

Floral resources in a village environment of the Brahmaputra valley, Assam: inventory, use and conservation

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Abstract: Village environment is an integral part of a wider framework of rural landscape. The settlement sites along with the homesteads and the production territories around form a functionally linked system, where floral resources play an important role. Floral resources may be basically of two types: natural and planted. The livelihoods of the rural people are closely associated with these resources and, therefore, people are in some way or other concerned about their state of existence and conservation. This paper is an attempt to investigate the floral resources available in a village environment of the Brahmaputra floodplain, Assam. It tries to make an inventory of such resources and their utility and to explore the conservation efforts made by the natives for sustainability of these valuable resources. A systematic survey was conducted in the entire village with a purposively designed schedule to generate first hand data and information for the purpose.

Key words: Floral resources, Brahmaputra valley, Assam, conservation and village environment.

Introduction

The Brahmaputra valley in Assam covering a geographical area of 56,194 km² (72 percent of the state's total area) is richly endowed with diverse floral resources. The complex physiographic make-up, variable weather, soil and hydrological conditions have provided distinctive ecological settings for the luxuriant growth of different vegetations. The floral resources in village level environment in the valley, unlike the broader regional context, generally comprise wild and planted trees distributed in different micro-agroecological niches such as residential land, home garden, grazing land, small patches of forest, wetland and cropland. The traditional wisdom of tree growing in the villages of the valley in both natural and cultural lands has given rise to most diverse agro-forestry and ethno-forestry landscapes which have immense contribution to the local ecology and economy.

However, in course of time people started using village resources at a scale beyond the carrying capacity and sustainability, either because of internal constraints and pressure or external demands and interferences (Stadel, 2007). The change in farming system, especially after the introduction of modern farming practices under green revolution during 1960s altered not only the crops cultivated but also reduced the flow of various local natural resources (Yoshino, 2008). Moreover, rapid population growth in the state of Assam resulting mainly from immigration from East Pakistan, particularly during and after 1950s, and concomitant pressure on forest resources for food, fibre and fuel, and commercialization of floral products have caused degradation of the floral resources more particularly in the Brahmaputra valley of the state.

Although some studies on the resources of the valley have already appeared, detailed study covering all aspects of availability and use of natural resources in the villages of the valley has not been done so far. As a matter of fact, a holistic study of the resource base and utilization in the villages is very important for any kind of resource management and development planning. This paper is an attempt to study the availability, pattern of ownership and utilization of floral resources in a floodplain village called

Muktapur in the district of Kamrup (Rural) of the Brahmaputra valley, Assam.

Materials and Methods

A comprehensive field work covering all the 408 households of the village was conducted through a purposively designed survey schedule during 2006-2008. The data / information regarding the availability, status, uses, ownership and management of floral resources generated through the household survey have been summarized and analysed. The information relating to the use and management of community resources are collected from the members of the *Chuburi* (hamlet) Development Committee and other groups and individuals. With the help of Participatory Rural Appraisal (PRA) and oral interviews conducted among some old and experienced farmers the distribution and utility of floral resources in the village has been studied. Personal field visit was made in the entire village to have an overall idea of the existing resource base within the village. The *dag* map collected from the Goreswar Revenue Office, Government of Assam is taken as the base map of the village. Modern tools and softwares such as GPS, ArcGIS 9.2 were also used to prepare the relevant map of the village.

Background of the Village: The name 'Muktapur' has historical significance. It stems from two local words: *Mukta*- meaning pearl and *pur*- meaning plethora. It is worth mentioning that upto the 1990s, there were abundant natural resources in the village comprising extensive fertile agricultural lands, a variety of fish and aquatic vegetables and valuable trees. The Punai dead channel which is lying along the boundary of the village acted as the artery of life and living of the villagers as it provided sufficient amount of fish, water, vegetables and also fresh alluvium to the agricultural fields. There was a time, when the people of Muktapur could sustain their lives depending solely on the locally available resources. But, under the changed social and ecological situation, there has been sharp decline of these resources in the village.

Muktapur village is located in Goreswar Revenue Circle of Rangia Sub-division, Kamrup (rural) district, Assam (Fig. 1). The village lies within 26°26'1" N to 26°25'6" N latitude and 91°43'14" E to 91°45'6" E longitude. This is a

typical village inhabited by indigenous non-tribal Assamese people. It is located in the north bank floodplain of the Lower Brahmaputra, about 35 km from the Guwahati city and 40 km from the Bhutan Himalayan foothills. It is surrounded by some typical Assamese villages which together create an environment of mutual exchange and mobilization resources among them. Muktapur village with 408 households and a population of

2080 covers an area of 3.67 sq km (as on 2006). The population density is 567 persons per square kilometer. Out of the total working force of the village, nearly 80 per cent is directly related to agriculture. The literacy rate for the village as a whole is 84 per cent. The village consists of 11 *chuburis* (hamlets) inhabited by people belonging to different castes.

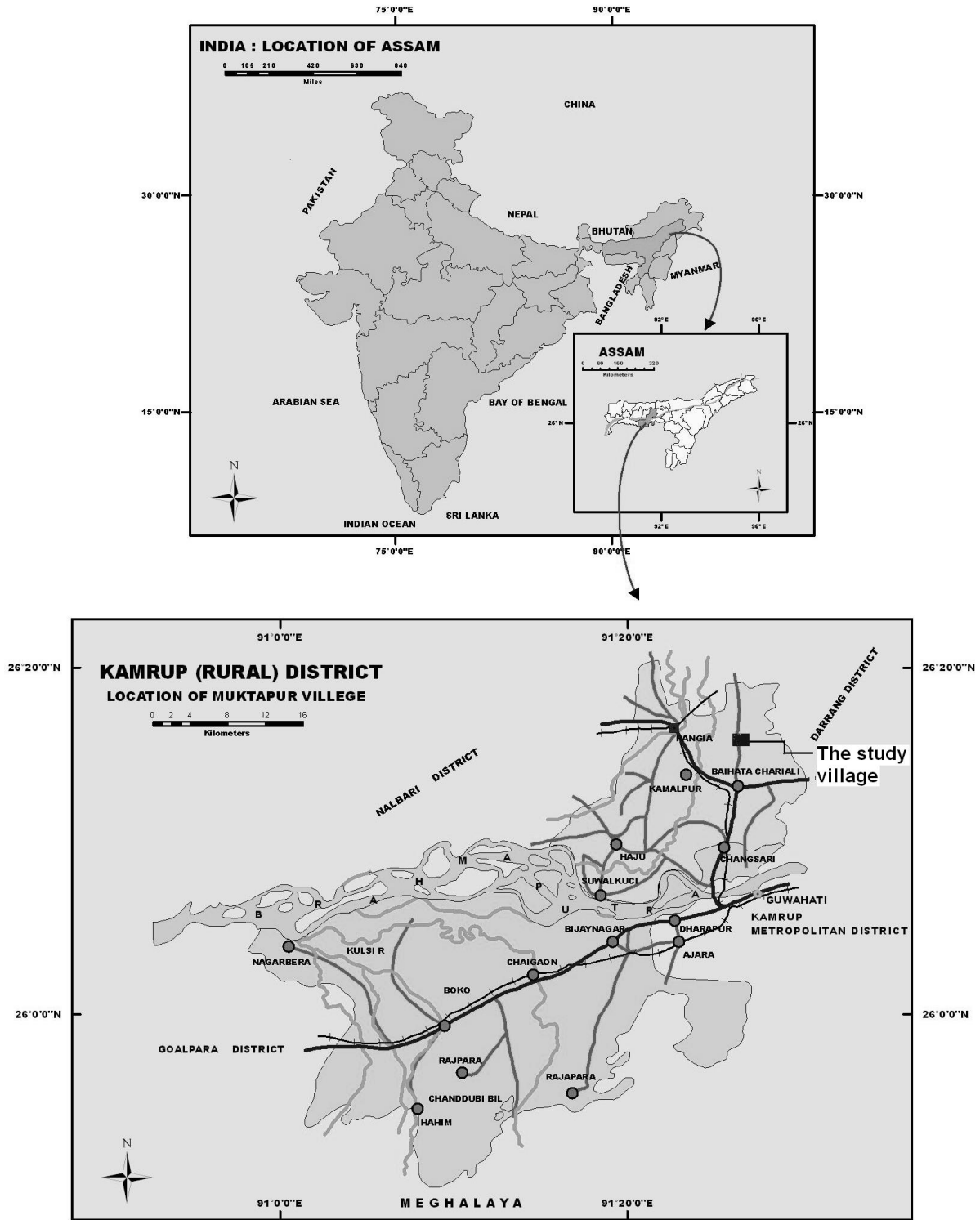


Fig. 1. Location of Muktapur village

Results and Discussion

Inventory of Village Floral Resources

The trees and other vegetation, aquatic resources and different types of crop lands form the principal resource base of the village (Table 1). Some of the trees available in

the village are natural, others are planted by the people to meet their requirements. The village is also blessed with diversified aquatic flora and fauna. The people procure aquatic vegetables like *helochi* and *kalmou*, and fodder from the nearby wetlands.

Table 1. Floral resources available in the village environment

Type of trees		Name of the trees	
Terrestrial vegetation	Natural	Wood, fruit and medicinal trees	<i>Moj, poma, ahat, jori, adimaru, kadom, simalu, siris, kata kuhi, safed siris, bogidhuli, loabandha, gomari, mysore gum, tangtangeli, tita chapa, khair, arjun, takou, bamboo, cane, kohimolla, bhoja, pongam, bastard cedar, gol mohur, peacock flower, tamarind, mango, black berry, hog plum, leteku, bokoto plum, indian jujube, rose apple, banana tree, ou, kuji thekera, bar thekera, indian curry leaf, posotia, bhedelilota, mesundari, manimuni, chamah, kachu, drum stick.</i>
	Planted	Fruit and flower trees & Medicinal plants	Coconut tree, betel nut, betel pepper, amla, jack fruit, guava, olive tree, carambola, <i>bhomora</i> , litchi, indian almond, papaya, wood apple, <i>atlash, harphuli</i> , pumelo, <i>mausumbi</i> , orange tree, sour orange, indian medlar, pomegranate, <i>debadaru, sewali, amaltas, batal brash, palash, tagar, golap, champa, keteki, karabi, patful, narjee, tej pat, sirata, tita bahek, hiju, maha neem, jetuka, tulasi</i>
Aquatic vegetation	Flora (natural)	Vegetables and grasses	Swamp cabbage, <i>helochi, makuwa, kachu, padum, dalghah, pani meteka</i>

Note: The local names of the trees are shown in italic form.

Floral resources in a village environment may be of various types depending upon the regional and local ecological conditions. Besides certain edible plants both aquatic and terrestrial, a large number of trees may be there serving various purposes. The main floral resources of the village comprise both naturally grown and planted trees. Interestingly, the assemblages of both natural and planted trees distributed in different categories of land in the village manifest a peculiar agro-forestry landscape with great potentiality to provide food, fodder, firewood, foliage, medicinal plants and building materials (Table 2). Tree-growing along with agriculture (agroforestry) as well as numerous vegetations in the cultural landscape (ethnoforestry) including the individual farms, watersheds and regional landscape can be integrated to take advantage of the services provided by adjacent natural, semi-natural or restored ecosystems (Pandey, 2007). The distribution of wood, fuel wood and fruit bearing trees and nut trees grown in the village under study is diverse and uneven (Table 3 & 4).

However, the number of wood trees by the side of the paddy fields is very negligible, accounting only for 1.27 percent of the total wood trees. Besides the wood trees, a large number of fruit- and nut-bearing trees are also there, especially in the homestead lands and home gardens accounting 7.63 percent and 90.54 percent respectively. It is noteworthy that like many other villages of the Brahmaputra floodplain, the people of Muktapur also traditionally grow a large number of coconut and betel nut

trees in their home gardens and around the homesteads. In addition to these, fruit-bearing trees like mango, blackberry, jackfruit, olive, *kardo*, litchi, *poniol, letuku*, etc are also grown in the village. The fruit-bearing trees are usually raised near the homesteads so that these can be protected from people and wild animals.

Areas of occurrence

As a substantial part of the village is under housing, infrastructural and agricultural uses, floral resources are limited to specific areas within the village (Fig. 2). The important areas of occurrence of these resources are as follows:

Residential lands (gharveti): The residential lands are in slightly higher lands accounting for 6.79 per cent of the village total area. Selected floras, like betel nut, betel leaf, coconut, neem, banana, bamboo etc are grown around the *gharbheti*. It is noteworthy that the plantation of betel nut and betel leaf in the front side of the homesteads traditionally is a peculiar feature encountered in the floodplain villages of the Brahmaputra valley. The trees grown around the homesteads not only protect the houses from the devastating wind (*bardoichila*) but also provide necessary floral products for various uses.

Homestead gardens (basti): The homestead gardens (Photographs 1 to 4) are endowed with highly diverse species providing edible plants and a variety of other products, such as firewood, medicinal plants, and some ornamentals species. These *bastis* are treated by the

villagers as 'productive units' from where they derive almost all necessary resources for their livelihood (Bhagabati and Das 1992). Economic plants such as coconut, betel nut, betel leaf, jackfruits, black berry, mango and citrus fruits like olive, orange, *rabab tenga*,

thekera tenga etc. grown in the *bastis* are used for domestic consumption as also for cash. The perennial woody trees such as *moj*, *poma*, *teak*, *katakuhi*, *kohimallya*, etc. are used as fire-woods and construction materials.

Table 2. Number of selected trees and their utility

Local name of tree	Botanical name of trees	Number of trees in the village	Number of households possessing tree	Utility of the trees
Aam	<i>Mangifera indica</i>	1192	329	Fruit, wood, religious
Kalajam	<i>Syzygium curmini</i>	294	217	Fruit, wood
Kothal	<i>Artocarpus sp.</i>	672	235	Fruit, wood
Bel	<i>Aegle marmelos</i>	89	81	Fruit, religious
Bogori	<i>Ziziphus mauritiana</i>	82	77	Fruit, firewood
Teteli	<i>Tamarindus indica</i>	78	68	Fruit, firewood
Leteku	<i>Baccaurea raniflora</i>	60	58	Fruit
Narikal	<i>Cocos nucifera</i>	1,287	298	Cash crop, religious and cultural
Tamol	<i>Areca catechu</i>	4,672	376	Cash crop, cultural
Pan	<i>Piper betle</i>	1,821	381	Cash crop, religious and cultural
Dalim	<i>Punica granatum L.</i>	55	47	Fruits, medicinal
Bakul	<i>Minusops elengi L.</i>	30	30	Religious, beautification
Kuji thekera	<i>Garcinia kydia Roxb</i>	37	33	Medicinal, wood
Jalpai	<i>Olea europia Linn</i>	22	19	Fruit, medicinal
Shilikha	<i>Terminalia cattapa L.</i>	24	20	Medicinal, religious
Kordoi	<i>Averrhoa carambola L.</i>	19	19	Fruits
Madhuri aam	<i>Psidium guajava L.</i>	237	219	Fruit, medicinal
Amlakhi	<i>Embilica officinalis</i>	67	65	Fruit, medicinal
Amara	<i>S. piñata (koem) kurz</i>	23	20	Fruit, medicinal, fire-wood
Ou	<i>Dillenia indica</i>	27	24	Medicinal, fruits
Ahat	<i>Ficus religiosa.</i>	12	8	Religious, shade
Jori	<i>Ficus hispida</i>	983	312	Firewood
Poma	<i>Cedrela toona</i>	456	284	Firewood, wood
Kadom	<i>Anthocephalus cadamba</i>	691	337	Firewood, wood
Simalu	<i>Bombax ceiba</i>	402	271	Wood, cotton
Moj	<i>Pithecellobium monadelphum</i>	980	330	Firewood
Arjun	<i>Terminalia arjuna</i>	18	0	Medicinal, religious, shade
Adimura	-	34	24	Religious, wood
Mahanim	<i>Azadirachta Indica</i>	337	289	Medicinal
Narasingha	<i>Murraya koenigii</i>	600	302	Medicinal
Posotia	<i>Vitex negudo</i>	182	174	Medicinal, tooth brash
Gomari	<i>Gemlina arborea</i>	897	219	Wood, leaves as fodder
Chegun	<i>Tectona grandis</i>	1,982	279	Wood
Khaira	<i>Acacia catechu</i>	145	80	Wood
Dimoru	<i>Ficus hirta</i>	140	110	Fodder, firewood
Takou	<i>Livistonia jankinsonia</i>	24	21	Roofing and <i>Japi</i> preparing
Banh	<i>Bambusa balcooa</i>	21,576	349	Construction materials, making tools and utensils, firewood, fencing, etc
Bet	<i>Calamus flagellum</i>	15,567	180	Construction materials, making tools and utensils

Crop lands (kheti mati): The crop lands, especially the paddy fields also contain a number of trees in their periphery which exhibit a unique agroforestry system in the village. Agro-forestry leads to a more diversified and sustainable rural production system than many treeless farming alternatives and provides increased social, economic and environmental benefits for land users at all level (Pandey, 2007). The plants in the paddy fields are seen along the dykes and approach roads which the farmers use as shade trees.

Grazing lands (bakari mati): These are slightly elevated lands kept specially for the growth of grasses. Because of

higher surface level, the water retaining capacity of these lands is low. Used for the purpose of grazing these lands cover 3.77 per cent of the total village area. The trees for timber and firewood are seen to grow in the periphery of the grazing lands. Moreover, some shed trees also are grown in the grazing lands to provide shelter to the cattle during hot summer days.

Forest patches (Janghaltoli): These are some small natural patches of trees and undergrowths. *Janghaltolis* cover an insignificant proportion of area of the village. These are, however, rich in plant species and provide habitats for some lower order wild animals and birds.

These patches play a great role by providing fire woods, construction materials, medicinal plants, fruits, etc to the villagers.

Table 3. Distribution of wood and fire-wood trees in different land categories, 2006-2007

<i>Chuburi</i> (hamlet)	Number of wood trees in each land categories							
	Rl	Hg	Gl	Sb	Po	Kg	Ar	Wr
Auniati	97	76	218	18	106	1	0	3
Daibagna	76	153	7	49	28	0	0	0
Kalita	25	129	36	2	53	0	0	0
Veko	1	94	15	0	6	0	0	0
Brahman	15	251	70	0	36	0	0	2
Karariapara	19	134	83	0	9	2	13	2
Alikash	18	94	10	3	13	23	4	1
Satra	2	886	274	0	5	8	26	0
Gayatola	8	242	16	22	20	0	0	0
Bharali	12	248	29	15	11	0	0	0
Maranoipar	97	107	0	3	7	2	0	0
Muktapur village	370 (9.17)	2414 (59.83)	758 (18.79)	112 (2.78)	294 (7.29)	36 (0.89)	43 (1.07)	8 (0.20)

Note: (i) Rl=Residential land, Hg=Home garden, Gl=Grazing land, Sb=Seedling bed, Po=Pond, Kg=Kitchen garden, Ar=Autumn rice field, Wr=Winter rice field. (ii) Trees include: Teak, gomari, titachopa, moj, kodom, khair, poma, sesu, jori, aahat, simalu, bogidhuli, radhachura, katakuhi, kohimalla, bhoja, korai, etc.

Table 4. Distribution of fruit and nut-bearing trees in different land categories, 2006-2007

<i>Chuburi</i> (hamlet)	Number of fruit and nut-bearing trees in each land category							
	Rl	Hg	Gl	Sb	Po	Kg	Ar	Rd
Auniati	623	2648	17	8	68	15	0	0
Daibagna	428	1435	0	19	28	5	4	5
Kalita	173	1707	0	1	11	0	0	0
Veko	32	1093	0	0	12	0	0	0
Brahman	222	2420	39	0	16	0	0	0
Karariapara	152	2361	83	0	8	0	4	35
Alikash	286	2270	15	0	61	0	0	32
Satra	214	7531	53	2	0	1	0	0
Gayatola	384	8365	23	29	31	6	3	0
Bharali	141	3069	7	6	35	0	1	0
Maranoipar	259	1676	0	0	3	0	1	0
Muktapur village	2914 (7.65)	34575 (90.80)	237 (0.62)	65 (0.17)	173 (0.45)	27 (0.07)	13 (0.03)	72 (0.19)

Note: (i) Rl=Residential land, Hg=Home garden, Sb=Seedling bed, Po=Pond, Kg=Kitchen garden, Ar=Autumn rice field, Rd=Road side. (ii) Trees include: Mango, blackberry, jackfruits, guava, litchi, palm, coconut, betel nut, orange, papaya, olive, indian jujube, indian almond, mousumbi, carambola, tamarind, *thekeera*, wood apple, pomegranate, pumelo, amla, *athiafal*, hog plum, bakoto plum, sour orange, rose apple

Wetlands (Khal-beel): The wetlands comprising natural *beels* and ponds (*khal*), dead channel (*mora nadi*), marshes (*pitoni*), water loggings (*hola*) and man-made ponds (*pukhuri*) make the aquatic vegetation in the village highly diverse in nature, occurrence and use.

On the banks of the man-made ponds, a variety of economic plants like coconut, betel nut, banana, bamboo are grown. On the other hand, the natural wetlands (*khal*, *beel*, *pitoni*) with saturated soil favour the growth of a large variety of herbaceous vegetation like rushes, reeds, sedges and grasses.

Road sides: The village landscape is criss-crossed by various roads from footpath to surfaced roads. People have a tradition of planting selected tree species for providing

shades to human beings and domestic animals. Often, fruit-bearing and nut trees and also religious trees like coconut, betel nut, mango, black berry, wood apple, *harphuli*, *jori*, *ahat*, *arjun*, gol muhor, peacock flower are preferred for road side plantation.

Community ownership pattern

The Common Property Resources (CPRs) of the village such as small patches of forest, marshes, *beels*, public ponds, grasslands, *dongs* (irrigation channels), trees etc. play an important role in the sustenance and socio-economic upliftment of the rural people. The CPRs, which have traditionally constituted invaluable asset-base, provide both direct and indirect benefits to the local communities ranging from physical, mental, material,

cultural to spiritual (Mukherjee, 1997). As mentioned earlier, the village comprises 11 *chuburies* (hamlets) with their production territories coalescing within the broad landscape of a cluster of villages. Each *chuburi* has some common property resources, or sometimes 3 to 4 *chuburies* jointly have this type of resources. Usually the Chuburi Development Committee (CDC), which is there in each *chuburi*, is given ownership right to manage these common resources. In the case of resources belonging to 3-4 *chuburies*, a development committee is generally formed by the people of the *chuburies* to use such resources. The CDCs have been playing important role in managing the CPRs. The *chuburi* people have collective right for using such resources. However, the poor people of the *chuburies* are allowed to use these resources for their home consumption, but not for sell. These people usually collect fuel wood, dry branches, leaves, roots and fruits from the small green patches. Some of such patches

are also used as community cremation site. The income generated from the CPRs is spent for common infrastructural development of the *chuburi* or the village. The villagers depend on the forest patches mainly to acquire resources for domestic use, although a small portion is sold to earn cash (Table 5). Of the total population of the village, more than 75 percent directly use the community resources, especially the forest patches. Generally people collect fuel woods, fruits, roots, vegetables, building materials etc from the forest patches. Table reveals that 31 percent of the people go to the forest patches for firewood collection, 63 percent for fruits, roots, leaves and green vegetables, and 17 percent for collecting building materials. It is found that the forest resources, especially the fire woods, are sold by only 24 percent of the households, while fruits, roots, and vegetables are sold for cash by 7 percent of the households.

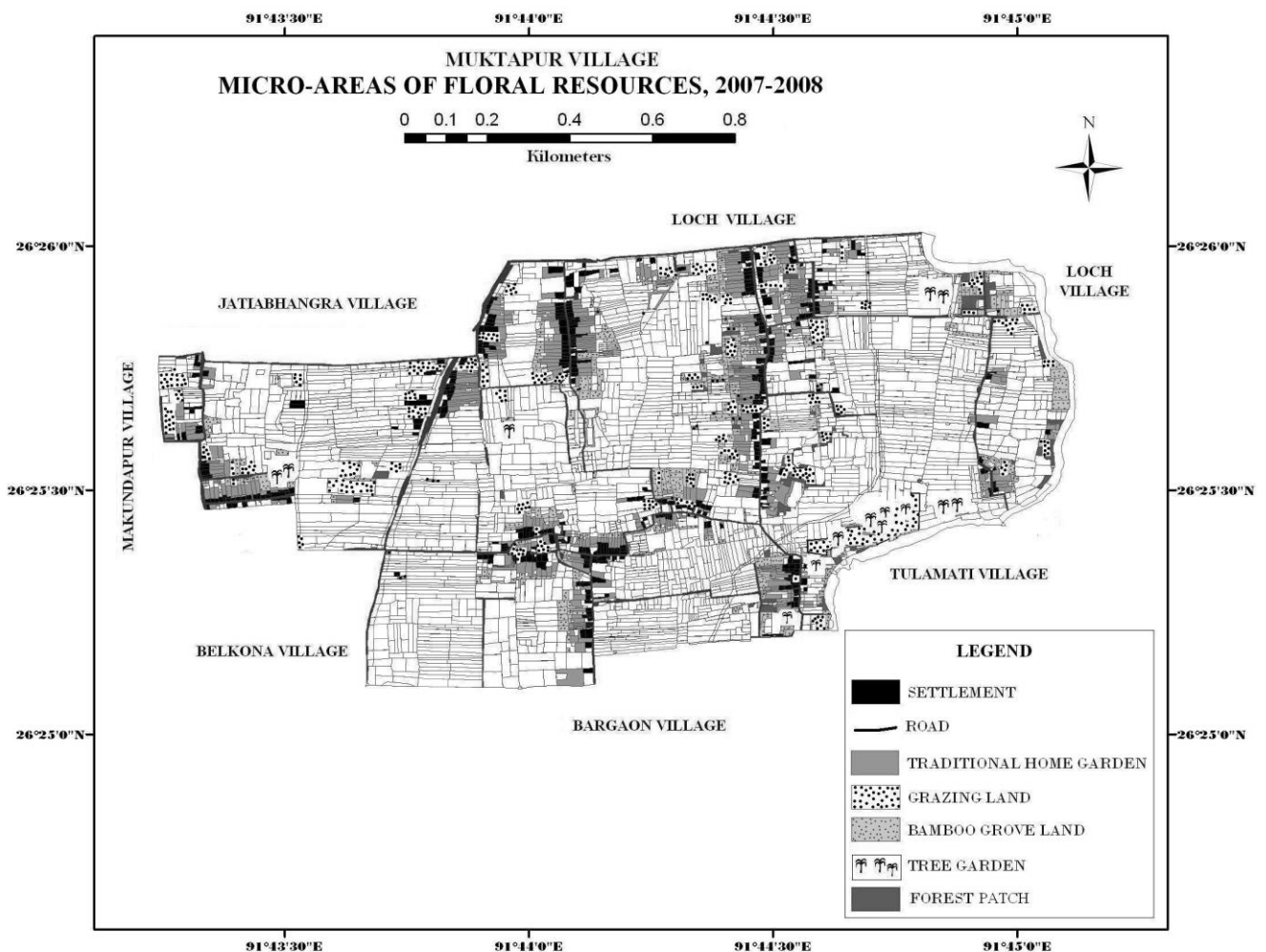


Fig 2. Distribution of floral resources in selected areas
 Note: (i) Trees scattered in the agricultural fields and (ii) aquatic flora are not shown

Conservation efforts

While responding to the local environment for survival, the villagers spontaneously developed an understanding of the natural elements and their interrelation. As their life and living are closely linked with the environment, they can easily appreciate the invaluable support provided by

nature. Thus the locals collectively play the role of a real custodian of the environmental elements that they have shared through generations. The feelings and perception that the people have developed about their environment help them to do something for conservation of natural resources. Thus, like other rural communities, the people

of Muktapur also have traditionally evolved some ideas and initiated actions towards conservation of their immediate environment. Interestingly, majority of the farmers, especially the small and marginal ones, still make use of the traditional practices, which proved to be effective and adaptive to their environment. For long, agriculture along with agro-forestry has been practiced on the basis of the availability and quality of land, water, and other organic elements as well as local seeds and indigenous knowledge that were nurtured traditionally in the area. Moreover, the households gardens, man-made

ponds (*pukhuri*) and natural ponds (*khal*) that the villagers have been maintaining through generations are the store-houses of a large number of plants and animal species. The tradition and indigenous ethics of tree growing around farms and homes have significant conservation value and impact on the ecosystem and the economic and social well-being of the people (Pandey, 2007). These informal and unorganized but sincere efforts on the part of the people towards conservation of nature as well as indigenous culture are invaluable so far the continuity of local floral diversity is concerned.

Table 5. Dependence on common property resources

Common resources	Type of use	No. of households involved	Purpose	
			For domestic use	For sell
Forest patches/ trees	Firewood	127 (31)	97 (76)	30 (24)
	Fruits/roots/ leaves/ vegetables	257 (63)	239 (93)	18 (7)
	Building materials	68 (17)	68 (100)	0 (0)

Note: Figures in the parentheses indicate the percentage to the total



Photograph 1. Trees on the man-made pond



Photograph 2. Forest patch



Photograph 3. Trees in grazing land



Photograph 4. Trees around homestead

There has been a growing consensus among the policy-makers, natural resource management practitioners, and academics towards the need of understanding the social

dimensions of natural resource management (Dovers, 2003). One of the most important steps in this regard may be empowering the local communities for active

participation in the practices and processes of conservation and management of natural resources. Local communities, who have traditionally acquire good knowledge and understanding about their surroundings, are individually unique, often holistic, spatially specific (Broderick 2005) and socially constructive (Lane 1997) and can therefore contribute directly towards resource management strategies. The tradition of leaving portions of environment completely untouched (sacred groves), for example, has made possible the survival of some important tree species. The indigenous rural people in the floodplain of the Brahmaputra, who may be called 'ecosystem people', (Bhagabati 2007) have played the role of real custodian of the local resources mainly the flora, especially the fruit, medicinal and other edible plants.

Conclusion

The rural life and livelihoods basically evolve around the natural resources, particularly the floral ones that are available within the village and its neighbouring environment. The rural people, generally with limited needs and aspiration use these resources sustainably. However, the pattern of utilization of the natural resources in the study village, which continued to be sustainable till recently, has now lost its traditional character under the changing ecological and socio-economic situations. Most of the floral resources of the village have been exhausted and others are in vulnerable condition. Trees of different quality and usability are the most valuable assets of the rural people which they use for domestic purposes and also sell to fulfill certain urgent needs. The *bastis* and agricultural lands are getting increasingly fragmented to accommodate more people and diverse ownership. The common lands including the forest patches on the other hand are getting reduced in size and have lost their rich ecological character. The rural landscapes in the floodplains of the Brahmaputra have thus experienced remarkable change in the processes and patterns of floral

resources use. There is, therefore, an urgent need to make the present generation of people aware of their immediate environment and its conservation and sustainable use.

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