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VALUATION OF MEDICINAL PLANTS AND CULTURAL ECOSYSTEM SERVICES –A CASE STUDY OF SATAJAN WETLAND AND BIRD SANCTUARY, LAKHIMPUR DISTRICT, ASSAM, INDIA

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Abstract

This study seeks to estimate the value of medicinal plants used by local people mainly mishing tribe and cultural ecosystem services provided by Satajan wetland and bird sanctuary situated at Lakhimpur district of Assam. For valuation of medicinal plants in the wetland, alternate valuation method is used. As urbanization increases, the relationship between wetland cultural ecosystem services and natural environment has become critical. In this study, we identified and mapped the cultural ecosystem services provided by Satajan wetland through preference survey data.Cultural ecosystem services provided by Satajan wetland and bird sanctuary are related to spiritual enrichment, recreation, ecotourism, aesthetics, formal and informal education, inspiration, and cultural Heritage. Estimation of cultural services is done by using Travel Cost Method (TCM) and Contingent Valuation Method (CVM). The result shows that wetland is rich in various medicinal plants that are extensively used by local community for

the treatment of various diseases which are of high economic value. Our findings also suggest that the Social and economic values for Ecosystem Services model is appropriate to serve such small-scale wetland and our results can provide a scientific basis for wetland management and planners to optimize the cultural ecosystem services and protect wetland resources.

Key words: Cultural ecosystem services, satajan wetland, bird sanctuary, wetland management

1. INTRODUCTION

Wetlands are unique, productive ecosystems where terrestrial and aquatic habitats meet. Wetland provides many benefits that contribute to human being. These include food and fiber, water supply, water purification, climate regulation, flood regulation, provide many plants that have medicinal prosperities, recreational opportunitiesand tourism. Ecosystem Services are the various benefits or services that human being gain from the natural environment or the natural ecosystems like forest ecosystem, grassland ecosystem or aquatic ecosystem. Collectively, these services are known as "Ecosystem Services". The livelihoods of people living in, or on the borders of, wetlands often depend partially or entirely on wetland ecosystem services. Ecosystem services are the direct and indirect benefits that human society gets from the environment or an ecosystem (*Millennium Ecosystem Assessment framework,* MA 2000). Ecosystem services have four distinct categories:

1) **Provisioning services**: This type of services includes the product obtained from ecosystem, for example food, fiber, genetic resources, and fresh water.
2) **Regulating services**: the benefits obtained from regulation of ecosystem processes, for example the regulation of climate, water and some human diseases.

3) **Cultural services**: The non material benefits people obtain from ecosystem through spiritual enrichment, recreation, aesthetic experience and tourism.
4) **Supporting services**: This include ecosystem services that are necessary for the production of all other ecosystem services. For example include biomass production, soil formation and retention, nutrient cycling, water cycling and provisioning of habitat.

The case we were going to study is all about the Satajan Wetland (Beel), Lakhimpur district, Assam. Lakhimpur is an Administrative district of Assam that lies on theNorth bank of the river Brahmaputra. The district is multi-cultured and multi-ethnic in nature where majority are Assamese peoples. Other than Assamese peoples, Mishing tribe, Deori tribe, live together with a unity showing a big cultural and traditional bonding. Satajan is a unique habitat of aquatic flora and fauna, which lies in the Eastern part of the district. The area of wetland is about total 95 acre (as consulted from Wetland sector office, Forest branch, Lakhimpur, Assam). It has been investigated that, besides three species of endangered turtles, as many as 34 species of residential and 13 species of long distance/migratory birds and more than 25 species of fish fauna in satajan is recorded (Green Heritage, Assam 2007-08) Satajan wetland provides the services that are very beneficial for human mankind and their livelihood (food, fuel, fiber, fodder, fertile soil, recreation and other cultural aspects). The Satajan Wetland and bird sanctuary is surrounded by three small villages of Mishing tribe. The Mishing peoples have the spiritual believe about the Satajan wetland and River Ranganadi, where every year, during rainy season they celebrate “Kanipan” (a traditional festival of Mishing tribe) for the good health of river Ranganadi and Satajan wetland. The Mishing peoples near satajan wetland gain direct benefits from the wetland area. They directly depend on satajan for their survival and their livelihood. They collect their day to day needs like firewood, wild edible plants, medicinal plants, fishes, fodder, etc for their

livelihood purposes. Satajan wetland and bird sanctuary plays an important role in providing beneficial services to the local peoples and other visitors. But day by day the services that Satajan wetland provide to the local peoples was decreasing due to human made disasters and also due to some environmental factors like climate change, etc.

2. Materials and methods

Study area:

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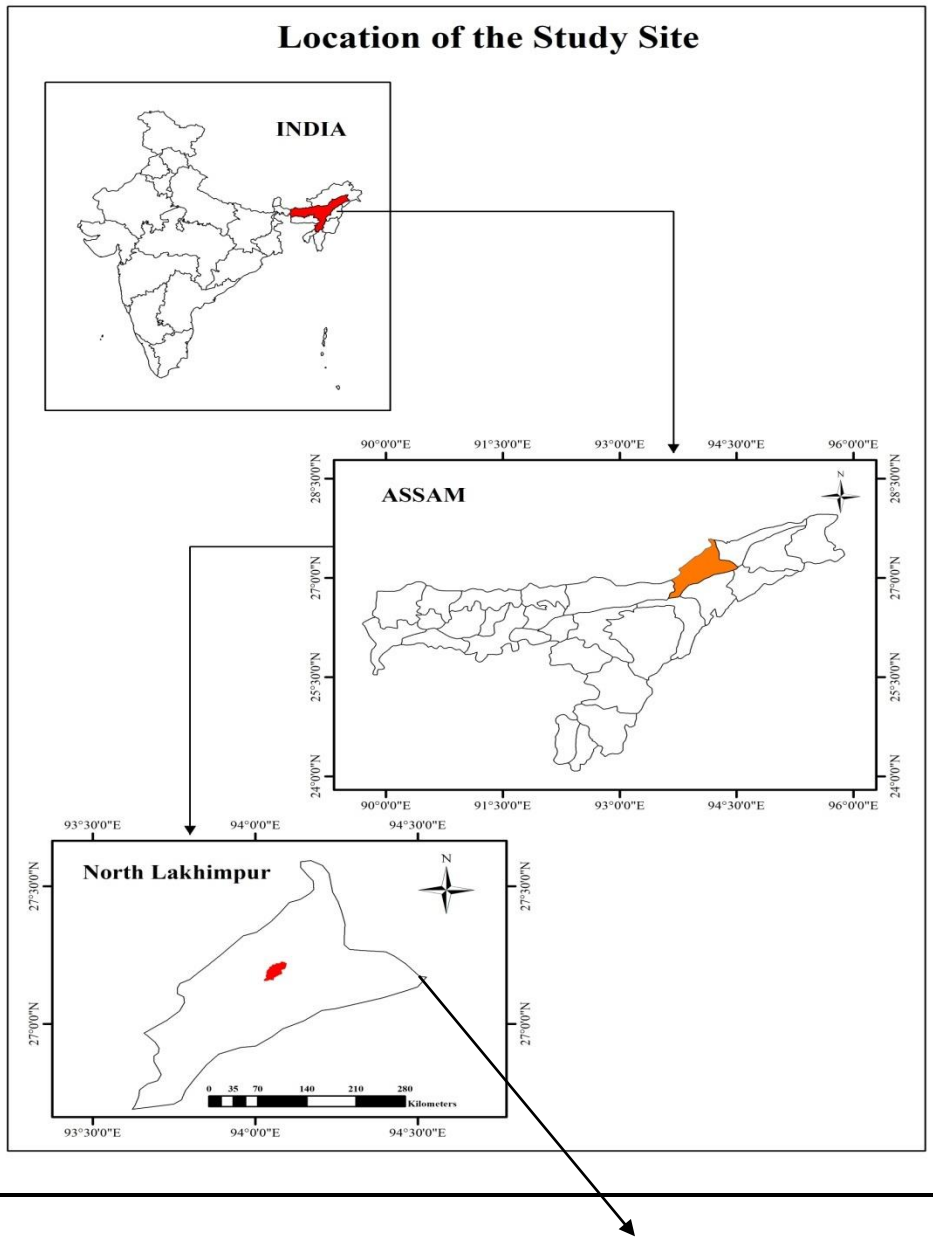

Satajan wetland and bird sanctuary, Lakhimpur, Assam

The present study is carried out in **Satajan Wetland and Bird Sanctuary**, North Lakhimpur, Assamcomprising 34 acres of area. The geographical location of the Satajan wetland is

27°12'36''N and 94°2'56''E at an altitude of 101m above mean sea level. The satajan is located in the floodplain of Ranganadi river regulated by 405 MW Ranganadi Hydroelectric Project which was created by devastating earthquake of 1950. The average annual rainfall of the area is 2949 mm, which occurred during the monsoon. Climate of the area is monsoonal tropical with summer temperature of 35-38°C and 6-8°C during winter.

3. Methods of data collection:

Data is collected through the method of survey. For present study we conducted three types of surveys.

1) **Key information interview**
2) **Focus group discussion**
3) **Household surveys**

In all the three categories, we involve direct analyzed and qualitative questionnaires and other techniques by using the local language (Assamese and Mishing).

First, we have focused on **Key information interview** where we visited the local communities and Divisional Forest Officer (DFO), Forest and Wetland sector, Lakhimpur, Assam and Forest Ranger Officer, Lakhimpur, Assam, who have specialized knowledge on the use of the resources and their protection in Satajan wetland. We collected information about tourist, cultural heritage of the wetland and policy to protect wetland resources. **Focus group discussion** involves a group of 20 to 30 peoples from the village community. Majority were women. Here, we have discussed about various resource harvesting activities like fishing and hunting. It also includes information

regarding seasons, market and prices and about other economic values in order toassist with the survey design. **Household surveys** were used to collect quantitative data on natural resource use and other household activities. Here, we have discussed about various issues like household composition, location and employment status, obtain details on each of the resources harvested, the equipment used, the amount gained annually, the quantity sold as raw product and the selling price per unit, the number of products produced from natural products and the amount sold and selling price of those products.

4. Methods of valuation:

For valuation of medicinal plants (provisioning services), we used **Alternate Valuation Method (Ninan et al. 2015)**on the basisof opportunity cost of time spent for collecting the medicinal plants.Thirty (30) households were visited and an average value of medicinal plants extracted from the wetland was calculated. From the average value the total cost(approx) per year was calculated.For example, if a person gets a cut/wound, he/she will have to buy ointments, cottons and bandage as fast aid. Instead of that (i.e. alternately), he/she will go to the wild and apply some wild medicinal plant part to cure his/her wound.The total cost for his/her treatment will be about 50 rupees (approx), instead of that they can use medicinal plant from the wild.

Cultural services of the wetland were evaluated by **Travel Cost (Ninan et al, 2015)** and **Contingent Valuation Method (*Mitchell and Carson*, 1989)**. The number of visitors that visited Satajan wetland and bird sanctuary per month on average was evaluated for the purpose

of research work, bird watching, boating, recreation, etc was calculated. Again the cost for cleaning purpose of Satajan wetland was recorded.

(i) Estimating Cultural services by using **Travel Cost Method** (TCM):

Travel Cost Method is a technique used for the purpose of valuation of benefits like recreation from the environmental amenities, especially in the case where visitor fees are low. It is assumed that the money and time spent on visiting a recreational site is used for the valuation of that site.

Example: The Travel Cost Method includes the total cost of visitors like research scholars, scientists, bird watching people, etc. It includes the travel cost of the visitors, staying cost (i.e. home stay or hotel cost).

(ii) Estimating Cultural services by using **Contingent Valuation Method** (CVM):

Contingent Valuation Method (CVM) is a technique used to estimate and understand people`s willingness to pay for access to or the existence of natural resources by means of direct questionnaire survey technique (*Mitchell and Carson,* 1989). In this survey, some hypothetical questions have been raised to each of the responsible individuals which elicit their willingness to pay for the preservation of biodiversity and also to protect them.

Example: The Contingent Valuation Method (CVM) includes the total estimation of people`s willingness to pay for the natural resources and environment of Satajan wetland and bird sanctuary. They donate the amount for the betterment of the wetland and also for the protection of the natural resources and its habitat.

5. Result and discussion:

Medicinal plants and valuation:

Sl. No.	Local Name	Scientific name	Uses	NO. of total Household	Values in Rupees (Approx/yearly)	Values in US$ (Approx/yearly)
01	Bormani muni	*Centellaasiatica (Linn.)*	Leaves, as brain tonic, dysentery	30	36,000	537
02	Man dhonia	*Eryngiumfoetidum(Linn.)*	Leaves, headache	30	36,000	537
03	Mosond ori	*Houttuyniacordata(thumb.)*	Leaves, chronic dysentery, stomach problem	30	60,000	895
04	Durun bon	*Leucasaspera*	Leaves, sinusitis problem	30	60,000	895
05	Tengesis ak	*Oxalis corniculata(Linn.)*	Leaves,diarrhoea	30	54,000	805
06	Dubori bon	*Cynodondactylon(Pers.)*	Plant paste, stop bleeding from cut and injuries	30	60,000	895
07	Kola kochu	*Colacasiaesculenta(Schoot)*	Petiole juice in cut and wounds	30	72,000	1074
08	Brahmi	*Bacopamonnieri*	Leaf juice as memory booster	30	96,000	1432
09	citronella	*Cynodonflexuosus*	Leaves juice in diff kinds	30	48,000	716

			of skin disease			
10	Noyontora	*Catharanthusroseus(Linn.)*	Flower paste used in insect bites	30	42,000	626
TOTAL					**5,64,000**	**8417**

The Mishing tribe has rich traditional knowledge of using various plants as medicine which they generally collected from the Satajan wetland like *Centellaasiatica, Bacopamonnieri, Cynodondactylon, etc.* Valuation of the medicinal plants was done throughAlternate Cost Valuation method and total cost evaluated was approximately Rs. 5,64,000 or $ 8417

6. Cultural services and valuation:

Estimation of Tourist by using **Zonal Travel Cost Method**

Sl. No.	Zone	Visitor/yr	Purpose of visit	Travel cost/person	Lodging and Fooding cost/person	Value in Rs	US$
1	Zone I-within North Lakhimpur	1000	Bird watching, Recreation, Research	100	nil	1,00000	1492
2	Zone II-outside Lakhimpur district but within Assam	500	Bird watching, Recreation, Research	600	1200	9,00000	13432
3	Zone III-outside Assam but within North East	200	Bird watching, Recreation, Research	1500	1500	6,00000	8955
4	Zone IV-outside North East but within India	100	Bird watching, Recreation, Research	4000	2000	6,00000	8955

TOTAL	**22,00000**	**32835**

Satajan wetland is not only a habitat for aquatic flora and fauna but also plays an important role for the migratory birds during winter therefore it is also a Bird sanctuary. As per the information from the forest office there are 34 residential and 14 species of long distance migratory bird in Satajan (Forest Department, 2017). Satajan wetland is known as the breeding ground of many migratory birds like lesser and large whistling teal, white breasted water hen and bronze winged jacana. Due to its aesthetic value and habitat provision to various birds and plants people visited Satajan wetland for several purposes like bird watching, and for many research purposes and other recreational aspects. The value of these services as assessed through the travel cost method of the vistors was approximately 22, 00000INR or $32835 which clearly indicates that these wetland also provide cultural ecosystem services.

People`s willingness to pay for conservation of natural resources of Satajan wetland by using

7. Contingent Valuation method:

Sl.No	Donated by (Individual and Organization)	Donated to	Amount donated (in Rs)	Value in US$

01	DFO, North Lakhimpur, Assam	NGO	90,000	1,343
02	Individual	NGO	10,000	149
03	Individual	Satajan Suraksha Samitee	5,000	74
04	Individual	Green Heritage	10,000	149
TOTAL			**1,15,000**	**1,716**

Contingent Valuation method is use to estimate people's willingness to pay for the development and better conservation of habitat and natural resources of the Satajan wetland. After the valuation, we came to know that the total amount of money donated for the wetland/year is 1, 15,000 INR or $ 1,716 which indicates that people are aware of the various services provided by these wetland to the society and willing to support it for future.

Total Value of **cultural services:**

Sl. No	**Services**	**Method of valuation**	**Value in INR**	**Value in USD**	**References**
1	Estimation of Tourist/Visitors	Zonal Travel Cost Method	22,00000	32835	Self Study
2	People`s willingness to pay for conservation of natural resources of Satajan wetland	Contingent Valuation method	1,15,000	1,716	Self Study
TOTAL			**2,315,000**	**34551**	

Above result shows that, evaluated value of different cultural services provided by the Satajan wetland of Lakhimpur district, Assam. We mainly focused on the total number of tourist/visitors visiting Satajan wetland and people`s willingness to pay for the conservation and protection of the Satajan wetland. Satajan wetland also provides cultural services to the society besides the provisioning services to the society.

8. Conclusion:

The assessment of the valuation of medicinal plants and Cultural ecosystem services provided by Satajan Wetland and Bird Sanctuary, North Lakhimpur, Assam revealed that the wetland provide a huge livelihood support to the local people especially the missing tribe as well as, it provides various essential services to the local community in terms of various wild medicinal plants as discussed above. Along with wild medicinal plants, Satajan Wetland and nearby River "Ranganadi" is highly believed for its cultural, spiritual and recreational aspects. The local tribes and communities were benefited directly or indirectly by various religious festivals like "KANIPAAN" (a religious prayer of missing tribe to the river Ranganadi), as well as various recreational works like Bird Watching, Boating, Fishing, eco-tourism, through which they were benefitted every year.

The evaluation value of wild medicinal plants of Satajan Wetland and Bird Sanctuary of Assam was Rs. 5, 64,000/- or 8417$ (Approx.)

From the present study, we can conclude that the local communities (tribes) residing near Satajan Wetland were directly or indirectly benefited by the wetland. Instead of destroying the nature, we should maintain the discipline of nature for a better future and a better livelihood.

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