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COMMERCIAL EXPLORATION OF NATURAL WATER BODY RAMGARH LAKE, GORAKHPUR

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ABSTRACT:

Lakes are lentic ecosystem. There exists a strong interdependence between human population and aquatic ecosystem, as they provide direct benefits like, drinking water recreation, fishing, crop production, boating, irrigation etc. and indirect ecological benefits like source of fresh air, maintain biodiversity, nutrient recycling, buffer zone assimilation of city sewage, recharging ground water. This study focuses on commercial application of natural water body Ramgarh lake, situated in the eastern part of Gorakhpur city, Uttar Pradesh.

Key Words – Lentic Ecosystem, Monetary Value, City Sewage assimilation, Buffer zone.

INTRODUCTION:

Water is life, it is a universal phrase, without water there is no possibility of life on earth. Water is required for all the life forms and all the biological entities are mostly made up of water. Water is a very good solvent so different material can dissolve in it. When any things are washed with water it dissolves and carries away the dirt. As water is a good dissolving agent, it also helps to transport the dissolved things from one place to another. This characteristic makes water very useful. Animal and Plant require free and fresh water which is present in very less amount on earth. 97.5% of total water is marine (sea) water. Only 2.5% of fresh water occurs on land. Most of the fresh water (1.97%) occurs as frozen ice caps and glaciers. Only 0.5% of the whole water occurs as ground water.

Sustainable use of lakes and reservoirs is being threatened all over the world. They are resources of economic, cultural, aesthetic and recreational importance. Significant loss of biodiversity is due to high demands and to an increasing degree of pollution is a common reporting. These processes are increasing because of anthropogenic activity. However, lakes are more complex and fragile ecosystem than rivers because they do not have a "self cleaning" ability, consequently they easily accumulate pollution and are also subjected to sedimentation and natural insults.

Lakes are lentic ecosystem. They are complete ecosystems, they comprises closed natural cycle that means biogeochemical cycles and are inhabited by highly specialized organism. During early age lake are clean called oligotrophic lakes. With the time organic load increase it change into mesotrophic lake and finally change into eutrophic lake.

Eutrophication is a process by which lakes are enriched naturally or by anthropogenic activity. Thus eutrophication means increase nutrient content in lake. The key nutrients for eutrophication are nitrogen and phosphorus especially phosphorus. Excess nitrogen and phosphorus come from many sources, municipal waste including domestic waste and detergent and agricultural runoff. Thus, eutrophication is socio-economic activities like urbanization and agriculture. On the basis of the source of nutrient for lake, the eutrophication is of two type i.e. natural eutrophication and cultural eutrophication. Eutrophication increases the production phytoplankton and algal bloom and other aquatic macrophytes. When the plant dies it increase sedimentation in lake.

MATERIAL AND METHODS:

Eutrophic lake present in Gorakhpur city is the Ramgarh Lake. In Gorakhpur there is no sewage treatment plant, so all the liquid waste of the city is directly poured in to a prominent water body the Ramgarh Lake. The Ramgarh Lake is present in pertinent place of Gorakhpur city. It is historical ox-bow lake form by the river Rapti (Singh1977) and is situated at the eastern part of city. Dimension of the Lake is about 5 km. length and 3 km. width. It has shallow flat basin with marginal slope. Total area of this lake is about 7.0 km. On the globe, Lake finds its location between 26° 42' 30" to 26° 45" North and 83° 24' 20" to 83° 25'20" East. The depth of water level varies from 50 to 245 cm in summer, 275 to 380 cm in rainy and between 150 to 280 cm in winter season. Thus, the volume of water in the lake varies accordingly in different seasons.

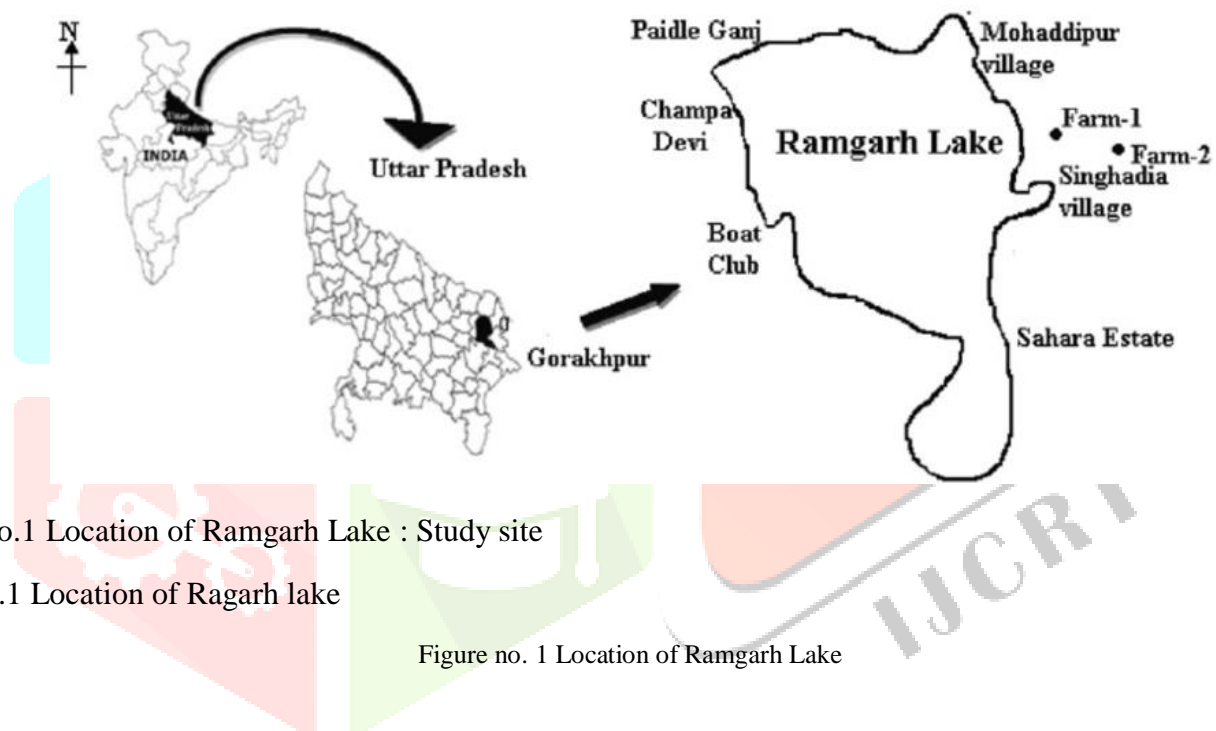


Figure No.1 Location of Ramgarh Lake : Study site

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The study is based on long term survey (1995-2018) of Ramgarh Lake with focus on market survey, government data analysis, books, thesis, reports, web sources, cooperative fishing societies and GDA records.

RESULT AND DISCUSSION:

Rapid progress, rapid industrialization, partiality against nature, lack of foresightedness etc were responsible for the poor situation of the Ramgarh lake. At the same time, the lake is still giving a lot to the man kind. Either due to ignorance or negligence we fail to perceives the gifts of the lake to us. The gifts need to be analysed critically to evaluate its monetary value and to highlight the importance of the lake for us.

MONETARY VALUE AND IMPORTANCE OF THE LAKE: The prominent evident gifts of the lake have been analysed for their monetary value, as given below:

Fishing: Fishing is one of the most important activities in the lake, as evidenced in figure no. 2. For fishing the available surface area is 669.764 hectare, which is 95.62 percent area of the lake.



Figure no. 2 Fishing



Figure no. 3 Paddy cultivation

Fishery in this lake is carried out by fishery society of Gorakhpur. This society consists of 189 families, employed in active Pisciculture for 8-9 month in the year i.e. from November to June. In Ramgarh lake, a variety of fishes are found, such as *Rohita* sps., *Catla calla*, *Labeo* sps., *Wallagoattus* sps., *Carps* sps. etc. The magnitude of fish production depends upon rain fall, amount and quality of fish seeds nurtured in the lake as well as on the water quality. In the year 2005-06 1270.85 qtl of fishes produced and the total income earned by the same according to the record is Rs. 38,39,500.15 and in the current data 2015-16 974 Qtl of fishes produced and the total income was Rs. 45,96,290.00. Detail of the same for the last 20 years is given below.

Table 1: Fish production in Ramgarh Lake (1995-2016)

Year	Seed reared (in quintal)	Production (in quintal)	Income (In Rs.)
1995-96	36.57	1263.76	1,940,343.00
2005-06	38.00	1270.85	38,39,515.00
2015-16	32.00	974.53	55,96,290.00

AUCTION OF RAMGARH LAKE, GORAKHPUR

Auction of Ramgarh Lake initially initiated by Nagar Nigam, Gorakhpur since 1987 (A K Pandey 2015) and operated by fisheries cooperation society, Gorakhpur then auction procedure initiated by Gorakhpur Development Authority, Gorakhpur, Since 2009, currently auctioned for five year 2014-2018. After getting auction from GDA the major fish *Labeo*, *Rohita*, *Catla catla* etc are showing.

Table -2: Details of the auction of Ramgarh Lake, Gorakhpur

Year	Amount (Rs. in Lacs)
Auction by Nagar Nigam, Gorakhpur	
2001-2003	68.20
2003-2005	69.20
2005-2007	70.50
2007-2009	74.00
Auction by GDA (Gorakhpur Development Authority) Gorakhpur	
2009-2012 (3 years)	78.00
2012-2013	No auction due to court case
2014-2018 (5 years)	226.75

PADDY CULTIVATION:

Paddy cultivation is another economic activity in Ramgarh Lake (Figure No 3). Near Ramgarh Village 18.2 Hectare area along the western and southern bank of the lake is used for paddy cultivation. The production of paddy has been recorded to be 7407.00 Kg per hectare during May 2006. Mostly Boro variety is cultivated.

VEGETABLE FARMING:

After harvesting the paddy crop, farmers cultivate the vegetable (Figure No. 4) for their own consumption and also for sale. Area for cultivation is increasing continuously due to sedimentation. No authentic data for the magnitude of vegetable farming is available, but the expenditure and importance of vegetable in our diet is an open fact. However the annual income by vegetable farming around Ramgarh Lake is estimated to be around Rs. 45 Lacs.



Figure No.4: Vegetable Farming



Figure No.5: Trapa Cultivation

TRAPA CULTIVATION:

Trapa is an aquatic plant its nutritious fruit is used by humans specially during fast. In Ramgarh Lake 669 Hectares area is available for *Trapa* Cultivation (Figure 5), further fifty quintal *Trapa* can be harvested in one hectare. Its cropping and maintenance is easy. Its sowing is done in rainy season and is harvested in winter season. Cultivation of *Trapa* can be an economical and commercial practice, as for *Trapa* cultivation neither land nor fertilizer is needed. The estimate of annual *Trapa* production from Ramgarh lake is summarized in table 3.

Table No 3: Change in utilization status

Activities	Current Status
Fishing	Continue
Irrigation	Continue
Vegetable Cropping	Up to 2005
Washing	Up to 1995
Recreational Activities	Continue
Religious activities	Continue
Dumping Status	Continue
Cattle Bathing	Up to 2011
Drinking Purpose	Up to 1980
Traditional Boating	Up to 2004

RECREATION:



Figure No. 6: Recreation Site



Figure No. 7: Boating Site

Ramgarh Lake is an attractive place to the tourist because of historical importance. It is said that village Ramgarh was the capital of Koliya and Yashodhara, the wife of lord Buddha was princess of Koliya family. Gorakhpur Development Authority has developed the Ramgarh Lake Project. The project includes development of Buddhist Complex, Research Center, Library, Deer Park, Circuit House, Tourist Bungalow, Five Star Hotel, Health Center, Water Sport club (Figure no. 6 & 7), Planetarium, Aquarium, Children's Park, Shopping Center, Japanese Garden etc. Thus the lake could develop as a source of income through Tourism also.

USES OF CATCHMENT AREA

Ramgarh lake is utilized by human in many ways. Pisciculture is the most important activity in the lake which occupies 95.62 percent of the lake. Pisciculture is carried out by a fishery society. Near about 600 persons from 189 families are employed for eight months from November to June in a year in fish culture. They catch fishes in the area of Jharkhandi Mahadev, Mohaddipur, Maherwa ki bari, Bhiwani ka sthan and Ramgarh. Remaining 4.38 percent area is used for caddy cultivation, vegetables farming, waste disposal, boating site, irrigation by water lifting pump named C.C. Singh water lifting pump and residential houses.

Ecological Importance: Ramgarh lake is a fresh water ecosystem. It has great ecological significance.

a- Source of fresh air: Plants are the natural source of molecular oxygen. Aquatic plants like *Hydrilla* sps., *Eichhomia* sps., *Lemna* sps etc evolve oxygen and reduce carbon dioxide level, thus, they purify the surrounding keeping the environment healthy. In addition, the lake is also rich in algal diversity. Photosynthetic efficiency is based on the incident light in proportion to chlorophyll density per unit area. Thus, Photosynthetic efficiency of lakes is higher than the terrestrial plants of same density because of absorption by accessory pigments.

b- Maintain Biodiversity: Ramgarh Lake is rich in rare plant and animal species. So the lake preserves rare species and maintains biodiversity (Dwivedi and Shashi 2006).

c- Nutrient Recycling: Nutrient Recycling is the main phenomenon of any ecosystem. (Radha and Seenayya, 2004) Ramgarh lake plays an important role in nutrient recycling and circulation of the elements through biological cycling. The lake is being fed by city sewage since urbanization, yet it has not been converted in to stagnant sewage, though the water quality has deteriorated. This is a prominent evidence of active nutrient recycling taking place in Ramgarh lake.

d- Buffer Zone: Ramgarh lake also works as buffer zone during flood. It is connected to river Rapti. When the level of water in Rapti rises during rainy season, the excess water finds its way into the Ramgarh Lake. Thus, preventing the main city from flood. The havoc of flood can not be overlooked. Table 2 shows the total loss by flood in Gorakhpur during last few years. In absence of the lake the values in table 2 would show rise in many folds.

e- Assimilation of City Sewage: Ramgarh lake has been assimilating the whole liquid and solid sewage waste of Gorakhpur city and surrounding since long back (Figure no. 7.14 and 7.15). Sewage is collected by different channels and is disposed into the lake. It is this practice which has ruined the water quality of the lake.

f- Recharging Ground Water: The water table is relatively high in the adjoining area of Ramgarh Lake. Thus, the lake plays an important role in continuously recharging the ground water (Dwivedi et al 2006).

Table 4: Estimation of monetary value of Ramgarh Lake

S.No.	Practice	Production /No. of individuals	Current Cost per unit (In Rs.)	Annual Cost (Rs.)
1	Fishing Practice	974.53 Qtls	5742.00	5596290.00
2	Paddy Cultivation	1348.074 Qtls	1000.00	1348074.00
3	Trapa Cultivation	33450.00 Qtls	500.00	16725000.00
4	Washing Activity	100 individuals	100.00	3650000.00
5	Use by cattle	3000 Individuals	10.00	10950000.00
Total Annual monetary value of Ramgarh Lake				38269364.00

CURRENT SCENARIO: On the ground of recommendation of our studies and also by other agencies, the government initiated and took the action as a result Ramgarh Lake is now presently totally transformed it is gaining handsome amount of economic resource for the government as well as for the local agencies., through applying all the commercial aspects as per recommendation (Figure 8 and 9.



Figure No. 8: Recreation Site



Figure No. 9: Recreation Site

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