



# Resource Inventory Analysis of Kabartal Wetland

MUKESH KUMAR  
M. Phil Scholar,  
Department of Geography,  
Delhi School of Economics,  
University of Delhi.

## Abstract:

*Wetlands are one of the most productive ecosystems and play a significant role in the ecological balance. There are many function of wetland such as hydrological function, which includes groundwater recharge, ground water discharge despite of this it help in flood control and flow regulation. KabarTal wetland has been used for water supply for irrigation and domestic purposes, fishing, netting of migratory waterfowl for sale, harvesting of wild rice and gathering of the edible mollusk, *Pilaglobosa* and edible plant product such as *Singhada* (water chestnut), *Makhana* (foxnut). In spite of its biological and ecological significance, this wetland is under threat because of reclamation of land for agriculture, changes in the hydrologic regime resulting from construction of dykes, excessive removal of biomass and population pressure. This calls for a long term planning for preservation and conservation of these resources.*

---

**Keywords:** Analysis, Resource inventory, KabarTal wetland

---

## 1. Introduction

Wetland as areas of land that are either temporarily or permanently covered by water exhibit enormous diversity according to their genesis, geographical location, water regime and chemistry. Wetlands are one of the most productive ecosystems and play crucial role in hydrological cycle. Utility wise, wetlands directly and indirectly support millions of people in providing services such as storm and flood control, clean water supply, food, fibre and raw materials, scenic beauty, educational and recreational benefits. Wetland provides number of resources to the local people, which are considered as the lifeline of them. Local people who lived vicinity of the wetland area often depend on natural resource extraction as a key part of their livelihood strategy. The local people utilise these resources as the food, fodder, fuel, construction of hutment, medicine etc. In developing countries in particular, rural households make extensive use of a variety of products and services from environmental resources (Cavendish, 2000). Natural resource based activities tend to require little skill and monetary investment with associated low returns except in cases of highly specialized resources or products with high market value (Vedeld et al., 2004). Some of the products obtained from natural resources include fuel wood, plants, medicines, wild food, fibre, grazing material for animals, hunting animals and building materials (Bluffstone et al., 2001; DeBoer & Baquete, 1998; Cavendish, 2000; Vedeld et al., 2004; Heltberg, 2001). Households that depend on agriculture for their livelihood also use the natural resources for crop/agricultural land or grazing land for animals (Bluffstone et al., 2001; Vedeld et al., 2004).

## 2. Study Area

Kabartal is ecologically most important wetland and considered as one of the Asia's largest fresh water oxbow lake, and it hosts number of species of resident and migratory birds. Due to its biodiversity this lake was declared protected area in 1986 and was declared bird sanctuary in 1989. The lake is surrounded by the river Burigandak and spreads over 6000+ ha in district

Begusarai (Bihar). It is an oxbow lake with high curvature and circular bend ended into hook-like connection towards the river Burigandak. It serves as suitable major habitat for many resident and migratory waterfowl and other avifauna. Kabartal wetland situated at latitude of  $25^{\circ}35' N$  and a longitude of  $86^{\circ}10'E$  is the largest freshwater lake in Northern Bihar, and is one of the most important wetlands of upper Indo-Gangetic plain (Fig 1). The Kabartal has been classified as wetland type 19 due to presence of habitat (Scott, 1989).

The Kabartal plays significant hydrological and ecological role in the surrounding landscape, besides being one of the most important staging grounds for migratory waterfowls. Traditionally, the wetland has been used for water supply for irrigation and domestic purposes, fishing, netting of migratory waterfowl for sale, harvesting of wild rice, and gathering of the edible mollusk, *Pila globosa*. It plays a significant role in lives of local people. More than 41 species of commercially valuable fish have been recorded (Anon, 2004).The lake is known to support a rich and diverse aquatic flora..

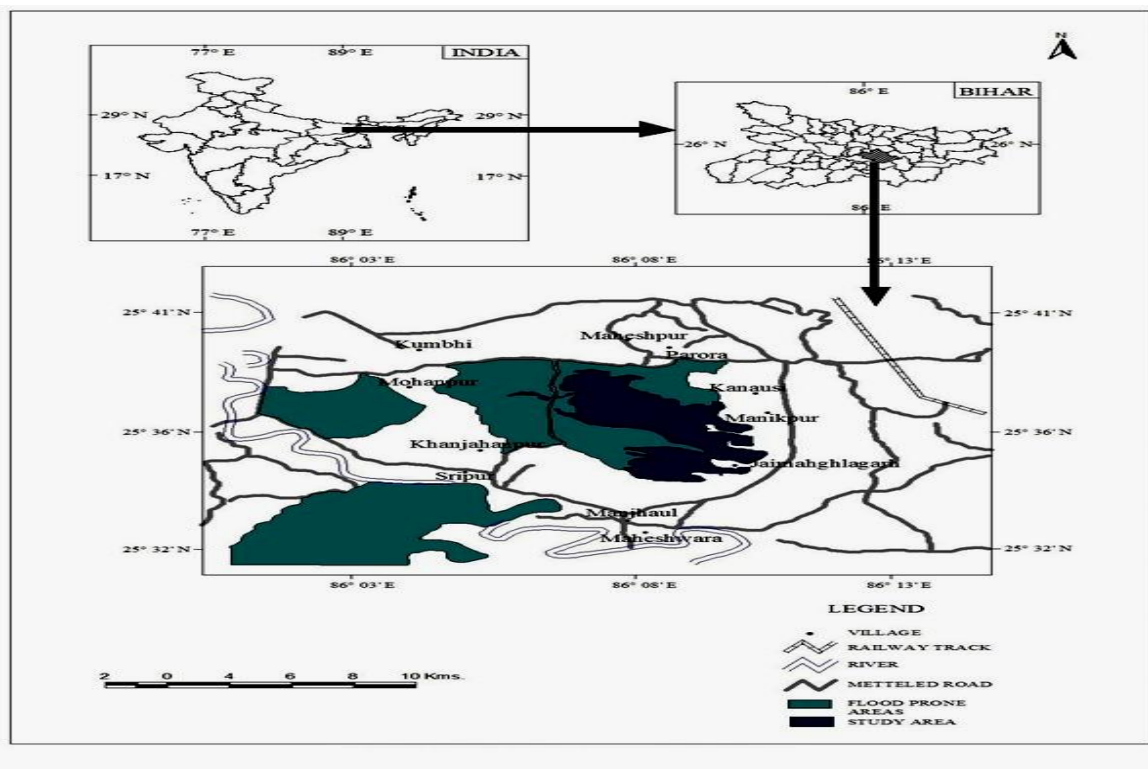


Fig. 1. Study Area

### 3. Methodology

For study of natural resources, secondary data has been used from various institutions such as State Department of Agriculture, District Agriculture Office begusarai, Central pollution control board. The Survey of India (SOI) 1:50,000 scale toposheet has been used for identification of numerous villages around the wetland with in a territory of 5 km. With the help of toposheet, total number of villages present in buffer zone (5km around lake) has been pointed out. All the villages have been divided into three categories based on their distance from the wetland. The villages which are situated 1.5 km away from the wetland has been considered in the first category. The second category has been included the villages which are 3 km away from the wetland. Finally, third category has been included the villages which are situated five km away from the wetland. Two villages from each of the category have been taken for questionnaire survey. Prior to questionnaire survey; a pilot study had been done for making questionnaire. 160 household were surveyed in six sample villages. Sample size has been selected based on total number of household present .More households has resulted to larger the sample size. The questionnaire included both responses-fixed and open-ended for for gathering data on

consumptive use of wetland such as fishing, fodder, grazing, plant use and non-consumptive use. To know about the resources base, formal and open ended interview with district agricultural officer, District forest officer and staff of block has been conducted. Along with this, Focus group discussion was conducted. Descriptive statistical method has been used for the representation of the result and which helps in the analysis of the resources base.

SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis has been done for assessment of natural resource and helps in assessing the exiting legal policy, project and economic decision .This is analysis attempt to identify strategic factor for considering further making new strategies. This can be facilitating the process of making decisions in multi-criteria framework in natural resource management.

#### 4. Result and Discussion

A natural resource is anything people can use which comes from nature. People do not make natural resources, but gather them from the earth. Examples of natural resources are land, air, water, wood, oil, solar energy, wind energy, hydro-electric energy, and coal. In the following section, we briefly describe the resources of trivial importance.

##### 4.1 Water Resource

Water resource is the most important component of wetland and supported various flora and fauna along with ecological balance. Source of Water in KabarTal Wetland:

##### 4.1.1 Rainfall

In this region monsoon, type of climate is found so rainfall occurs in sufficient amount every year. Therefore, rainfall is the main source water for KabarTal wetland. Favourable topographical relief causes most of water for wetland fed every year.

##### 4.1.2 Flooding In River System

There are two main river flowing around the lake namely Burigandak and Bagmati. Along with these larger rivers, smaller river are also present and various local name such as Chanha river, Kali river and Kubi Nadi (shown in fig. 2). This advance state of horseshoe shaped lake is fed by rainwater or by overflowing the river Burigandak and Bagmati during rainy season. During rainy season due to overland flow from the adjoining villages viz. Jaimanglagarh, Rajour, Parora, Narainpur, Sonbasa, Kumbhi and others, increase in the depth as well as the area of the lake takes place. But during winter and summer month's water dries up, resulting into significant shrinkage of the lake. Presently water comes into the Kabar from its catchment area at the time of flood it comes through Chaura canal made amidst meandering courses of Chawara River. The depth of the canal is 3meter only .therefore, Chawara helps in the outflow of water from Kabar, which rises slowly with the rise of water in the Buri-Gandak and subsides slowly as level of water in Buri-Gandak goes down. During flood, the water comes into Kabar lake and in May and June it does not go out. Same interaction has been seen between Bagmati River and Chanha Nadi (Fig. 2).

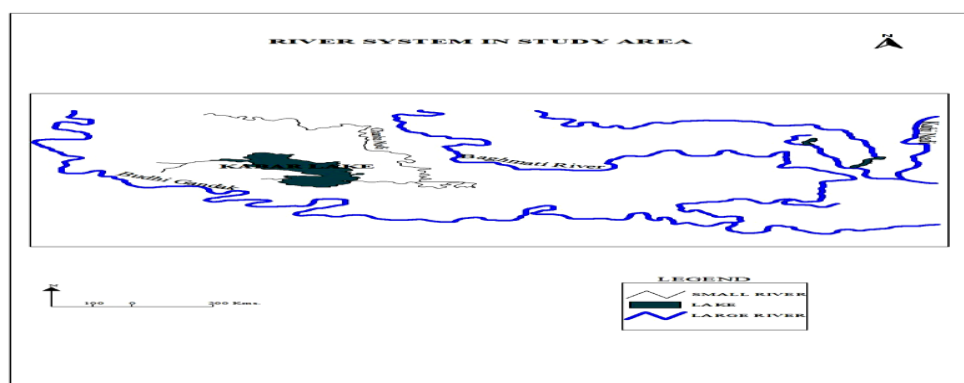


Fig. 2. River system near the KabarTal wetland of north Bihar

### 4.1.3 Groundwater

This lake is situated in mid Gangaic basin which is a water surplus area. So ground water recharge is done easily and resulting into high water table. Due to the absence of ground water based irrigation system, less depletion of ground water resources take place. But unpredictable and discontinuous nature of monsoon force people to go for ground water irrigation at the time of Kharif season mostly. At that time, water availability for people in the wetland also decrease as less rainfall takes place (in discussion with local people around this area).

## 4.2 Uses of Water

Water is one of the main wetland resources. Local people are used these resources for their own consumption, household task (washing cloth, bathing etc.).

### 4.2.1 Consumptive Use of Lake

Lakes are most important ecosystem for not only human being but also animal too. Though most of the activities associated with wetland system in these villages are distributed equally but there are slight variations in the portfolio of activity amongst neighbouring villages. Primarily the livelihood of these villages is significantly dependent on agriculture and livestock productions and evidently, the consumptive use of KabarTal resources in terms of fodder varies in between 21.4 to 43.3 percentage points (Table 1). In other words, people in the surrounding villages majorly use the KabarTal wetland system for fodder growing. Since these areas have been used as a resource to grow, fodder a substantial share of it goes into grazing purpose. Nevertheless a wetland system is rich source of fish production and consequent consumption of it. Again substantial share of population around this wetland system use this for fishing purpose and which varies in between 13.3 to 25 percentages (Table 1). Amongst these villages Manikpur records highest fishing activity by its population i.e. every fourth person in this village in some way or other engaged in fishing. The lowest fishing activity is being recorded in Parora villages, which is 13.3 percentages. Apart from these activities a significant share of households are involved in plant production activity as well as in different derivatives activities. This sort of activity is also equally distributed amongst villages but Khajahnpur records highest activity in this case and which is mainly because of the proximity to the KabarTal wetland system. The distribution of consumptive use of wetland system of KabarTal is almost homogenous across the villages. The simple inference one can draw out of it, that the population around this wetland system, on an average is very much involved in agriculture and livestock production and consequently they show a homothetic preference on the likely dependence on the KabarTal wetland system.

**Table 1. Consumptive Use Pattern around KabarTal**

Consumptive use/ name of village	Jaimanglagharh	Parora	Maheswara	Kanousi	Manikpur	Khajahanpur
Sample size	16	30	28	24	28	34
Fodder collection	37.5(6)	43.3(13)	32.1(9)	25(6)	21.4(6)	23.5(8)
Fishing	18.75(3)	13.3(4)	17.8(5)	20.8(5)	25(7)	20.6(7)
Grazing	18.75(3)	10(3)	21.4(6)	16.6(4)	10.7(3)	8.8(3)
Plant product	12.5(2)	16.6(5)	14.3((4)	20.8(5)	17.8(5)	41.17(14)
Other	12.5(2)	16.6(5)	14.3(4)	16.6(4)	32.8(7)	11.7(4)

### 4.2.2 Non Consumptive Use

The non-consumptive use of the KabarTal wetland system is not showing the same pattern as that of the consumptive use. Across the villages, non-consumptive use activities like bathing, recreation, boating, religious ceremony and other sort of activities are not evenly distributed. In a nutshell, Jaimanglagharh is showing minimal use in terms of non-consumptive use of the KabarTal resources. On the other hand Khajahnpur and Parora show higher inclination towards the non-consumptive use of the wetland system. On the bathing activity Parora people are using relatively more than others, and which may be because of cleaner water in that adjacent area or



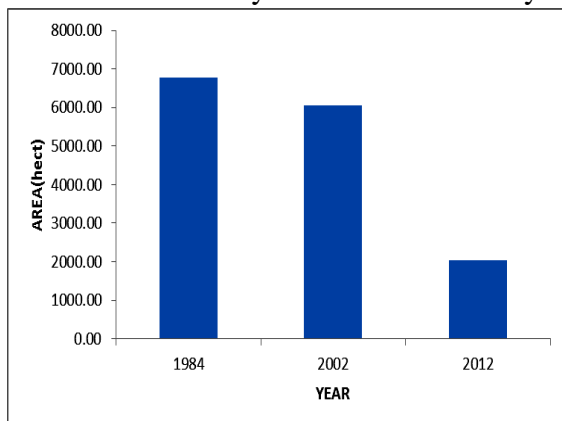
because of low number of hand-pumps in that area and hence may be due to low affordability in that villages. This signals a linked poverty in Parora villages but cautiously this is mere speculation about the correlation of non-consumptive use activity and socio-economic conditions. Manikpur population are better on using it as recreation (39.7%) purpose than any other villagers and this may be just because of the proximity or they are relatively richer to afford recreation activity rather than putting themselves into other economic activity. Not surprisingly, the religious activity by population around this wetland system by different villages is also evenly recorded.

**Table 2. Non-Consumptive Use Pattern around KabarTal wetland**

Consumptive use/ name of village	Jaimanglagharh	Parora	Maheswara	Kanousi	Manikpur	Khajahanpur
<b>Sample size</b>	16	30	28	24	28	34
<b>Bathing</b>	5(31.2%)	9(30%)	7(25%)	3(12.5%)	2(7.1%)	3(8.8%)
<b>Recreation</b>	1(6.25%)	2(6%)	6(21.4%)	8(33.3%)	11(39.2%)	8(23.5%)
<b>Boating</b>	3(18.7%)	4(13.3 %)	2(7.14%)	2(16.6%)	3(10.7%)	2(5.8%)
<b>Religious ceremony</b>	6(37.5)	10(33.3 )	8(28.5%)	9(37.5%)	9(32.1%)	9(26.4%)
<b>Other</b>	2(12.5%)	5(20%)	7(25%)	2(8.3%)	3(10.7%)	13(38.2%)

### 5. Shrinkage of Water Body

Area of the wetland continuously decreases due to conversion of wetland into the farmland .In 1984,KabarTal wetland had been covered 6786 hec despite of declaration of the these wetland as a protected area in the 1989 ,their area continuously decreases In 2002, area of this wetland has shrunk into 6043hec .During this period area of lake decreases into 10.94%.Subsequently the area of KabarTal has reduced drastically to 2032 hectare in 2012 as compared to 6786 in 1984) almost two third of it has been either gone out of wetland system or encroached by the population in neighbourhood. It is evident that the lake was heading toward extinction as its area has shrunk considerably. This occurred due the lack of water tight administrative control on these area. People are engaged in illegal activity like poaching of bird, sown the paddy crops in the protected area. There is no demarcation or clear cut boundary for demarcating the bird sanctuary in lake area this encourage for illegal poaching. After knowing about the impending loss of wetland, rich farmer and powerful person are shown crops and deliberately widen the outlet canal for extracting water from the wetland due this water could not stay for the long time and create instability in the wetland ecosystem. Rich farmer and powerful man is encroached the lakebed and overexploited them. Shrinking rapidly. With the base year as 1984 the wetland area has reduced by two third of its initial endowment. And compared to 2002 it has reduced by almost half, with an average annual decline in area by 20 percent. In the local focused group discussion, it came out that the local people have captured the land of the lake for agricultural purposes. Eventually people stated that it is also because of inaction of the authority in this region which prompts individuals to capture and acquire



**Fig 3. Area (hect) of the KabarTal wetland in different time -Source: Ghosh et.al.**

the wetland resources for their own benefit. Traditionally this wetland was home to an amazing sour There was relatively less reduction in the wetland are in 2002 and then after it is being ice of flora, many of which were excellent source of nutrition. For example, Makhana, Singhara, Karmietc grew naturally here. A particular type of plant known as Chikotais found about three feet under the wetland and is good for eyes. It also

came out of the discussion that it is adding to the loss of this lake, and will be great loss to the ecology of the state. It has a significant interpretation that people around the wetland system are very much aware of the cause and consequences of loss to the ecology. Thus the situation demands a proper mechanism and regulation in place to control the unethical activity around the KabarTal wetland system.

## **6. Hydrologic Alteration**

Alteration in the hydrology can change the character, functions, values and the appearance of wetland. Construction of weir structures around rivers, railway embankments (Fig 2.1), unregulated flow of water, and farming practices can be caused the alteration to hydrology of KabarTal.

## **7. Land Resource**

Land resource has been playing significant role in driving livelihood in rural area. Rural people attached with it through the social and cultural values.

### **7.1 Land use**

The villages around the KabarTal lake witnesses varied kind of land uses practices. The villages as the lake, lies in the mid Gangetic plane. It receives high to moderate rainfall. The main occupation of the people is agriculture. For cultivation and other kind of land uses the forests have been completely cleared from these villages. The land devoted to forest area is completely negligible.

A very small portion of land is barren and uncultivable. It is completely devoid of any kind of vegetation. About 2.73 per cent of the total land falls in this category (Table 3). There are no specific uses of this kind of land for the villagers. 5.13 per cent of the total land has been put to nonagricultural uses (table 3). This is because the villages have large human as well as livestock population. They need land for shelter. There are quite a significant number of concrete dwelling units which have come up on these lands. Also there are large number of houses made up of mud and other materials. Most of these houses have separate resting places for their animals. Facilities like roads and schools also fall under this category.

There is also a small chunk of land which can be categorized as cultivable waste land. A reasonably small fraction, a 2.80 per cent of the total land is permanently under water. These are primarily the low lying areas and thus completely water logged. Water based plants such as Makhana are grown widespread. Fishing is also very popular among villagers which are carried in the waterlogged area. Such kind of land also acts as shelter for various kinds of plants and animals. And 1.05 per cent of total land is temporarily under water (table 3). They get water logged during the monsoon season and then gradually dry up. This kind of land is used for paddy cultivation as well as fishing.

Majority of the land in these villages is used for agricultural purposes. The net sown area is very high. It is almost 60 per cent of the total land resource. The major crops grown in the villages are rice, maize and wheat. Paddy, wetland paddy and sugarcane are cultivated during the kharif season in the villages near the wetland. Farm size is generally small where the household labors are engaged. Agriculture, though being the mainstay of the local society and the source of livelihood, it is again used for subsistence purpose only. 18.38 per cent of the total land falls under the category of more than once cultivated land. Rice and wheat is grown alternately on this kind of land. The productivity of the land is low and farm mechanization is almost absent.

**Table 3. Land use and land cover pattern near the KabarTal wetland of north Bihar**

S.R.	Land use and land cover class	Total area (hec)	Total area (%)
1	Forest area	0	0
2	Barren and uncultivated land	375.7	2.73
3	Land put to agricultural uses	755.6	5.13
4	Cultivated waste land	370	2.51
5	Current follow	263.6	1.79
6	Permanently water logged	412.7	2.80
7	Temporary water logged area	154	1.05
8	Net sown area	8829.9	60.0
9	More than once cultivated land	2704.34	18.38
10	Total geographical area	14716.5	100

Source: Ambastha et.al, 2007

### 7.2 Cropping Pattern

The population surrounding the wetlands is purely rural and major part of the rural area is engage in agriculture for their livelihoods. So their agricultural practice concern to cropping cum practice. Different type of crops has been sown near the KabarTal wetland (Table 4)

**Table 4 Cropping Area and Cropping Pattern around KabarTal Wetland**

S. R.	Crops	Cropping area(manjaul subdivision),hec		Cropping area(begusarai subdivision)	
1.	KarifArhar	650	1020	1300	1940
2.	Karifurad	200		450	
3.	Kharif other pulse	170		190	
4.	Oil seed		680		440
5.	Till	90		40	
6.	Sunflower	90		200	
7.	Andi	500		200	
8.	Rabi wheat	8500	16455	18500	32770
9.	Rabi macca	6000		9500	
10.	Rabi Gram	70		400	
11.	Rabi masur	130		750	
12.	Rabi mater	80		490	
13.	Rabi other pulses	45		160	
14.	Rabi mustered	1500		2650	
15.	Rabi tisi	100		250	
16.	Rabi sunflower	30		70	

Source:Distric Agricultural Office (Begusarai):2004

In the KabarTal catchment of KabarTal wetland,Kharif and Rabi croppers are evenly distributed across three villages namely Kanausi, Parora, and Khajahanpur (Table 5). As per the focus group discussion at the KabarTal wetland site, people reveal that the tenants in these villages are mainly rice, wheat, sugarcane cultivators. Apart from this there are few who mostly grow

vegetables around in the lake area. The interesting story people claim to state that though there agriculture management practice in recent days is far intensive than what it used be in 2000 and though the marginal return is not significant. The agriculture especially growing vegetables now a day is costly affairs for small farmers compared to their previous era. They claim that in absence of regulation, monitoring and appropriate value chains in the neighbourhood, making it unproductive and costly business with low assurance of returns. Some of the significant points is to be noted is that the farmers or the tenants in KabarTal wetland system very much know the cause, effect and impact of introduction of any new agricultural practices. They claim that it's our new management practices is diluting the purity of KabarTal wetland system (personal talk with the primary teacher). They argue that the cropping pattern of cereals is not experiencing much change though there is gradual increase in the productivity but it is not substantial. But again people in the vicinity claims that their agriculture practices have become too much pesticide and insecticide intensive.

**Table 5. Distribution of Cultivators around the KabarTal**

Parameter(%)	Kanausi	Parora	Khajahanpur	Total
Kharif crop cultivators	88	86	81	85
Rabi crop cultivators	80	79	85	81.33
Wetland paddy cultivator	32	32.78	7.44	24.07
Sugarcane cultivators	20	11.47	2.18	11.2
People having land in KabarTal	36	29	12	25.67

Source: Ambastha et al,2007

### 7.3 Problem

Wetland has been encroached for the agricultural practices. Consequently, shrinkage of wetland has been raised drastically during 2002 to 2012. Area of Karif paddy and mustard crop has been increasing since 2004. (Personal communication with district agriculture officer). Consequently Rabi crops has been decreasing. The catchment area is an integral component of wetland ecosystem.

### 7.4 Flora and Fauna

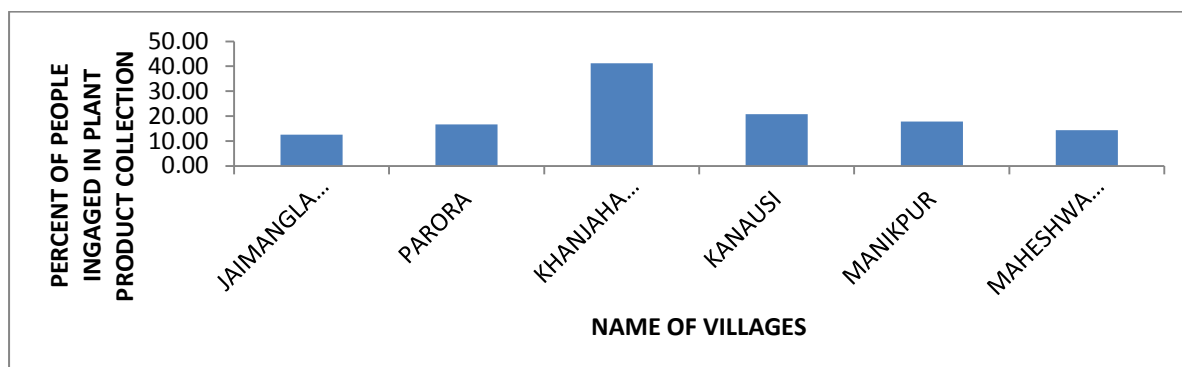
There are number of macrophytes found in the KabarTal wetland which is in use for different purposes. Some uses are confined to household purposes and some are for marketing purposes. Number of flora and fauna found for multipurpose. At least twenty five macrophytes are growing profusely in KabarTal, which are utilised for different purposes by native people. These macrophytes are collected and put to diverse uses or sold for cash in the nearby market. The utilisation as food (young leaves of *Ipomoea aquatica*, seed of *Euryale ferox*, seeds of *Nelumbo nucifera*), as fodder (shoot of *Cammelina benghalensis*, *Cyno dondoctylon*, *Oryza rufipong*), as fuel (dried stem of *I.aqatica*, shoots of *S.spontaneum*) ,as medicine (leaves of *centella asiatica*, rhizomes/flowers of *N. ouchali*), in decoration (flowers of *Nelumbo nucifera*), in workshop (*Nilumbo nusifera*) have been seen in rural community. Certain aquaphytes and their part play significant role in the economy of rural poor people who belong to Gohri caste and Soda (Mushar caste) who earn their livelihood out of the aquatic resources of the lake. The selling of two aquatic plants (*C.demersum* and *H.verticillata*) and bundles of dried culms of marketing is also commonly done.



**Table 6. Useful Macrophyte in KabarTal wetland**

S.R.	Botanical Name	Family	Habitat	Parts/product	Uses
1	C. asiatica	Apiaceae	Emergent	Leaf powder	Mixed with milk and given to cure madness
2	C. demersum	Ceratophyllaceae	Unanchored submerge	Whole plant	As fish trap, Feed for fish
3	E. ferox	Nymphaeaceae	Rooted-floating	Perisperm	Eaten roasted
4	Ipomoea aquatica	Convolvulaceae	Emergent	Dried stem	As fuel
5	Neilmbonucifera	Nymphaeaceae	Rooted floating	Rhizome powder flower	For decoration

People belong to Khanjahanpur village has been engaged larger in percentage whereas family belong to Maheshwara and Jaimanglagarh lowest one. Khanjahanpur is connected with mettle road and have good market (locally name Haat) so number of family engaged in plant production collection. People has been collected plant product for commercially and earn money for sustaining their livelihood. During field visit, people has been collected leaves of plant which are used as plate for eating. Small vender and shop has been used this leaves for providing eatable things to consumer in some of same villages more prominent in the Khanjahanpur. Despite of this people close to the lake also use whole plant for the fuel purposes specially in Parora and Kanausi. Households of Jaimanglagarh has been engaged in less plant production, but number of family own shop near the famous temple. Due to very small population has been lived in this village and far away from the local market along with poor transport system discourage the family for collecting the plant product.



**Fig. 4. Engagement of people for plant product collection in sample villages near the KabarTal wetland**

### 8. Problem

The efficient utilisation of available resource to an optimum level makes the life of native people prosperous in general. KabarTal wetland with profuse growth of macrophytes due to its shallowness and richness of soil in the humus seems to act very potential resource but not optimum utilisation. It is clearly seen in engagement of family for collecting plant product, only around less than 20% except Khajahanpur (41%). Due to non-optimal use of plant product has been causing the obstacle for the bird habitat and tremendous growth of plant are also responsible for un-sustainability of the wetland ecosystem. Ultimately, it leads to transformation of terrestrial ecosystem. So the valuable water body requires immediate conservation and management so as to meet the material needs of the local people now and for the future.

### 9. Utilisation of Wetland

Living beings dependence and association with the wetlands have been started since the beginning of civilization. Wetlands are one of the productive and important parts of global

ecosystem, which support many valuable aquatic flora and fauna. The increasing world population and over exploitation of wetland resources demand for human habituation and permanently changes of landscape could be identified as the inheritance problem of during few past decades. As a consequence of this, the fertile wetland play greater role in the environment to keep it in the balanced state. Wetlands are the multiple values to the ecosystem. They perform number of vital function in the maintenance of overall balance of nature, flood control, soil erosion, water storage and purification, ground water recharge and discharge, protection and stabilization of storm by acting as natural barrier and recreation, besides providing out puts of commercial values and economic substances.

### 10. Fishing

Fisheries are the most important activity in the KabarTal wetland. Diversity of fish has been seen in this wetland system. These fishes are categorised into air breeding fishes, catfishes, exotic and the indigenous fish. People have been using different active and passive methods of fishing. Some people have own boat. Some owned a boat but most used passive methods only, for example barrier, castanets (Khapiyara), and box nets (Arsi) for fishing. Monsoon and pre-monsoon period are known as good season for fishing. Also reflect biochemical of fishing along with traditional method. Approximately 40% of Sahnis fish throughout the year, and approximately 60% during the monsoon. After this people switch over this profession and shift to other activity such as farm labour, bird trapping and post harvesting activity. With the help of Household survey, It has been found that out of total 160 household surveyed,31 of them go for fishing into the KabarTal wetland, which basically shares 20 percentage of total consumptive use of lake. If the individual village is considered then,Manikpur(35%) have highest and Parora(13.3%) have lowest proportion of family going for fishing in the lake.

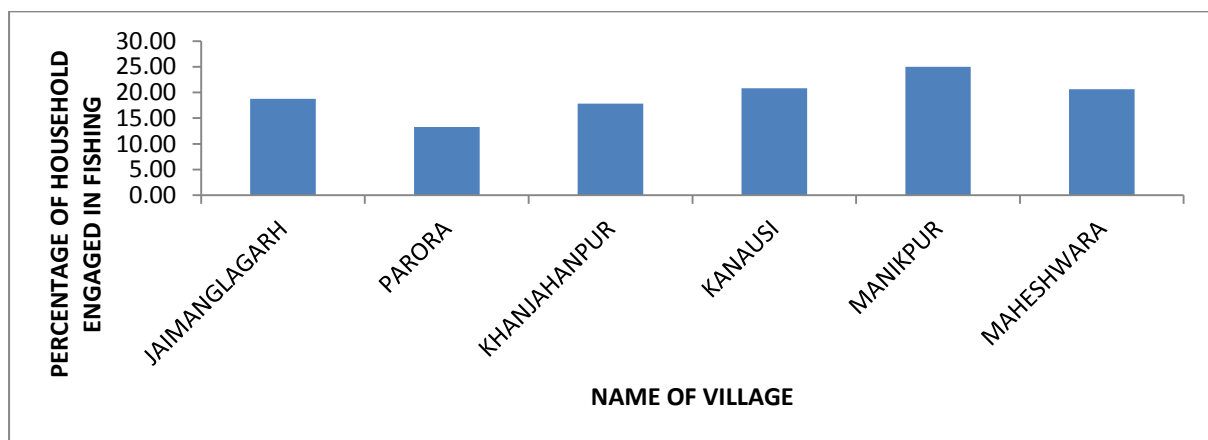


Fig. 5. Engagement of people for plant product collection in sample villages near the KabarTal wetland

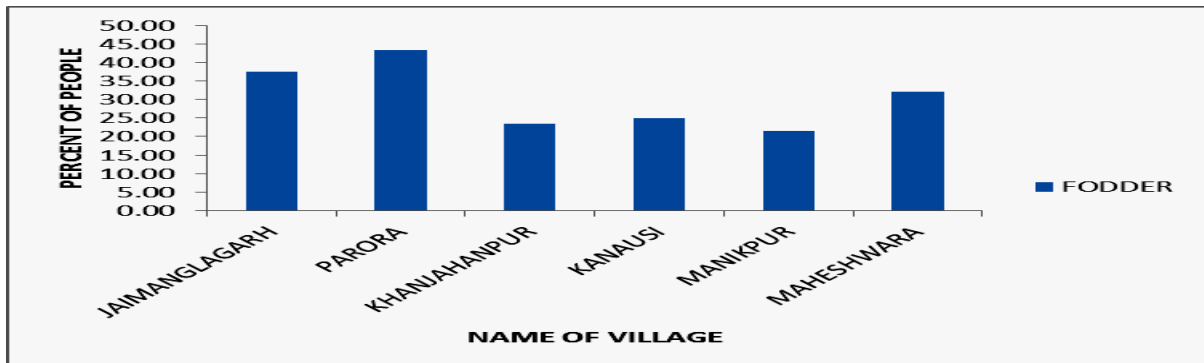
### 11. Problem

During household survey, number of family has been informed about availability of weed (rooted, submerge and floating) causes less involvement of people for fishing.

### 12. Fodder

There are number of macrophyte are found in the KabarTal wetland which are economically and medicinally very important. Various type of macrophyte are extracted for the multiple purposes from KabarTal wetland. Among this macrophyte, some are very important for fodder such as shoot of Cammelinabenghanlensis, Cynodondectylon etc. Among these fodders Cynodondoctylon is the excellent fodder in this wetland. Parora village has been engaged highest percentage of people for collecting fodder whereas Manikpur engaged lowest on. It occurred

due to rich livestock and healthy market for fodder. (In discussion with local people). People belong to the Manikpur not interested in collecting fodder due less accessibility of market. Connectivity with Manjhul which is a good market, people sell this fodder to the market and earn some money for driving their livelihood activity. So 37.5 house hold engage in collecting fodder.



**Fig. 6.. Engagement of people in fodder collection in sample villages near the KabarTal wetland**

**Table 7. Local and Scientific name of fodders grown in KabarTal system.**

S.R.	Scientific name	Local Name
1	Cammelinabenghalensis	KankausaGhass
2	Cynodondactylon	Doobhi
3	C.rotundus	---
4	Echinochloacolonum	Sama
5	E.crus-gali	Barsama
6	Leessiahexandra	Garar
7	Orizarufipogon	Jhangalidhan
8	S. Supinus	---

### 13. Problem with excessive use of fodder

The efficient use of macrophyte at optimum level makes native people life prosperous in general. Kabarta wetland witnesses profuse growth of macrophyte due to shallowness. And richness of soil in hummus seems to act as a very potential resource and though not under optimal utilisation. Excessive use of Narkat and promoted environment for prophilation of this macrophyte causes the destruction of diet of bird and is gradually transforming the wetland into a terrestrial ecosystem. Jhangalidhan (Orizarufipogon) is the main food for exotic bird especially for those come from Siberia. But excessive use of this macrophyte as a fodder also causes the declining the number of these Siberians bird (discussion with local people).

### 14. The Bird Sanctuary

Kabertal is one of the most important wetlands for waterfowl in Indo-Gangetic plain and it is supported lot of migratory and native bird. It is suitable breeding ground for Siberian crane and provided nest to number of waterfowl. Renowned ornithologist Dr. Salim Ali had been visited this area in 2000 and reported 60 migratory birds that come from central India in winter and 106 species of residence birds near around Kabar-lake. This small area has been hold richness of avian fauna. Some common are Little Grebe (*Tachybaptus ruficollis*), Great cormorant (*Phalacrocorax carbo*), Indian cormorant (*P. fuscicollis*), Little cormorant (*P. niger*), Grey heron (*Fulica atra*) and several others.

### 15. Threat to wetland birds

KaberTal wetland provide ideal and adaptive conditions for all migratory birds and abundant of migratory bird were found around lake area during eighth decade. The area is declared as bird

sanctuary in 1989. But now a day's many of them have become rare, endanger vulnerable categories due to various human pressures in the form of intense hunting and habitat destruction. There are no systemic studies about the number of trapping of the birds. But till early 1980, S.P. Shahni estimated that about 70,000 birds were trapped and Manjhol town was a major bird market and for distribution of other area. Since the declaration of the bird sanctuary in 1989 bird trapping has been reduced considerably but it replaced illegal marketing. During the field survey, it was observed that the birds are marketed very frequently without any administrative checks and balances. Though being a profitable exercise to catch birds and sell it into open market, it has become illegal and nevertheless it is unethical. Now it has been replaced by mixing of poison in the food of birds (in discussion with local people). Due to illegal trapping, using poisonous substance in the food of bird, bird's habitat, distracted human activity and ignorance of this bird sanctuary are major reasons for listing of birds in different categories of IUCN list.

**Table 8. Common and Scientific name of birds, which come under different IUCN categories in KabarTal system**

Iucn categories	Serial number	Common name	Scientific name
Critically Endangered	1	Oriental White-backed Vulture	Gyps bengalensis
	2	Long-billed Vulture	Gyps indicus
Vulnerable	1	Greater Spotted Eagle	Aquila clanga
	2	Sarus Crane	Grus antigone
Near Threatened	1	Darter	Anhinga melanogaster
	2	Painted Stork	Mycteria leucocephala

## 16. Problem

Wetland resources are utilised by rural people in unsustainable way, which causes serious challenge for natural resource conservation. The growing rate of rural poverty, poor education and socio-cultural beliefs contribute towards the current diminishing of KabarTal wetland. The challenge that faces wetland sustainability stems from the over utilisation of wetland resources for survival as well as cultural activities that are practiced. Household data collected by secondary as well as primary data, gave a clear picture of socio-economic status of the community the restoration of wetlands. Furthermore, as many community members practiced subsistence agriculture, most of their livestock depend on wetland

## 17. Swot –Analysis

SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis has been used for assessment of natural resource and also helps in assessing the existing legal policy, project and economic decision. This is an analysis attempt to identify strategic factors for considering further making new strategies.

**SWOT analysis of KabarTal wetland has been done**

<b>Strength</b>	1	Source of income and employment
	2	Protection of flora and fauna
	3	Providing platform for house hold task
	4	Development tourism site
<b>Weakness</b>	1	Limited income through employment
	2	Loss of access to some areas
	3	More weed prevent in pisciculture development.
		Agricultural runoff
		Lack of survey
<b>Opportunity</b>	1	Improve awarness and education on environment
	2	Increase local community involvement
	3	Improve better community and government relationship
	4	Commercially develop plant product at national and international platform
<b>Threats</b>	1	Listed the bird in IUCN red data book
	2	Conflict between community and government personal for compensation to land acquisition
	3	Conflict between local people and rich along with powerful personal
	4	Limited involvement of decision concern to wetland

**18. Conclusion**

Wetland provides number of resources such as water, land, and various floras and faunas. It provides life supporting system for number of aquatic floras and faunas. Catchment area of wetland has been used for farming, grazing and for the various settlement purposes. Water has been playing significance role in socio-economic development of the local people. Local people use water for their consumptive and Non-consumptive uses of the water. Significant number of people depends on live sustaining activity like fisheries, collection of plant product etc. Land resources are very rich in its fertility and it provides better standing crops due to fertility and presence of water and moisture. Local people do depend upon the farming despite of this, encroachment has been increasing.

Deteriorating ecology of the KabarTal wetland has been evident and continuous reduction in the area of wetland due to encroachment of the wetland for the agricultural practices. Despite of declaration of the bird sanctuary, number of bird has been listed as endangered, vulnerable .critically endanger species. It shows the detritions of habitat, illegal poaching and predominantly



bird trapping activity. SWAT analysis of KabarTal wetland has been indicating towards weakness, strength, along with the great opportunity for the local people.

### References

1. Ambastha, K., S. A. Hussain and R. Badola. (2007). "Social and economic considerations in conserving wetlands of indo-gangetic plains: A case study of KabarTal wetland, India." *Environmentalist* 27 (2007): 261-273.
2. Anon, (2004). Management Action Plan for kanwar Lake 2004-2005 to 2008-2009. Department of Environment & forest, Government of Bihar.
3. Bluffstone, R., M. Boscolo, and R. Molina. (2001). How does community forestry affect rural households? A labor allocation model of the Bolivian Andes. Working Paper, University of Redlands, USA.
4. Cavendish, W. (2003). "Empirical regularities in the poverty-environment relationship of rural households: Evidence from Zimbabwe." *World Development* 28(11).
5. Collar, N.J. (ed) (2005). *Threatened Birds of Asia-The Birdlife International Red Data Book*. BirdLife International, Cambridge, United Kingdom, p 3088, 2005.
6. De Boer, W.F. and D.S. Baquete. (1998). "Natural resource use, crop damage and attitudes of rural people in the vicinity of the Maputo elephant reserve, Mozambique." *Environmental Conservation* 25(3):208-21.
7. Ghosh AK, N Bose, KRP Singh and RK Sinha (2004). Study of spatial-temporal changes in the wetlands of north Bihar through remote sensing. ISCO 2004-13<sup>th</sup> International Soil Conservation Organisation Conference Brisbane.
8. Takasaki, Y., B.L. Barham and O.T. Coomes. Rapid rural appraisal in humid tropical
9. Vedeld, P., A. Angelsen, E. Sjaastad, and G.K. Berg. (2004). Counting on the environment forest incomes and the rural poor. Environmental Economics Series, World Bank Paper No. 98.