

**SUSTAINABLE GROWTH AND DEVELOPMENT OF WETLAND PRODUCE IN
NORTH BIHAR: A STUDY IN GOGABEEL WETLAND OF KATIHAR DISTRICT
(BIHAR)**

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ABSTRACT

Gogabeel is one of the largest fresh water wetlands of North Bihar situated in Amdabad Block (*Subdivision-Manihari*) of Katihar district. It has been declared as a bird sanctuary by the Government of Bihar. The study narrates ground realities of unemployed rural adolescent girls and young women and their complete dependence on daily wages earned through casual labour, which did not provide guarantee of work every day. The study describes need of developing entrepreneurship among rural women through 'wetland produce management.' Integrated Fish-Cum-Makhana cultivation could be promoted to empower rural women. The study, on which the paper is based, was conducted during the period January, 2012 to December, 2013. It delineates growth and development of aquaculture activities to empower rural population of North Bihar.

Key words: Wetland, Aquaculture, Rural Population.

Introduction

Wetland produce i.e., *Makhana & Singhara* are considered aquatic cash crops in Bihar. It is cultivated in several districts of North Bihar, where it was the main support for livelihood of the poor people. Makhana cultivated water bodies are also utilized along with the fish culture. It is a perennial aquatic floating leaved herb, cultivated as a seasonal annual crop, which dies out after the fruits mature. The fruits mature and burst between June and August.

Integrated Makhana & Singhara-cum-fish cultivation was reported to be the common practice in the state of Bihar. It involves rearing of air-breathing fishes, like; Kawai, Mangur, Singhi etc., along with cultivation of makhana in small ponds with moderate supplementary food.

The culture of water breathing fishes is restricted in such ponds, as Makhana leaves create a blanket cover over the water surface, restricting fishes to take water breathing. However, in large ponds, the integrated Makhana fish culture consisting of water breathing fishes, like; Rohu, Katla, Mrigal etc., was also observed in the field. The calorific value of makhana compares well with staple food material, such as; wheat, rice etc. Makhana is superior to dry fruits, such as almond, walnut, coconut and cashew nut in terms of sugar, protein and ascorbic acid and phenol content. It is even superior to many plants and animal based diets. The medicinal properties of makhana are also well established, but least explored. Its curative properties for human ailment, such as; respiratory, circulatory, digestive and reproductive system are well established. It is also effective for stomachic and articular pain as also seminal loss. On account of lesser fat content, it serves as an ideal food for heart patient.

Objectives of the Study

The following are the main objectives of the study:

- i. To prepare wetland inventory
- ii. To pin-point Makhana producing wetland
- iii. To work out market potential
- iv. To explore the possibilities of involving private sectors in the cultivation of wetland produce on scientific line.
- v. To survey the export possibilities of wetland produce.

Materials and Methods

The study, on which the present paper is based, was meant for Gogabeel wetland of Katihar district. It was one of the largest wetlands of Bihar. Area of the lake was about 217 acres, and its extent was up to 5 km by 1 km. Gogabeel, an ox-bow lake in Bihar's Katihar district had been declared as the state's first 'Community Reserve.' Gogabeel is formed from the flow of the rivers Mahananda and Kankhar in the North and the Ganga in the South and East. It served as feeding ground of fish and birds, area of recreation and had been a source of livelihood and employment for many fishing communities surrounding it. Despite its fisheries and recreational importances, studies with regards to ichthyofaunal diversity, eco-fishery status and ecology were limited. The paper deals with fishery and its management along with wetland produce enhancements in this wetland.

Gogabeel lake wetland is located at 6 kms. east of Manihari and about 19 kms south-east from district headquarters of Katihar. This wetland, at present is under high environmental stress due to cultural and chemical pollution, as proximity of lake was linked to the district town by a state highway. The National Highway No. 31 is about 40 kms towards NE of this lake.

Methodology

A study of socio-economic condition of fishermen of the Gogabeel wetlands area was conducted during January, 2012 to December, 2013 by personal interview technique with the help of pretested schedule. One hundred (100) fishermen were selected for the study.

Reference Period of the Study

January, 2012 to December, 2013

Limitations of the Paper

The paper, being an empirical one, has certain inbuilt limitations such as:

- i. It was not possible to cover entire area in view of time and resource constraints.
- ii. The respondents were mostly illiterate and shy, and therefore, in some cases, they were disinterested, and;
- iii. Primary survey research method of data collection was based on recall of memory method, because Makhana cultivators, as well as other farmers of the region were not maintaining the records. So, it could not be free from its biases, particularly in case of literate and semi literate respondents.

Results and Discussions

Socio-Economic Features of Fishermen of Gogabeel Wetland Region:

The prosperity and development of the wetlands' produce were naturally dependent on the socio-economic conditions of local fishermen. Out of the 100 fishermen, majority of them belonged to the caste Gorhi (47%) and Mallah (40%). They were considered on very low stratum of the society. Fishermen are highly individualistic in outlook, and are, in no way, connected with the proper marketing and cost profit calculation of the their produces.

Regarding education, it was found that 48 per cent of fishermen were illiterate and 43 per cent have nominal education in terms of primary and middle level education due to the reason

of illiteracy of parents and existing rural, social, environmental conditions, they might have not encouraged them to take formal education.

Table 1: Socio-Economic Characteristics of Fishermen of the Gogabeel wetlands region of Bihar

SN	Variable and Category	Number	Percentage
Education			
i.	Illiterate	48	48.00
ii.	Primary & Middle	43	43.00
iii.	Secondary	09	9.00
iv.	College	00	0.00
Caste			
i.	Gorhi	47	47.00
ii.	Mallah	40	40.00
iii.	Bind	8	8.00
iv.	Others	5	5.00
Family Size			
i.	1-4 members	31	31.00
ii.	5-8 members	63	63.00
iii.	9 and above members	6	6.00
Annual Income			
i.	Below Rs. 7500/-	48	48.00
ii.	In between Rs. 7500/- to Rs. 20000	43	43.00
iii.	Above Rs. 20000/-	09	9.00

With respect to occupation, fishing and fish selling were found as main occupation. It was found that majority (63%) of fishermen believed in big sized (5-8 members) family due to high child mortality rate (CMR) in backward community of rural area, but a new trend appeared to control the family size i.e., 31 per cent (1-4 members) of fishermen. Majority of surveyed households (Hhs) i.e., 48 per cent of fishermen families had an annual income below Rs. 7500/- and 43 per cent were having income between Rs. 7500/- to Rs. 20000/-. Possible reasons could be the poorer socio-economic conditions since most of them had not their own nets gears and, generally remained under the clutches of money lenders. There was no hope of ever being free from debt. Actually, the middlemen were the main problem for the development of this backward community (table 1).

Gogabeel is one of the important wetlands of North Bihar. It is situated in Manihari subdivision of Katihar district. This wetland was spread over in an area of 0.8 hectare.

Maximum depth of this wetland was 2 meters. This wetland received water mainly from rain water and during monsoon, water surrounded from all sides inundating agricultural land. During monsoon, fertilizers and other agro chemicals enter into this wetland through surface run-off. Flora and fauna of the area had great potential to develop a national park as well as, tourism centre. Almost 300 migratory birds came to the lake from Caspian Sagar and Sibarean region in monsoon and winter seasons. Gogabeel area was declared as a closed and protected area for the conservation, preservation and protection of wild life. Recently, the Ministry of Tourism, Government of Bihar had planned to develop the Gogabeel as “Tourism Centre,” while the Government of India did also recommend to the International Union for Conservation of Nature (IUCN) for recognizing this lake as a place of international importance, like; Bharatpur (Rajasthan), Chilka (Orissa) lake bird sanctuary and prawn fish respectively.

During 2012-13, primary productivity of phytoplankton was studied by using Gander and Gran Method (1927).

Table 2: Gross and net primary productivity of phytoplankton in Gogabeel, Katihar during 2012-13.

SN	Period	GPP	NPP
		$\text{mgcm}^{-3} \text{hr}^{-1}$	$\text{mgcm}^{-3} \text{hr}^{-1}$
i.	November	70.3	60.66
ii.	December	82.4	70.6
iii.	January	104.3	90.4
iv.	February	128.6	112.4
v.	March	140.7	130.3
vi	April	170.8	150.6
vii	May	192.3	170.3
viii.	June	200.6	180.4
ix.	July	160.4	155.3
x.	August	100.6	89.6
xi.	September	64.3	58.3
xii.	October	56.8	51.4

The trend of fluctuation shows that the value of GPP and NPP increased gradually during winter and summer months, and started decreasing during monsoon months. Water quality of the wetland could also be responsible for the fluctuation in productivity round the year. Lowering in production during rainy season could be also due to rains, which brought allochthonous organic matters from the catchment areas, which started decomposing leading to low productivity rate.

Table 3: Economics of Makhana Cultivation in per hectare water area

SN	Items of Expenses	Rate (Rs) Quantity	Amount (Rs)	Total
1.	Lease Charges	1 ha	1500	1,500.00
2.	Cost of Makhana Seed (kg)	110 kg	22	2,420.00
3.	Labour charges for seed broadcasting, seed collection after harvesting and pop preparation	20 manday	30	6,000.00
4.	Interest on capital expenditure			1,388.00
5.	Total Income			11,308.00
6.	Sale of Makhana pop profit	500 kg	70 kg	35,000.00

It was observed that Makhana Guris grown in Katihar district with smaller size yielded better recovery rate in respect of Makhana pop.

Marketing of Makhana in Delhi Market

Delhi and Kanpur were the most important consuming centres, both from the point of view of quantity of Makhana sold to these centres, and the number of whole sellers using these. It was observed that producer's share was 53.03 per cent from out of the price paid by the consumer, and the remaining was distributed in different functions and functionaries of Makhana marketing.

Export Possibilities of Wetland Produce

Makhana is graded and prepared ready to eat produce, like; salted Makhana, sweetened Makhana, dried Makhana, kheer mix etc. By developing proper packaging method and materials at the rural level, Makhana may have a major potential source of hard currencies by exporting it to the developed countries of the world. APEDA, NABARD and Agriculture

Department should take initiative through Makhana processors for exporting it. Other essential facilities should also be provided to the interested people for exporting Makhana from the potential areas.

In the study area, there was huge export potential for Makhana. Proper facilities of processing, packaging, transporting and demand agreement were provided. Thus, there is need to investigate the proposal of development of such makhana. Generally due to poor technique of processing, processors were unable to prepare good quality of makhana and, as such, restricted the demand for makhana in foreign countries. If proper processing machine would have been established in the locality and suitable infrastructure developed, then export possibilities of makhana would have definitely increased in future. Makhana possesses medicinal properties. According to research studies, several types of medicines may be prepared from makhana and exported to international markets, especially to the countries, like; Norway, Canada, UK & USA, where there was a huge demand for makhana.

Involving Private Sectors in Cultivation of Makhana on Scientific Basis

To explore the possibilities of involving private sectors in cultivation of makhana on scientific line, the following steps are needed:

This crop was and still is traditionally grown by a particular caste i.e., mallah/Sahni. They were economically and socially very backward. They generally took ponds on lease and cultivated fish and makhana in these tanks and ponds. They hardly got year round income from this activity. If this venture is taken by private corporate sector and large private growers' packaging may be performed on highly scientific technique, then good quality makhana could be produced by establishing processing units in the locality. It was further observed that due to poor economic condition, makhana growers failed to provide local requisite manures and fertilizers in their farms, which caused low yield and low quantity of the produce.

Conclusion and Suggestions

On the basis of the findings, our efforts and emphasis should be on exploring and develop economic opportunities in aquatic agriculture, natural and community resources through innovative research and development programme on makhana, that benefit the people

involved in makhana cultivation, post-harvest processing, marketing, export and consumption. Hence, following steps should be taken:

- i. To conduct basic, strategic, applied and adoptive research for increasing productivity that may ensure sustainability and enhancing profitability of makhana.
- ii. To develop and standardize the post harvest processing and value adding technologies.
- iii. To facilitate and promote co-ordination and dissemination of appropriate agricultural technologies through network/consortia approach involving all stakeholders of makhana.
- iv. Serve as a repository of the agro-eco-bio-aqua diversity and scientific information of makhana.
- v. Provide consultancy and advisory support for promoting makhana based industries.

Based on the field visits, the following steps may be proposed to be taken up for expediting increase in production and exporting of wetland produces from Bihar:

- i. Integrated fish-cum-makhana cultivation should be promoted, which will play vital role in livelihood enhancement of the rural poor.
- ii. Good agricultural practices, as recommended by the Makhana National Research Centre, Darbhanga, should be promoted through cluster based approach.
- iii. Mechanization of harvesting, post harvesting and processing required.
- iv. Institutional credit facilities are needed at two intervals, viz., during leasing of pond/land and for irrigation.
- v. Training/capacity building on makhana processing, especially from guris to pop is required.
- vi. Contract farming based on centralized model may be adopted. It is more so desired as the processor buys the commodity from a large number of farmers under contract with the firm.
- vii. As there was less application of chemicals and fertilizers, so this crop could be taken as organic produce and its promotion is required accordingly.
- viii. The Agri-Export Zone, Hazipur could be expanded to include export promotion of makhana products, as well under partnership of makhana growers, and value adding

processing firms to get fiscal incentives in terms of tax concessions under the schemes of Government of India.

ix. Strengthening of Fish Farmers' Development Agency (FFDA) is desired. Till recently, 33 FFDA's were operational in the state. Their financial activity was very limited and they did not work as independent organizations. FFDA's should be provided Rs. 10 lakhs working capital. The fund would be used as a "Revolving Fund."

x. The traders/wholesalers/retailers were not aware of the procedures of export. So, training for creating awareness regarding export procedures/ISO certification etc., is urgently needed.

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