farming, but now they follow plough cultivation in plain land by transplanting rice. But they managed their homesteads and forest land as agroforestry system namely agrosilvipastoral system and agrisilvicultural system and woodlot plantation respectively. They also have developed indigenous knowledge system of their own in practicing the special type of utilization pattern of forest produces (Alam and Khisa 2000; Rashid and Rashid 2002; Ahmed 2003; Anon 2003; Nasrin and Khalifa 2004). Today most of the wealth of indigenous knowledge of the *Garo* community in Bangladesh is being threatened by the settlements of the non-tribal people in the region.

It was hypothesized that the *Garo* community encompassed a particular type of utilization and dependence on trees including indigenous knowledge. Several studies have been carried out with various tribes regarding the exploration of ethno-forestry and indigenous knowledge in Bangladesh (Banik 1998; Khisa 1998; Sattar 1998; Siddiqi 1998; Alam and Khisa 2000; Haque 2000a, 2000b; Alam 2002; Mohiuddin *et al.* 2002; Mustafa *et al.* 2002; Miah and Chowdhury 2003; Miah and Chowdhury 2004; Partha and Hossain 2007; Rana *et al.* 2009; Uddin *et al.* 2009; Rana *et al.* 2010; Rahman *et al.* 2011). But the indigenous knowledge of plants utilization and farming system of *Garo* tribe were ignored earlier despite they were the original forest dwellers in East instead of east region of Bangladesh. The *Garo* have special and particular relationship and dependency on forest for their daily needs. However, due to the isolation and the relative inaccessibility of the *Garo*, no study has yet been carried out on their agroforestry practices, homestead management, dependency and utilization pattern of trees, which is why the present study was undertaken in the East instead of east region (Netrokona district) of Bangladesh.

Study Area

The study was conducted at Durgapur *upazila* (sub-district; an administrative entity) of Netrokona district in the division of Dhaka, Bangladesh (Fig. 1) with an area of 293.42 km^2. It is located between 25.1250°N, 90.6875°E (BBS 2005). It is bounded by Meghalaya (State of India) on the north, Netrokona Sadar and Purbadhala upazilas on the south, Kalmakanda upazila on the east, Dhobaura upazila on the west (Banglapedia 2000). Geologically the area is almost uniform (Rashid 1991). Topographically the area is characterized by its large platen like hillock, known as *tilla*. The drainage pattern of the area is dentric. The soil pattern of the Durgapur is complex. Most of the upland has deep, moderately well drained permeable clay with heavy clay in the valleys. Some of the upland has impervious clayey sub soil. Soil pH varies from 6 to 6.5 (Rashid 1991). The area lies in the semi drier part of the Bangladesh. The maximum temperature is usually 30°C during the month of May and maximum temperature is about 10°C during the month of January (BBS 2005).

Survey Methods

Among ten upazila of Netrokona district, the study area was selected purposively in Durgapur upazila because the

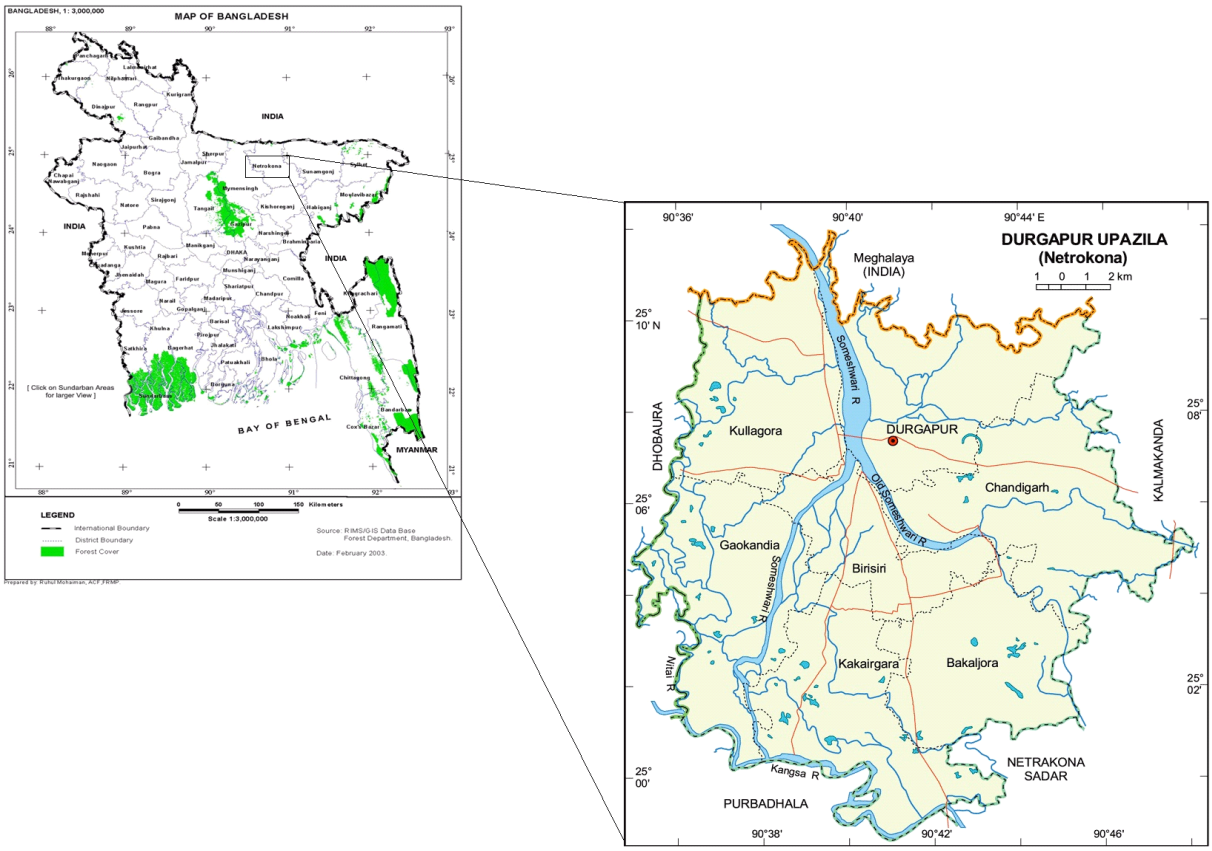

Fig. 1. Map of the study area.

Garo are concentrated in this area. There are two tribes in this district namely *Garo* and *Hajong*. We collected the list of *Garo* villages from Durgapur upazila statistics office. There were five villages in where *Garos* are dominant. Two villages namely Fulbari and Nollapara were selected randomly. We found 100 *Garo* households in these two villages. Data were collected both by the interview and from direct observation during July 2010 to December 2010. A total of 40 households were selected randomly, with a total population of 260 for interviewing. Sampling intensity was 40%.

Before households were sampled, a formal discussion was held at the local *union* (a rural administrative unit consist of a number of villages) council office with the local representative in Chairman and Members of the local union council. The village headman and the members of the farmers group and other influential persons e.g. school teacher and the NGO officers. The objectives of this work were to explain the work indented and to identify two suitable research associate to assist the study. The following criteria were taken into consideration while recruiting the associates. They are community members, literate and able to communicate in local dialect and are willing to work with local community.

A preliminary socio-economic survey was carried out to ascertain important socio-economic parameters of the study area to select respondents for detailed study. The households were surveyed completely at that stage. A semi-structured questionnaire was used for the survey, worked out in advance and pre-tested for intelligibility. On each topic the respondents were free to express his/her views. The survey was designed to gather information relating to: family size, household composition, educational status, total annual income, occupation of the respondents, different cultural activities, total land holdings, farming system of house and agrifields, division of labor, collected material from the for-

est, myth an belief about trees and their and marketing of their farm product, etc. Household heads (in this case all were male) were the respondents of the study and they were helped from other family members where it was deemed necessary.

First of all, species used for food, fruit, energy, timber, basketry, utensils and festivals were collected under their local names. A field-visit was then arranged to the forest and homestead with the relevant respondents and other key persons to ascertain the Bengali and scientific name. Following this, a list of the species used for various purposes was prepared using Das and Alam (2001); Dey (2006) as the basis of reference. The various parts of the plant species used for food and fruit were ascertained with the several physical observations in the *Garo* house. The baskets and utensils made of forest products were checked to corroborate the interview and plants used for festivals also were crosschecked with several physical observations.

Results and Discussion

Homestead agroforestry

From the ancient time *Garo* tribe in Bangladesh used homestead agroforestry system. They follow agrosilvipastoral system in their homesteads. Seed, seedling and vegetative propagules are used generally to generate the plant in their homestead. They broadcast or put the seeds in a certain place and watering. After germination watering continued and keeps it free from goat and other cattle. Sometimes they throw the seeds after consuming the fruits. Some trees are grown from vegetative propagules for budding grafting and cutting. Sometimes they collect vegetative propagules which produced from root such as Teak (*Tectona grandis*), Kachu (*Colacasia esculenta*) and Kola (*Musa* spp.) etc. There are three main components of this system namely trees, crops and livestock's. Table 1 enlisted the plant and crop species found in the surrounding homestead of *Garo* tribe community in the study area. Contemporary, the main livestock rearing in the Garo's homestead were found *Sus Scrofa* (34%), *Gallus gallus* (33%), *Boss Indica* (17%), *Anas poecilorhyncha* (9%) and *Capricorins sumatrensis* (7%), etc.

Participatory agroforestry

Since 1990 woodlot plantation was started by the forest department in the border line hillocks of the study area. Most of the land property of the forest department is used as participatory agroforestry by the *Garos*. Local forest department, settlers and the *Garo* are the key component of this program. Total area of woodlot plantation is 100 hectares and total 100 participants were engaged. Each participant gets one hectares land year to year as a renewable basis and they follows the agrisilvicultural system in this land according to the suggestions by the forest department. They plant different types of tree and crops species in the restricted land. They get whole benefit from the medicinal and horticultural species. About 21 tree species and 9 crop species were found during the survey in the woodlot plantation (Table 2).

The plantation established on participatory basis are being harvested at the end of rotation and the sale proceeds are distributed on the basis of benefit sharing agreement approved by the Apex Body as follows: Forest department 30%, beneficiaries 60%, tree farming fund (TFF) 10%. This sharing agreement is documental and it is delivered to all participants. TFF is kept to a committee and spend to establish and maintain new plantation. The participants get several technical supports from forest department. Proper training on how to plant and maintain the plantation is given to them by the forest department. Planting materials such as fertilizer, stick, strings are also provided to them. Protection from pest, disease and mortality and vacancy filling are done by the forest department.

Food habit

Study found that rice is the main staple food of the *Garo* tribe; getting three times in a day at morning, noon and night. In addition with rice; fish, meat, vegetables, eggs were regarded as side dish. Oil, salt, chilly, zinger, turmeric and various kinds of spices and condiments were found to be used as condiments in cooking the vegetables and curry to increase its taste and delicacy. Green chilies are very common as a condiment. They take all type of flesh e.g. beef, pork, mutton, duck, chicken and various other fleshes. It may be bird, reptile etc. Men and women drink homemade intoxicating liquors or rice beer (*Chu*) especially during

Table 1. List of plant and crop species found in the home garden of *Garo* tribe of Bangladesh

	Local name	Scientific name	Family	Preference	Occurrence
Tree species	Akashmoni	*Acacia auriculiformis* Willd.	Mimosaceae	+++	C
	Eucalyptus	*Eucalyptus camaldulensis* Dehnhardt.	Myrtaceae	++	C
	Gamar	*Gmelina arborea* (Roxb.) DC.	Verbanaceae	+++	C
	Jarul	*Lagerstroemia speciosa* (Linn.) Pers.	Lythraceae	++	FC
	Jiga	*Lannea coramandelica* (Houtt.)	Anacardiaceae	+	R
	Mahagoni	*Swietenia mahogany* (Linn.) Jacq.	Meliaceae	+++	C
	Rain tree	*Samanea saman* (Jaq.) Merr.	Mimosaceae	++	C
	Segun	*Tectona grandis* L. instead of Linn.	Verbenaceae	+++	C
	Sil koroi	*Albizia procera* Benth.	Mimosaceae	++	FC
	Sissoo	*Dalbergia sissoo* Roxb.	Fabaceae	+	C
Fruit species	Am	*Mangifera indica* Linn.	Anacardiaceae	+++	C
	Bel	*Aegle marmelos* (Linn.) Correa.	Rutaceae	++	FC
	Boroi	*Zizyphus mauritiana* Lamk.	Rhamnaceae	++	FC
	Chalta	*Dillenia indica* Linn.	Dilleniaceae	+	FC
	Jalpai	*Elaeocarpus floribundus* Blume.	Elaeocarpaceae	+	R
	Jam	*Syzygium cumini* (Linn.) Skeel.	Myrtaceae	+++	C
	Jambura	*Citrus grandis* (Linn.) Osbeck.	Rutaceae	+	FC
	Kanthal	*Artocarpus heterophyllus* Lamk.	Moraceae	+++	C
	Peyera	*Psidium guajava* (Linn.) Bat.	Myrtaceae	+++	C
	Supari	*Areca catechu* Linn.	Arecaceae	+++	C
	Tentul	*Tamarindus indica* Linn.	Caesalpiniaceae	++	C
Medicinal plants	Amloki	*Phyllanthus embelica* Linn.	Euphorbiaceae	+	FC
	Arjun	*Terminalia arjuna* W & A	Combretaceae	++	FC
	Basok	*Adhatoda vasica* Nees	Acanthaceae	+	FC
	Bohera	*Terminalia belerica* Roxb.	Combretaceae	+	R
	Durba grass	*Cynodon dactylon* (Linn.) Pers.	Poaceae	+++	C
	Horitaki	*Terminalia chebula* (Gaerth.)Retz.	Combretaceae	+	R
	Neem	*Azadirachta indica* A. Juss.	Meliaceae	+++	C
	Shatamuli	*Asparagus racemosus* Willd.	Asparagaceae	+	R
	Thankuni	*Centella asiatica* (Linn.) Urban	Umbelliferae	+++	FC
	Tulsi	*Ocimum sanctum* Linn.	Labiatae	+++	C
	Ulotkombal	*Abroma augusta* Linn.	Sterculiaceae	+	R
Horticulture	Anaros	*Annas comosus* (Linn.) Marr.	Bromeliaceae	+++	C
	Kola	*Musa* spp.	Musaceae	+++	C
	Lebu	*Citrus limon* (Linn.) Burm.f.	Rutaceae	+++	C
	Papaya	*Carica papaya* Linn.	Caricaceae	+++	C
Root crops	Ada	*Zingiber otficinale* Roscoe	Zingiberaceae	+++	C
	Halud	*Curcuma longa* Linn.	Zingiberaceae	+++	C
	Mati alo	*Dioscorea bulbifera* Linn.	Dioscoreaceae	+	R
	Misti alo	*Dioscorea alata* Linn.	Dioscoreaceae	+	FC
	Piaj	*Allium cep*a Linn.	Liliaceae	+++	C
	Rashon	*Allium sativum* Linn.	Liliaceae	+	C

their cultural festival. These are prepared from rotten rice. *Chu* is their most favorite drinking item without drinking *Chu* any kind of function or ceremonies remains incomplete. They also take tea every day in their houses and men and women of old ages take betel leaf with tobacco, nut, lime and *khoir* (a thin coating of catechu). Along with those foods, the *Garo* were also reported to consume wild animals like pig by hunting. In one month they could catch four to

Table 1. Continued

	Local name	Scientific name	Family	Preference	Occurrence
Vegetables	Bagon	*Solanum melongena* Wall.	Solanaceae	+++	C
	Derosh	*Abelmoschus esculentus* (Linn.) Moench, Meth.	Lamiaceae	++	FC
	Kachu	*Colacasia esculenta* Schott.	Araceae	++	FC
	Lal shak	*Amaranthus tricolor* Linn.	Amaranthaceae	+++	C
	Lau	*Lagenaria siceraria* (Molina) Standl.	Cucurbitaceae	++	C
	Maskolai	*Phaseolus mungo* Linn.	Legumominosae	++	FC
	Misti kumra	*Cucurbita maxima* Duch. ex Lamk.	Cucurbitaceae	++	C
	Morich	*Capsicum frutescens* Linn.	Solanaceae	+++	C
	Palongsak	*Spinaceae oleracea* Linn.	Chenopodiaceae	+	FC
	Poisak	*Basella rubra* Linn.	Begoniaceae	++	FC
	Sim	*Lablab purpureus* (Linn.) Sweet	Fabaceae	++	FC

Preference: +++ High, ++ Medium, + Low; Occurrence: C-common, FC-fairly common, R-rare.

Table 2. Plant species composition of agrisilvicultural system practiced by *Garo* tribe

Species	Local name	Scientific name	Family
Timber species	Akashmoni	*Acacia auriculiformis* Willd.	Mimosaceae
	Gamar	*Gmelina arborea* (Roxb.) DC.	Verbanaceae
	Mahagoni	*Swietenia mahogany* (Linn.) Jacq.	Meliaceae
	Rain tree	*Samanea saman* (Jaq.) Merr.	Mimosaceae
	Segun	*Tectona grandis* L. f.	Verbenaceae
	Sil koroi	*Albizia procera* Benth.	Mimosaceae
	Sissoo	*Dalbergia sissoo* Roxb.	Fabaceae
Cultivated	Bansh	*Bambusa* spp.	Gramineae
	Cane	*Calamus* spp.	Palmae
	Murta	*Schumannianthus dichotomus*	Marantaceae
Fruit species	Am	*Mangifera indica* Linn. instead of L.	Anacardiaceae
	Jalpai	*Elaeocarpus floribundus* Blume.	Elaeocarpaceae
	Jam	*Syzygium cumini* (Linn.) Skeel.	Myrtaceae
	Kanthal	*Artocarpus heterophyllus* Lamk.	Moraceae
	Peyera	*Psidium guajava* (Linn.) Bat.	Myrtaceae
	Supari	*Areca catechu* Linn.	Arecaceae
Medicinal plants	Arjun	*Terminalia arjuna* W & A	Combretaceae
	Bohera	*Terminalia belerica* Roxb.	Combretaceae
	Horitaki	*Terminalia chebula* (Gaerth.)Retz.	Combretaceae
	Neem	*Azadirachta* A. Juss.	Meliaceae
	Tentul	*Tamarindus indica* Linn.	Liguminosae
Horticulture	Anaros	*Annas comosus* (Linn.) Marr.	Bromeliaceae
	Kola	*Musa* spp.	Musaceae
	Lebu	*Citrus limon* (Linn.) Burm.f.	Rutaceae
	Papaya	*Carica papaya* Linn.	Caricaceae
Root crops	Ada	*Zingiber otficinale* Roscoe	Zingiberaceae
	Halud	*Curcuma longa* Linn.	Zingiberaceae
	Maskolai	*Phaseolus mungo* Linn.	Legumominosae
Vegetables	Morich	*Capsicum frutescens* Linn.	Solanaceae
	Sim	*Lablab purpureus* (Linn.) Sweet	Fabaceae

five (average) pigs from the forest. Different kinds of cakes are prepared by the women.

Findings reveal that rice consumed by the *Garo* mainly came from the farmer's own agricultural field irrespective of farm category. Many plants, reported as being used for food, were exclusively collected from the surrounding forests (herbs and flower and fruits) and homestead. Most of the plant parts were said to be used as vegetables. Various parts of the plants were used as food evident from the survey. The use of plant parts as food by the tribal's in Chittagong Hill Tracts (CHTs) is also evident from the other studies. The young shoots of *Bambusa* spp. and *Daemonorops jenkinsianus* are used as vegetables by the tribes in CHTs, Bangladesh (Jalil and Chowdhury 2000). In some cases only one part of the plant was used, in others more than one part was edible and in some cases the whole plant is used. The mode of usage was one of the important aspects in using the forest plant. The *Garo* used nine plant species which were directly used as food materials (Table 3). Most of the meat consumed by the high and the medium income farmers were obtained from the market followed by low-income groups major source of meat was forest. Most of the poor farmers (45%) followed by medium farmers (35%) collected fish through fishing in the water bodies in and around the homestead forests.

The consumption of bamboo shoots by the tribal has a scientific basis, which was reported by Banik (1997), the average nutritional values of various bamboo shoots, with 4.5% carbohydrates, 2.6% protein, 0.3% fat and 0.9% ash; makes them a valuable, nutrient-rich source of sustenance. Young shoots of different bamboo species, especially Muli bansh (*Melocanna baccifera*), are cooked as vegetables. Those shoots have a bitter taste and are usually consumed in the rainy season. It is generally the new tender growth of the rhizome apex into a young Culm consisting of compressed internodes protected by a number of leathery sheaths. After removing the sheaths the inner tender portion is thoroughly washed in water, cut into pieces, cooked and consumed as a vegetable. Sometimes they are sliced and dried for use in times of food scarcity. Banik (1997) states that the young shoots of several species of bamboos are important vegetable ingredients in daily diets in China, Japan, Taiwan and Thailand. Other tribal people of Bangladesh also collect bamboo shoots from the natural forests and have traditionally used them as a major food item during rainy seasons (Barua 1995; Banik 1997; Jalil and Chowdhury 2000). Sajna (*Moringa oleifera*), Tentul (*Tamarindus indica*), Kola (*Musa* spp.), Kanthal (*Artocarpus heterophyllus*), Chalta (*Dillenia indica*) and, Thankuni (*Centella asiatica*) used as vegetables and pickles. Kola (*Musa* spp.) core cooked with rice is used in days of food scarcity and, chopped and mixed with bran it, makes excellent fodder for pigs and cattle (Jalil and Chowdhury 2000).

Fruits consumption

The survey reveals that fruits provide a seasonal food supply to the *Garo* community, especially to the children, who most frequently collected wild fruits as snacks. Our study reported that fruit was usually collected prematurely by children and the *Garo* generally considers fruit to be a food for children rather than for adults. Moreover, the *Garo*

Table 3. Food habit of the *Garo* tribe community in the study area

Local name	Scientific name	Family	Plant type	Using parts	Using pattern
Chalta	*Dillenia indica* Linn.	Dilleniaceae	Tree	Leaves, flower, fruit	Vegetables and pickles
Kachu	*Colacasia esculenta* Schott.	Araceae	Herb	Root and leaves	Vegetables
Kanthal	*Artocarpus heterophyllus* Lamk.	Moraceae	Tree	Inflorescence and seeds	Vegetables and pickles
Kola	*Musa* spp.	Musaceae	Herb	Inner stem, flower, inflorescence, fruits	Vegetables
Mati alo	*Dioscorea bulbifera* Linn.	Dioscoreaceae	Herb	Root	Vegetables
Muli bansh	*Melocanna baccifera* (Roxb.) Kurz	Graminae	Bamboo	Young shoots and leaves	Vegetables
Sajna	*Moringa oleifera* Lamk.	Moringaceae	Small tree	Young leaves, fruit	Vegetables and pickles
Tentul	*Tamarindus indica* Linn.	Liguminosae	Tree	Young leaves, fruit	Vegetables and pickles
Thankuni	*Centella asiatica* (Linn.) Urban	Umbelliferae	Herb	Leaves	Leafy vegetables

Table 4. Fruit species consumption of *Garo* tribe community in the study area

Local name	Scientific name	Family	Parts used	Season	Sources (%)	
					Own	Market
Am	*Mangifera indica* Linn. instead of L.	Anacardiaceae	Inner flesh	Summer	100	-
Amloki	*Phyllanthus embelica* Linn.	Euphorbiaceae	Outer parts	Winter	23	77
Anaros	*Annas comosus* (Linn.) Marr.	Bromeliaceae	Inner flesh	Rainy	30	70
Bel	*Aegle marmelos* (Linn.) Correa.	Rutaceae	Inner flesh	Spring	60	40
Boroi	*Zizyphus mauritiana* Lamk.	Rhamnaceae	Outer parts	Winter	100	-
Chalta	*Dillenia indica* Linn.	Dilleniaceae	Whole parts	Summer	20	80
Jalpai	*Elaeocarpus floribundus* Blume.	Elaeocarpaceae	Outer parts	Winter	10	90
Jam	*Syzygium cumini* (Linn.) Skeel.	Myrtaceae	Outer parts	Summer	37	63
Jambura	*Citrus grandis* (Linn.) Osbeck.	Rutaceae	Inner flesh	Winter	100	-
Kanthal	*Artocarpus heterophyllus* Lamk.	Moraceae	Inner parts	Summer	100	-
Kola	*Musa* spp.	Musaceae	Inner flesh	All	100	-
Lebu	*Citrus limon* (Linn.) Burm.f.	Rutaceae	Juice	All	83	17
Papaya	*Carica papaya* Linn.	Caricaceae	Inner flesh	All	56	44
Peyera	*Psidium guajava* (Linn.) Bat.	Myrtaceae	Whole parts	Rainy	80	20
Tentul	*Tamarindus indica* Linn.	Leguminosae	Inner pulp, seed	Winter	50	50

were found to consume a total of 15 sorts of fruits species of twelve families, ranging from the smallest, Anarosh (*Annas comosus*), to the gigantic Kanthal (*Artocarpus heterophyllus*), Am (*Mangifera indica*) and Tentul (*Tamarindus indica*) (Table 4). Kanthal and Am is the only fruit tree species common to almost every household of the community. Present study took various fruits consumed by the *Garo* tribe into account, along with information on which parts are used, season of availability and the sources. Some fruits are seasonal and some are found all the year round. The rich *Garos* also buy seasonal fruits from the market. The poorer farmers derive the facility of fruit consumption from the market but they are engaged in cultivating some fruits like, Papaya (*Carica papaya*), Anarosh (*Annas comosus*), Jambura (*Citrus grandis*), Lebu (*Citrus limon*), etc. Edible wild fruits, seeds and leaves often provide food, when staple food item such as rice, buckwheat or barley are not available. The sources of fruit were recorded during the study, most of which were collected from own homestead (69%) followed by forest (17%) and market (14%). Samal (1997) reveals that the *Kandha* tribe of Koraput, India, extracts tamarind seeds to eat. Mango stones and tamarind seeds are powdered and then made into gruel with other food items. Jana and Chauhan (2000) agree in this regard. Kumar and Goelo (2000) consider the fruits of Mahua (*Madhuca indica*) as the most important minor forest product. They eaten the outer coat as raw or cooked, the inner coat is dried and ground into flour, while greenish oil or butter is obtained from the kernel.

Species used for energy

Fuelwood was observed to be the only source of energy for cooking in the study area. The *Garo* people generally collected dried leaves, litter, twigs, fallen trees or dried branches of different trees for cooking purposes. The cooking includes both human and animal (pig) foods. They were observed to use the branches and main stem wood for this purpose and the sole source of this material is the homestead. A total of 12 plant species were used to generate energy for domestic purposes. There is no scope of collecting fuelwood from the nearby forest. In near past it was possible to go to the forest and collect fuel wood, foods etc. But presently, it is strictly prohibited by the forest department to cut down any forest trees. They collect and store fuelwood in the outer side of their house in the winter season (Table 5).

Species used for Timber

All of the houses in the *Garo* community in our study sample were made of bamboo, wooden posts and sun-dried grass. The trunks of certain timber species, from which the bark is stripped, serve as the main posts and major cross-

Table 5. Plant species used for energy by the *Garo* tribe community of Bangladesh

Local name	Scientific name	Family	Preference (%)
Akashmoni	*Acacia auriculiformis* Willd.	Mimosaceae	93
Am	*Mangifera indica* Linn. instead of L.	Anacardiaceae	90
Bansh	*Bambusa* spp.	Gramineae	96
Boroi	*Zizyphus mauritiana* Lamk.	Rhamnaceae	75
Dumur	*Ficus hispida* L.f.	Moraceae	87
Eucalyptus	*Eucalyptus camaldulensis* Dehnhardt.	Myrtaceae	83
Jarul	*Lagerstroemia speciosa* (Linn.) Pers.	Lythraceae	94
Jiga	*Lannea coramandelica* Houtt.	Anacardiaceae	79
Kanthal	*Artocarpus heterophyllus* Lamk.	Moraceae	55
Mahagoni	*Swietenia mahogany* (Linn.) Jacq.	Meliaceae	68
Neem	*Azadirachta indica* A. Juss.	Meliaceae	67
Rain tree	*Samanea saman* (Jaq.) Merr.	Mimosaceae	95
Sil koroi	*Albizia procera* Benth.	Mimosaceae	79

Table 6. Plant species used for timber by the *Garo* tribe community of Bangladesh

Local name	Scientific name	Family	Preference (%)
Akasmoni	*Acacia auriculiformis* Willd.	Mimosaceae	93
Am	*Mangifera indica* Linn.	Anacardiaceae	78
Eucalyptus	*Eucalyptus camaldulensis* Dehnhardt.	Myrtaceae	90
Gamar	*Gmelina arborea* (Roxb.) DC.	Verbanaceae	80
Kanthal	*Artocarpus heterophyllus* Lamk.	Moraceae	80
Mahagoni	*Swietenia mahogany* (Linn.) Jacq.	Meliaceae	85
Neem	*Azadirachta indica* A. Juss.	Meliaceae	73
Rain tree	*Samanea saman* (Jaq.) Merr.	Mimosaceae	98
Segun	*Tectona grandis* L. f.	Verbenaceae	95
Sil koroi	*Albizia procera* Benth.	Mimosaceae	90
Sissoo	*Dalbergia sissoo* Roxb.	Fabaceae	68

beams of their houses. A total of 11 species were reported to be used as timber (Table 6). The most common species used in construction are: Akasmoni (*Acacia auriculiformis*), Gamar (*Gmelina arborea*), Mahagoni (*Swietenia mahogany*), Rain tree (*Samanea saman*), Kanthal (*Artocarpus heterophyllus*), Silkoroi (*Albizia procera*) and Segun (*Tectona grandis*), etc. Sattar (1998) reported on the durability and resistance to bio-deterioration of the species used by the tribal people for timber; e.g., Gamar is dimensionally stable and shows no degradation after long periods of use. The tribes are unlikely to be aware of the scientific reason for this, but know that this is so from transmitted, traditional knowledge.

Species used for Basketry and other utensils

The survey revealed that the weaving baskets and utensils were an essential part and parcel of the *Garo* community. Most men and women weave baskets and utensils as their leisure time activities. These vary in type, size and pattern according to their probable use for various purposes such as for seeds collection and harvesting, portable baskets for potting cloths and for stationery purposes. All of these products were made mainly of bamboo (*Melocanna baccifera*) and canes (*Calamus tenuis*). Amongst the everyday articles that the *Garo* uses the baskets, the storage pot for water was found to be an interesting utensil.

Utilization of Medicinal plants

It was evident from the survey that the *Garo* people greatly dependent on herbal medicine for their daily health care. Because of the inaccessibility to the modern medical

Table 7. Medicinal plants and their using pattern by the *Garo* tribe community of Bangladesh

Local name	Scientific name	Family	Plant type	Parts used	Disease	Using pattern
Ada	*Zingiber otficinale* Roscoe	Zingiberaceae	Herb	Tuber	Appetizer, dysentery, cough, vomiting	Eaten direct with salt, juice of it also eaten.
Amloki	*Phyllanthus embelica* Linn.	Euphorbiaceae	Tree	Leaf, bark	Constipation, jaundice, spermatorrhoea	Kept soak in water for several hours. Drink the water with salt
Amra	*Spondias pinnata* Kurz.	Anacardiaceae	Tree	Fruits, Bark	Fever and skin disease	Juice of fruit flesh is drunk
Anaros	*Annas comosus* (Linn.) Marr.	Bromeliaceae	Herb	Fruit	Jaundice	Fruits are eaten
Arjun	*Terminalia arjuna* W & A	Combretaceae	Tree	Bark	Burning, dysentery	Bark is soaked in water then water is drunk
Basok	*Adhatoda vasica* Nees	Acanthaceae	Shrub	Leaves, roots, flower	Cough, asthma, cardiac disease, malaria	Its juice is used with piper, pipul etc
Bel	*Aegle marmelos* (Linn.) Correa.	Rutaceae	Tree	Dry fruit	Gastric, flatulence	Juice from fruits
Bon ada	*Zingiber zerumbet* (Linn. instead of L.) Smith.	Zingiberaceae	Herb	Roots	Typhoid, cough	Juice from tuber is served as medicine
Debdaru	*Polyalthia longifolia* (Benth.) & Hk. f.	Annonaceae	Tree	Bark	Jaundice	Coconut water & sugar are mixed together with bark juice
Dhania	*Coriandrum sativum* Linn.	Umbeliferae	Herb	Leaves & roots	Stomach disease, diarrhea	Juice is produce from leaves and roots
Dhatura	*Datura innoxia* Mill.	Solanaceae	Herb	Whole plant	Diarrhea, dysentery	Grinding to make juice then drink the juice
Durba grass	*Cynodon dactylon* (Linn.) Pers.	Poaceae	Herb	Whole plant	Blood checking, skin disease	The paste from whole plant is placed in the wounded spot.
Kalohalud	*Curcuma caesia* Roxb.	Zingiberaceae	Herb	Leaves	Itching, cholera	Juice from leaves is used.
Kalomegh	*Andrographis paniculata* Nees	Acanthaceae	Herb	Whole plant	Fever, worm, dysentery	Its juice is used
Nagdana	*Attmisia maritime* Linn.	Asteraceae	Big shrub	Leaves & bark	Weakness, women disease etc	A paste is made from bark and leaves to make pill. Then dried pills are eaten
Neem	*Azadirachta indica* A. Juss.	Meliaceae	Tree	Bark, leaves & seed	Fever, stomach trouble, malaria, diarrhea	Pills are made from grinded bark, leaves and seeds. Then pills are eaten regularly.
Pathorkuchi	*Bryophyllum pinnatum* (Lamk) Oken.	Crassulaceae	Herb	Whole plant	Dysentery, cough	Juice is drunk 2-3 times in a day
Piaj	*Allium cepa* Linn.	Liliaceae	Herb	Whole plant	Common cold	Cutting slice is used with mustered oil
Shatamuli	*Asparagus racemosus* Willd.	Asparagaceae	Climber	Roots & leaves	Sexual weakness, fever, dysentery	The juice from roots and leaves is drunk regularly

Table 7. Continued

Local name	Scientific name	Family	Plant Type	Parts used	Disease	Using pattern
Sornolata	*Cuscuta reflexa* Roxb.	Convolvulaceae	Climber	Tender shoots	Fever, chicken disease	Juice is used
Thankuni	*Centella asiatica* (Linn.) Urban	Umbelliferae	Herb	Whole plant	Stomach disease, pain, blood dysentery	Its juice is used with honey
Tulsi	*Ocimum sanctum* Linn.	Labiatae	Shrub	Leaves, roots	Malaria, cough, spasm	Juice is made from leave and bark then juice is drunk with 1-2 drop of honey
Ulotkombal	*Abroma augusta* Linn.	Sterculiaceae	Shrub	leaf	White discharge, jaundice	Juice is with sugar & salt

facilities due to their primitive and pristine living style, they have much dependence on indigenous medical practitioner, locally called *kabiraj*, who generally prepare medicine from the plants available in the homestead and give prescription to the community members who face any disease. Since they were found to be the most dependent on herbal treatment, they had a greater understanding of medicinal plant too. A total of 23 species recorded from the homestead forest garden of the *Garo* tribe which has medicinal value (Table 7). Most of the species were found to use curing more than one disease. Some times for a particular disease a single species were used while in many cases a maximum of the species with different proportion also used. From the result, it was found that *Garo* have the vast and indigenous knowledge about using herbal medicine in primary health care in their everyday lives.

Gender role in daily activities of the Garo tribe community

The *Garo* people work together in some case and some cases there have distinct functions performed by male and female. Women do mostly the household activities and managing the homestead and helping agricultural field in sowing, mulching, weeding and harvesting. Men perform hard works like ploughing, cutting the big trees, digging the soil, preparation of the land for planting and all works in case of rice cultivation. Fuelwood collection from forest for daily cooking was the task of women. If there is no work male also collect fuel wood from the nearby forest. Female does all the activities of cottage industries except man participate in raw material collection and processing and marketing of the products. Collection of drinking water from the tube well, pond and carrying it to the home two times daily was also the job of women while the young girls helped their mother. The poultry was also observed to be feed and take care by the woman. Hunting and fishing was exclusively the job of men who also prepared the hunting devices and traps and is the major job performed by men. Young boys support in that job. In the preparation of horti-

Table 8. Gender role of the *Garo* tribe community in the study area

Activities	Gender role (%)	
	Male	Female
Agriculture		
Field preparation	90	10
Seed and planting materials collection	80	20
Planting, paddy cutting	50	50
Weeding and watering	35	65
Harvesting and grain separation	50	50
Drying and storage	-	100
Home garden and woodlot plantation		
Preparing seed bed	80	20
Seed and planting materials collection	30	70
Planting	60	40
Weeding	-	100
Tending operation	-	100
Fuelwood collection	-	100
Cottage industries		
Raw material collection and processing	50	50
Making	-	100
Marketing	40	60
Hunting	90	10
Fishing	85	15
Food and fruit collection	35	65
Marketing of food and fruit	70	30
Drinking water collection	-	100

cultural and agricultural land were mostly done by men where sometimes helped by the women and young boys (Table 8).

Conclusion

The *Garo* community is very heavily dependent on the plants for all kinds of produce for which it finds multiple uses, the most important of which are food, fruit, energy, timber and medicine so much that they constituted one of the integral components of forest ecosystem, where they had developed a balance with nature which might be viewed as a biome, a balance between man (here the *Garo* themselves) on one hand and flora and fauna on the other. The purpose of this study was to provide insights of the indigenous knowledge of *Garo*'s practiced on plain land and homestead management that would be useful to the agricultural department, relevant non-government organization, and forest department in the efforts to support their livelihoods. The indigenous knowledge on the utilization of the resources also shows a very particular pattern of forest use. They possessed an intimate relation with each and every component of forest like herbs, shrubs, trees, vines, wild animals both harmless and ferocious ones, insects, even soil and water also. Traditional dietary practices, especially involving plants, may provide important and valuable information on the medicinal effects on humans. For a full understanding of the nutrition and medicinal values of the food materials, chemical analyses need to be carried out on the respective parts of plants. Plants are also used as a source of energy; timber shows a traditional pattern of usage. To understand the scientific basis of these usages, studies on calorific values of the species used for energy, traditional use of the cooking stoves, wood structures and small scale forest based industries in the study area should be undertaken.

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