

ECOLOGICAL STRATEGIES FOR THE SUSTAINABLE MANAGEMENT OF GUJAR TAL ECOTONE BELTS

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ABSTRACT

The present paper deals with an eco centric approach for the restoration and eco-reforms of fast degrading Gujar Tal ecotone belts in district Jaunpur, (U.P.). Gujar Tal lake-land transition zone are surrounded by natural vegetation ecotone belts and at certain places covered with agricultural crop lands. The present wetland and its ecotones are under great threat of degradation. Therefore, the main objective of this kind of study is the first step to discuss the remedial course of management of Gujar Tal wetland ecotone belts based on logical, field and experimental studies from April, 2008 to March, 2009 at two selected sites viz. (I) abandoned or neglected lands- 80×125 m (II) cultivated lands or crop lands -50×200 m.

KEYWORDS : Wetland, Ecotone Belts, Lake-land, Transition Zone, Plant Diversity

District Jaunpur may be referred as 'Tal District' in the eastern U.P. as there are number of 'Tals' and among them 'Gujar Tal' (24°-6'-25°5'N and 80°- 82'E longitude) is the biggest one, about 200 ha and 4.5 m deep. The particular 'Tal' was dig out in 1904 by joint efforts of landlords and local public of nearby lake in order to meet scarcity of water and hunger disasters. The present lake is 28 km from Jaunpur city and 1.5 km away in west from Khetasarai town area near Sarvodaya Inter College, Khudauli. Wetland margins overlapping with the adjacent upland margins are called 'wetland ecotones' (Ambasht and Ambasht, 2008). They enjoy some of the best ecological conditions found in terrestrial and aquatic habitats and, therefore, are richer in biodiversity and rate of primary production. Wetland ecotones are the store-houses of 'gene pools' and habitat of wild relatives of some cultivated plants. Most of the winter season migratory birds spend daytime here in search of insects, molluscs and fishes as food and night on trees. These ecotones often experience cyclic hydric to xeric condition when the annuals of one season plants species emerge and flourish, the seeds and propagules of the other season undergo perennation, buried in the mud. World's largest segment of human population depends on rice and wheat (as food and fodder) which are mostly cultivated during rainy and winter seasons at lake margins in localized patches. These ecotones are an extremely open system with lots of inflows, retention and outflows of materials and nutrients from uplands to aquatic ecosystems.

Lake-land transition zone corridors are specialized terrestrial habitats that are characterized by

slight sloping topography, inundation and extreme dry phases, agricultural operations mainly during winter, grazing, fishing and host of other biotic forces. The efforts of crop cultivation fail during rainy season due to cyclic inundation or submergence, run-off and erosion and some time extreme dry condition due to scarcity of rainfall during rainy season. These habitats are delicately balanced and prone to erosion. In all regions of the world, human populations are suffering social, economic and environmental hardship resulting from the destruction and mismanagement of their natural resources, notably including their wetlands ecotone and water resources. This destruction which is continuing at alarming rates is contributing to escalating poverty and water quality and food security problems, as well as robbing the biological diversity soil and nutrients with which wetlands ecotone and water bodies are endowed.

Although wetland's ecotones are amongst the richest life supporting ecosystem on the earth, they are amongst the most threatened due to various biotic stresses. Wetland ecotones with their embankment vegetation are regarded as 'kidneys' of the landscape as they filter out pollutants and allow deeper water storages of lakes, ponds and rivers etc. and of ground water free from toxic material (Ambasht, 2008). Land-lake ecotone is the Nation's Border Security Force for the water bodies (lakes and rivers) against some natural and made forces of degradation. There are number of studies about management of wetlands (Gopal and Sharma, 1982) and flood plains (Ambasht and Shardendu, 1989) in India. Present study has been

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conducted for the first time in the lake-land transition zone of Gujar Tal (Jaunpur) with different kinds of biotic pressure in relation to its conservation and management.

MATERIALS AND METHODS

In the present investigations fortnightly visit of selected study sites were done in order to record plant diversity and characteristic features of both study sites I & II from April, 2008 to March, 2009. In order to assess the role of vegetation in conservation against erosion was determined at study sites during natural rainfall in rainy season (Ambasht et al., 1984).

RESULTS AND DISCUSSION

It can be discussed in two different heads:

(A) Role of Ecotone Vegetation In Economic And Ecological Reforms

It has been observed in the present study that lake margins are highly dynamic in their stability, qualitative usefulness and sustainability which depend on preservation of plant diversity. The values placed on plant diversity are strongly linked to human influences. Human being gets benefits through plant diversity. Therefore, there is a great need of plant resources in such lake land transition zone as diversity of plant provide economic and social cultural values and many of ecological services free of charge, and are also responsible for stability and maintenance of such ecosystem.

(B) Strategies For Implementation

On the basis of present study there are various steps of strategies and measure of eco-reforms are recommended in respect to conservation of plant diversity, soil, water and nutrients stability and finally for the material benefit of mankind. It will be greatly beneficial for the restoration of ecological balance and sustainable utilization for the local inhabitant, without this participation of local people will not be available. It may be discussed as follows:

(i) Soil erosion is a burning problem of sloppy habitat and it needs to be tackled in a systematic and scientific manner, by terracing, bunding and by the plantation of perennial grasses and fast growing trees at erosion prone areas.

(ii) Proper care should be taken for growing grasses and other herbaceous plants which act as effective soil binders viz. *Saccharum munja* Linn., *Saccharum spontaneum* Linn., *Desmonstachya bipinnata* (L.) Stapf, *Cynodon dactylon* (L.) Pers., *Imperata cylindrical* (L.), *Eragrostis atrovirens* (Desf.) Trin., *Polygonum monspiliensis* Linn., *Lippia nodiflora* A.Rich. and *Typha angustata* Linn. etc. Among them many of them are very effective soil binders (Ambasht et al., 1984 and Ambasht and Shardendu., 1989). Some of other most frequent members of cyperaceae like *Scirpus erectus* Poir., *Scirpus tuberosus* Linn., *Cyperus rotundus* Linn. and *Cyperus pygmaeus* Descr. etc. having good soil conserving efficiency may be grown in the lake-land transition zone.

(iii) Naturally grown *Oryza rufipogon* Griff. mixed with *Eleocharis plantaginea* (Retz.) R.&S. and *Ipomoea aquatica* Forsk. etc. usually covering the emergent zone of the lake also may be helpful in stabilizing the lake-land transition zone. *O. rufipogon* a variety of wild rice is a boon for production potential at 'Gujar Tal' ecotone belts.

(iv) *Ammannia baccifera* Linn., *Eclipta prostrate* (L.) Linn., *Lippia nodiflora* A.Rich., *Alternanthera sessilis* (L.) Dc., *Rumex dentatus* Linn., *Gnaphalium indicum* Linn. and *Polygonum barbatum* Linn. etc. usually growing on exposed banks of the lake may be helpful to prevent lake-land transition zone, to be erosion prone upto some extent. Our experimental studies performed at the study sites during rainy season to determine the role of vegetation in conservation against erosion revealed the following findings: Soil = 29.895 & 31.930 ton/ha/yr, Water = 3.050 & 3.220 L/ha/yr, Nitrogen = 0.195 & 0.181 ton/ha/yr, Phosphorous = 0.026 & 0.22 ton/ha/yr, at study sites I & II respectively (Singh, 2012).

(v) During 2007-2008 in the upper zone of site I (Present study site) afforestation of *Acacia farnesiana* (L.) Willd was done but at present only a few samplings survived. Large handsome, evergreen tree like *Terminalia arjuna* (Dc.) Wight & Arn., *Syzygium cumini* (L.) Skells, *Eugenia jambolana* Lamk. and other fast growing trees i.e. *Accacia nilotica* (L.) Del, *Acacia farnesiana* (L.)

- Willd, *Eucalyptus lanceolatus* L. Herit., *Holoptelea integrifolia* Roxb., *Dalbergia sisso* Roxb., *Albizia lebbek* (L.) Bth. and plant like *Bambusa arundiinacea* (Retz.), Willd. etc. may be plantated in the upper zone of lake margin under aforestation programme. Besides, naturally grown scattered *Zizyphus* species and *Butea monosperma* (Lamk) Taub. are other options of plantation in localized pockets. These all may contribute significant role in conserving soil, water and nutrients, and it can also lead a new dimension in maintaining the rural economy.
- (vi) Grazing, scraping, and cutting of herbaceous plants for thatching of huts and other purposes, and digging of soil, etc. are quite injurious practices that should be restricted because these make the habitat more erosion prone. Some of the plants like *Neptunia oleracea* (Lamk.) Baill. and *Vetiveria zizaniodes* (L.) Nash. are reported a very few and therefore during present study have become very rare. It might be due to biotic and abiotic stresses.
- (vii) Conversion of neglected low-lying lakeland transition zone in the form of grassland patches may be one of the most beneficial aspects in conserving soil profile, water column and nutrients. It may prevent the lake from eutrophication also.
- (viii) Neglected upper zone of lake-land transition zone could be fenced with barbed wire into small (three or four) subparts and grazing should be allowed in only one sub part, while protecting the vegetal cover of other subparts. When the vegetal cover of grazing sub-part is reduced, second sub-part is open for grazing and previous sub-part is closed. This with differed grazing can protect with adverse effects of uncontrolled grazing and may be substitute more fodder to domestic animals.
- (ix) Fencing with wire in certain localized, pockets of neglected lake-land and agro-wetland of transition zone is essential for the preservation of biodiversity. It may prevent the loss of plants of ethnobotanical interest and may also provide suitable habitats for large number of species which are becoming rare.
- (x) The raw sewage (not very common) but should be purified in 'oxidation pond' with the help of algae, fungi and bacteria at neglected upper zone then may be passed into midstream of lake through pipes. This treated water will be least harmful to lake water.
- (xi) Present neglected study sites may be developed into 'Manoranjan Parks', and natural Gujar lake apart from fish culture may be used for boating, etc. by minimizing the macrophytes of lake for recreation purposes.
- (xii) It is recommended that indiscriminate use of biocides in the surrounding crop fields should be regulated as to reduce the chances of run-off in the lake through lake corridors.
- (xiii) Trampling is another important factor which damages the plant cover. There should be proper pathways along the lake corridors.
- (xiv) Gujar Tal lake margins and lake are habitat of large flocks migratory water birds like ducks, cranes, flamingoes, egrets, lapwing during winter season from December to March. The *O. rufipogon* Griff. grains and fishes etc. are usually eaten by birds. These birds are protected by law but are hunted for human consumption on very large scale. If this lake is subjected to bird's sanctuary by a resolution passed by legislature of U.P., State Government, it may develop a good picnic spot. Recently Sri Ghanshyam Rajbhar and his son Sri Rohit Rajbhar have started rearing of duck birds (about 250) from last two years near the lake-land ecotone. Lake-land ecotone and lake provide good natural habitat for these birds, and these duck birds provide source of income by selling egg and birds, etc. The efforts of these people must be appreciated and should get financial support by local government.
- (xv) Lake-land transition zone corridors apart from winter cropping are used for rice cultivation during rainy season but their efforts fail due to inundation of flood-water and spreading of aquatic weed like *Eichhornia crassipes* (Mart.) Solms. in the field or due to scarcity of rain. Therefore, experimental farms may be established in the proximity of lake and its margin with different management practices. These farms may serve as demonstration block for education of the villagers. During course of this study we observed that farmers are not aware of improved varieties of rice crop which are recommended by National & International Rice

Research Institutes which could be worthwhile to raise their agricultural economy. Large areas of experimental farms should be used for seed multiplication to collect appropriate and waterlogged varieties qualities and quantities of seeds of different varieties of rice crop and good forage grasses as there is acute shortage of fodder for cattle. Conservation, rehabilitation and eco-reforms of lake-land transition zone which may prevent degradation of its precious resources like soil, water, nutrients and plant diversity then it will be possible to achieve the goal of the theme of Ramsar convention 2008, i.e. 'Healthy wetlands and Healthy people'.

Therefore, education and creation of awareness among people about lake and its margin, i.e. about conservation of plant diversity in lake and lake ecotone vegetation are urgently required at local, regional, state, national and global levels. This kind of study will undoubtedly encourage the National Development Policies of the country by vegetational cover and afforestation of neglected bare lands through native plants, which in turn shall help in the eco-reforms of the lake and lake-land transition zone. These biotopes if managed properly may lead to material benefit of mankind.

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