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WETLANDS AND ITS ROLE IN AGRICULTURE: UTILIZATION AND CONSTRAINTS

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Wetlands are the transitional land between terrestrial and aquatic ecosystems enjoying a great diversity and habitat of thousands of flora and fauna. The importance of wetlands lies in their values as wildlife protection areas as well as areas of water management and conservation for agricultural development. Wetlands have nurtured the development of many important cultures around the world. Wetlands contribute to global food security by supporting agriculture and providing livelihoods, as a source of water for crops and livestock, and as habitat for rice production and aquaculture, helping to meet the world's Sustainable Development Goals (SDGs) (FAO, 2019). Thus, wetlands are often a primary driver of economic growth and economic stability for poor rural households in many developing countries. However, the overall production and the economic output of the system are not always encouraging due to its ill adaptation, economic set back and technical know- how at the root levels. To increase the mass awareness among the people 2nd February in every year is celebrated as "World Wetland Day". So the wetland farming, as an applied science, requires an understanding of scientific aspects and economic realities to ensure proper utilization of such valuable ecosystems in developing countries like India where arable lands are decreasing and degrading over period due to increasing population pressure, industrialization and extensive agriculture (Rao and Hemant, 2003).

Wetlands by definition: Wetlands are areas of marsh, fen, peat land, or swamp, whether natural or artificial, permanent or temporary, with water that may be static or flowing, fresh, brackish, or salt, including areas of marine water, the depth of which at low tide does not exceed 6 m (https://www.ramsar.org).

Some Important Features of Wetlands

1. Wetlands are **transitional land** between terrestrial and aquatic system described as **"the kidneys of the landscape"** for the functions they perform in hydrologic and chemical cycles.
2. They can be natural or man-made and found both in inland and coastal areas.
3. In wetland the water table is usually at or near the surface of the land.
4. The wetlands should be saturated with water or covered by shallow water at some time during the growing season each year.
5. The soil is predominantly un-drained hydric soil (saturated long enough to create an anaerobic situation in the soil environment).
6. At least periodically the land must support predominant hydrophytes.

Role of Wetlands in Agriculture

1. **Regulating functions**

i. **Water regulation**-Wetlands maintain the natural hydrological balance, store rain water for longer time and contribute to recharging of groundwater supplies.

ii. **Water purification**- Wetlands called 'natural filters' intercept runoff water allowing sediments and pollutants to settle down. Nitrogen & phosphorus are generally removed by vegetation. Heavy metals, pesticides and herbicide molecules can be removed from the water by ion exchange & adsorption in the organic and clay sediments and also uptake by the plants such as water hyacinth.

iii. **Erosion control**- Wetlands vegetations helps to control excessive erosion by dissipation of wave and current energy or by binding and stabilizing the soil.

iv. **Natural hazard regulation**- Wetlands prevent flooding by temporarily storing and slowly releasing storm water thus minimizes flood hazards in nearby areas.

2. **Provisional functions**

i. **Food**- Wetlands can be utilized for production of many types of food crops like deep water rice, water chestnut, makhana, etc. and various fishes by the resource poor farmers that can meet their nutritional demand and economic stability.

ii. **Fiber & fuel**- Many of the wetlands are being utilized for biofuel production.

iii. **Fresh water**- Wetlands are very good source of water that can be used for irrigation, households or many other purposes.

iv. **Natural habitat-** Wetlands provide habitat for many plants, animal and bird species being analyzed as "Biological Supermarket".

3. Supportive functions

i. **Carbon sequestration-** Wetlands have approximately 10% of global total carbon store.

ii. **Nutrient cycling-** Being natural filter, they can takes up excess nutrients and convert them into less harmful forms, and over time, the nutrients are recycled with in wetlands.

iii. **Organic matter addition-** Decomposition of the dead bodies or residues of various vegetation and animals in wetlands over time adds lots of organic matter in the bottom soil.

4. Cultural functions

A well-managed wetland may also provide cultural services, aesthetic and spiritual values, education and recreation. While these benefits are not directly relevant to agriculture, they constitute an important contribution for wider community and future generations.

Efficient Utilization of Wetlands in Agriculture

Wetland utilization for crop cultivation

Most of the wetlands experience a good portion of its area coverage to be contributed to intensive cultivation or to be cultivated in their natural form. The crops generally grown in wetlands or surrounding areas as follows:

- **Food crops:** Deep water rice, Jute, Water chestnut or Singhara, Makhana or Fox nut, *Colocasia sp* or Taro
- **Food cum ornamental plants:** Lotus and Water lily
- **Medicinal plants:** Brahmi, Kesut, Swamp cabbage or Kalmisak, Helencha, Kulekhara, Indian pennywort or Thankuni, Marselia or Susni, Water cress or Swamp forest
- **Non food commercial crops:** *Cyperus* spp, Hogla, *Calamus* or Bet, Shola plant *(Aeschynomene sp.)*, Shital pati (*Cyperus tegetum*)
- **Fodder crops:** Para grass or Water grass, *Coix* sp. Or Job's tears

Apart from the above crops, cucumber, mustard, wheat and other vegetables can be cultivated in the wetland bed and also in peripheral areas of the wetland.

Wetland Utilization for Fish Collection

Fresh water species such as Chanda (*Chanda nama*), Tangra (*Mystus tengara*), Punti (*Putinas sp.*), Magur (*Clarias batrachus*), Bacha (*Pangasius bocourti*), Bata (*Labeo bata*) etc. and small amount of commercially important fish like Kalbaush (*Labeo calbasu)*, koi (*Cyprinus rubrofuscus*), Khalisa or Indian glassy fish etc. are caught by the fishermen and sold to the local market that sustain the livelihood and economy. Apart from diverse fishes, gugli (*Teuthowenia pellucid*) and oysters/mollusks are important products collected from natural wetlands.

Wetland Utilization for Irrigation

Wetlands are chiefly used as a source of irrigation for the surrounding farm lands. Cultivators around the wetlands prefer to use small pumps or some manual lifting devices to tap the irrigation water from wetlands (Mukherjee, 2008). Thus, the benefit of the farmers around the wetlands is primarily due to the saving of cost of irrigation which can therefore be diverted to the cost of other allied inputs.

Wetland Utilization for Jute Retting

During monsoon, various wetlands are used for jute retting by large number of farmers from surrounding habitations which help them to save money from large amount of water expenses.

Rice Cum Fish Culture – An Effective Utilization of Wetland in An Integrated Way

Rice cum fish culture is a dual culture farming where rice is the main enterprise and fishes are taken as additional source of income using same resources and same area. It is in vouge in many areas in China, Vietnam, Thailand, Bangladesh, India, Japan. It is the most promising alternative for monoculture of lowland rainfed and flood prone (deep water) rice ecosystem to diversify the rice productivity. Out of 44.5 million ha of rice cultivated land in India, 20 million ha land is suitable for adoption of rice-fish integration system but only 0.23 million ha is under the culture. Genarelly three types of rice-fish farming predominate-

1. Shallow trench within the rice field (Philippines, China, Indonesia)

2. Pond refuge adjacent to the rice field (India, China)
3. Deep water rice field (mainly in Bangladesh)

Advantages of Wetland Farming

i. Wetland farming can meet the challenges of sustaining food security, economic stability, and resource utilization for the poor and marginal farmers without risking too much investment.
ii. Various utilization of wetlands can support year round employment opportunity for the farming family.
iii. It also helps to maintain a pollution free environment without much use of agro-chemicals, farm machinery and degradation of natural habitat.
iv. It helps to maintain marvelous nutrient dynamics in nature.

Constraints Related to Utilization of Wetlands

i. **Problems in crop cultivation**: Wetlands become out of cultivation during peak rainy months except some of the conventional practices like deep water paddy, fish culture etc. but economic output is not always encouraging.
ii. **Compaction or crusting surface soil**: This problem is very common in semi permanent *tal* wetlands due to heavy clayey soil which discourages emergence of seedlings.
iii. **Handling of implements:** Operating farm implements is very difficult due to excess water.
iv. **Lack of drainage facilities:** Due to saturated condition, draining out of excess water from wetlands is very important before utilization which involves huge expense initially.
v. **Post-harvest problems:** Harvested crops may be damaged in the threshing floor or due to transportation problem. The stored grains due to excess moisture content may become susceptible to further attack by pests.
vi. **Aquatic weeds:** They create a nuisance by blocking of drainage channels, rendering navigation and made fishing or other aquaculture impossible.
vii. **Fisheries constraints:** Poor quality water, siltation of wetlands, pollution of water, damping of waste materials, use of pesticides, unavailability of capital and among fishermen etc.

Threats to Wetlands

Urbanization	Increasing developmental pressure for residential, industrial and commercial facilities
Anthropogenic activities	Unplanned agricultural development, industries, road construction, impoundment, resource extraction and waste disposal
Agricultural activities	conversion of wetlands into paddy fields, construction of reservoirs, canals and dams for irrigation, over with drawl of groundwater leads to salinization, eutrophication
Deforestation	soil erosion and siltation
Pollution	Unrestricted dumping of sewage and toxic chemicals from industries
Aquaculture	Over cultivation of shrimps, fishes and overfishing
Introduced species	Plant species like water hyacinth and *Salvinia* clog waterways and compete with native vegetation.
Climate change	Increased air temperature; shifts in precipitation; increased frequency of storms, droughts, and floods; increased atmospheric carbon dioxide concentration, sea level rise

Impacts Due to Degradation of Wetlands

i. Serious reduction of natural indigenous fish habitat, their population and diversity
ii. Extinction and reduction of indigenous aquatic herbs, shrubs, wildlife, aquatic birds and reptiles
iii. Extinction of many indigenous varieties of rice with the propagation of high yielding varieties
iv. Loss of natural soil nutrition
v. Increase in the recurrence of flash flood due to loss of natural water reservoirs
vi. Degradation of wetland-based ecosystems, occupation, socio-economic institutions and cultures

Conclusion

Despite the importance of the range of resources and services which wetlands provide, inadvertence over the years and anthropogenic squeezes pose serious threat to the survival of this precious ecosystem. Therefore, the conservation of wetlands should be given prime importance from the point of global and local perspectives. So, a robust policy relating to mass awareness, participation of local people, use of indigenous knowledge and scientific techniques in the management strategies are urgently needed to keep this valuable ecosystem sustainable. The synergistic effects of hydrology, chemical inputs and climatic conditions on wetland productivity and on how plants and animal adapt to stressful situation in various

wetland types has provoked ideas for further research on wetlands where there is need of integration of several disciplines (Irrinki and Irrinki, 2006).

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