

GEOGRAPHICAL STUDY OF INLAND FISH PRODUCTION IN NORTH BIHAR USING GEO-INFORMATION TECHNIQUES

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Abstract: *The present study area is characterised by thick alluvial soil, moderately good rainfall, ample sunshine and numerous water resources in the form of perennial rivers. It possesses many ponds, lakes, tank, and irrigation projects. It has large untapped water resources and highly potential for inland fish production. Even then it depends on states like Andhra Pradesh for the supply of about half of its annual fish demand. Fisheries occupy a prominent place in the economy as the fish is one of foods of vast majority of people. Fish not only provides proteins but also contains fat, inorganic substances and vitamins. Fish protein is easily digestible and it contains considerable proportion of soluble proteins. North Bihar is the most potential region in terms of total number of ponds 74 % and the water spread area 63%. The study area comprises 21 districts and all districts contribute to Inland fish production. Most of the fishermen belong to the Sahni castes only.*

Keywords: *Fish Production; Water area; Number of Ponds and Mouns.*

1. INTRODUCTION

Fisheries play a key role in food security and employment generation as significant proportion of population depend upon fish production and its allied activities for their livelihood sustenance and income. North Bihar is endowed with rich aquatic and fisheries resources in the form of rivers, flood plains, wetlands (chaurs), ox-bow lakes (mauns), reservoirs, tanks and ponds. Flood plain and other wetlands locally known as chaurs are other major fisheries resources and measure about 45,978 ha which are found mainly in the basin of Kosi-Gandak river systems of North Bihar. Ox-bow lakes locally known as mauns, are the discarded loops of meandering rivers which got cut off from the main rivers and is estimated to be about 9000 ha. Ponds can be perennial or seasonal. It is locally known as Talab and measure about 44,633 hectare. The important lakes are Kawar and Kusheshwar Sthan. These

lakes are the discarded loops of meandering rivers, mainly in the Gandak and Kosi river basin, which gets disconnected and connected with the main rivers during floods or rainy season thereby drawing water. They constitute the main source of inland fish production in the region.

2. STUDY AREA

North Bihar is bounded by north latitude of $25^{\circ}15'$ to $27^{\circ}31'$ and east longitude of $83^{\circ}22'$ to $88^{\circ}20'$ (Fig. 1). It is a very fertile segment of middle Ganga Plain. It comes under Gangetic Alluvial Plain and Himalayan Foothills of Shiwalik range. The geological base of the region is composed of Quaternary Sedimentary Alluvial deposits- mainly sand, clay, silt etc. and tertiary represents as Sumeshwar hill of Shiwalic range in west champaran district only. Administratively, on the north, the region is bounded by Nepal, on the east by the West Bengal, on the south by the South Bihar Plain and on the west by the Uttar Pradesh and is inhabited by 6, 53, 98,660 people as per 2011 census. The entire region is divided into 21 districts.

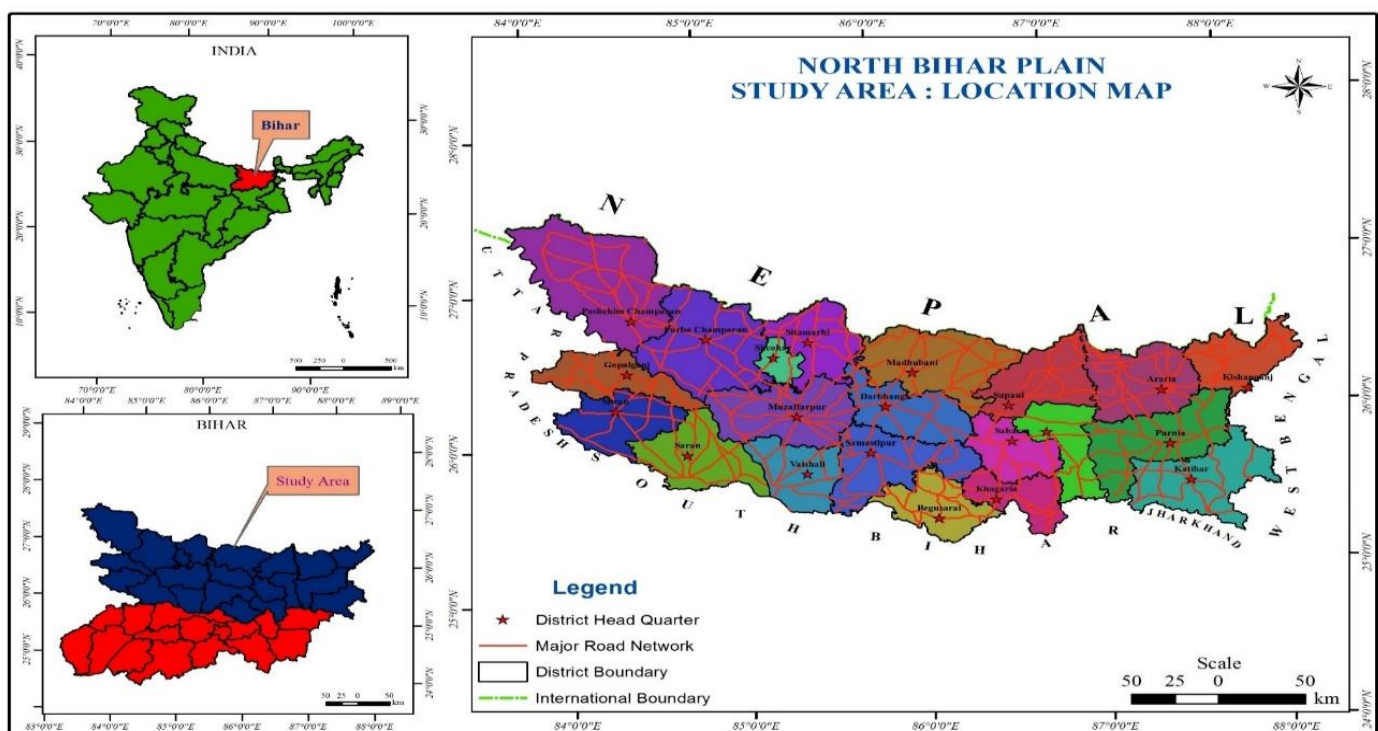


Fig. 1: Showing Location Map of North Bihar.

3. Aims and Objectives

The main objectives of the study are:

- To estimate the production of fish.
- To identify the various channels of fish production.
- To enhance the production of fish and productivity of fisherman
- To examine the future prospects of fish culture in the area.

4. MATERIALS AND METHODS

The methods and procedures of research are determined by the nature and characteristics of the information, data and purpose of study. In the present work both qualitative and quantitative methods have been adopted. The major data and information pertaining to this study have been collected from the primary and secondary sources. The primary data was collected with the help of duly structured fish farmers' structure whereas the secondary data was collected from the Directorate of Fisheries and its district level offices of the study area and from different published and unpublished sources. Interpretation of USGS Toposheets have been clipped using spatial analysis-extraction by 'Mask Technique'. Here, one shapefile having the toposheets actual coverage act as a vector layer for masking and clipping. The clipped toposheets have been put into mosaic analysis. The main aim of these analysis is keeping in single file. The final mosaic single toposheet file again mosaic by North Bihar administrative boundary shapefile which is downloaded from Diva GIS. Now study area illustrated single toposheet (comprising all toposheets belongs to the study area) have done.

5. SCENARIO OF INLAND FISHERIES IN NORTH BIHAR

North Bihar has large inland fisheries and aquaculture resources. It has large untapped water resources for fisheries. Even then it depends on states like Andhra Pradesh for the supply of about half of its annual fish demand. Despite the fact that North Bihar has vast potential for production and is famous as a major fish producing area. This is a fact that North Bihar is poorest region in the country where more than 80 percent population have their livelihood from agriculture and allied activities like aquaculture.

The North Bihar Plain possesses many ponds, tank, and irrigation projects. It offer immense potential for inland fish production. There are long seasonal ponds, reservoirs and lakes. The important lakes are Kawar and Kusheshwar Sthan. They constitute the main source of inland fish production in the region. The study area contributes 214.6 tonnes in 2009-10, 213.6 tonnes in 2010-11, 249.5 tonnes in 2011-12, 273.2 tonnes in 2012-13 and 311.2 tonnes of fish production during the year 2013-14.

5.1 FISH PRODUCTION

Fisheries plays not only an important key role in the supply of nutritionally rich protein but also as provides rural livelihood as well. Fishes are good sources of

vitamin B and iodine. It contains only 0.4- 4 percent fat. Both the water resources and the high first sale price of fish in the region allow for increasing productivity. Fish production in the region has been very under developed. It is steady growth, besides being an ample opportunity of providing gainful employment to rural households through pisciculture. The study area comprises 21 districts and all districts contribute to Inland fish production. Most of the fishermen belong to the Sahni castes only. The district wise figures for production of fish for the year 2009 to 2014 are presented in Table 1. It has been observed that the present annual fish production in North Bihar plain is 311.2 lakh tonnes. It increased substantially every year from 214.6 lakh tonnes in 2009-10 to 311.2 lakh tones in 2013-2014 but declined trend has been observed in

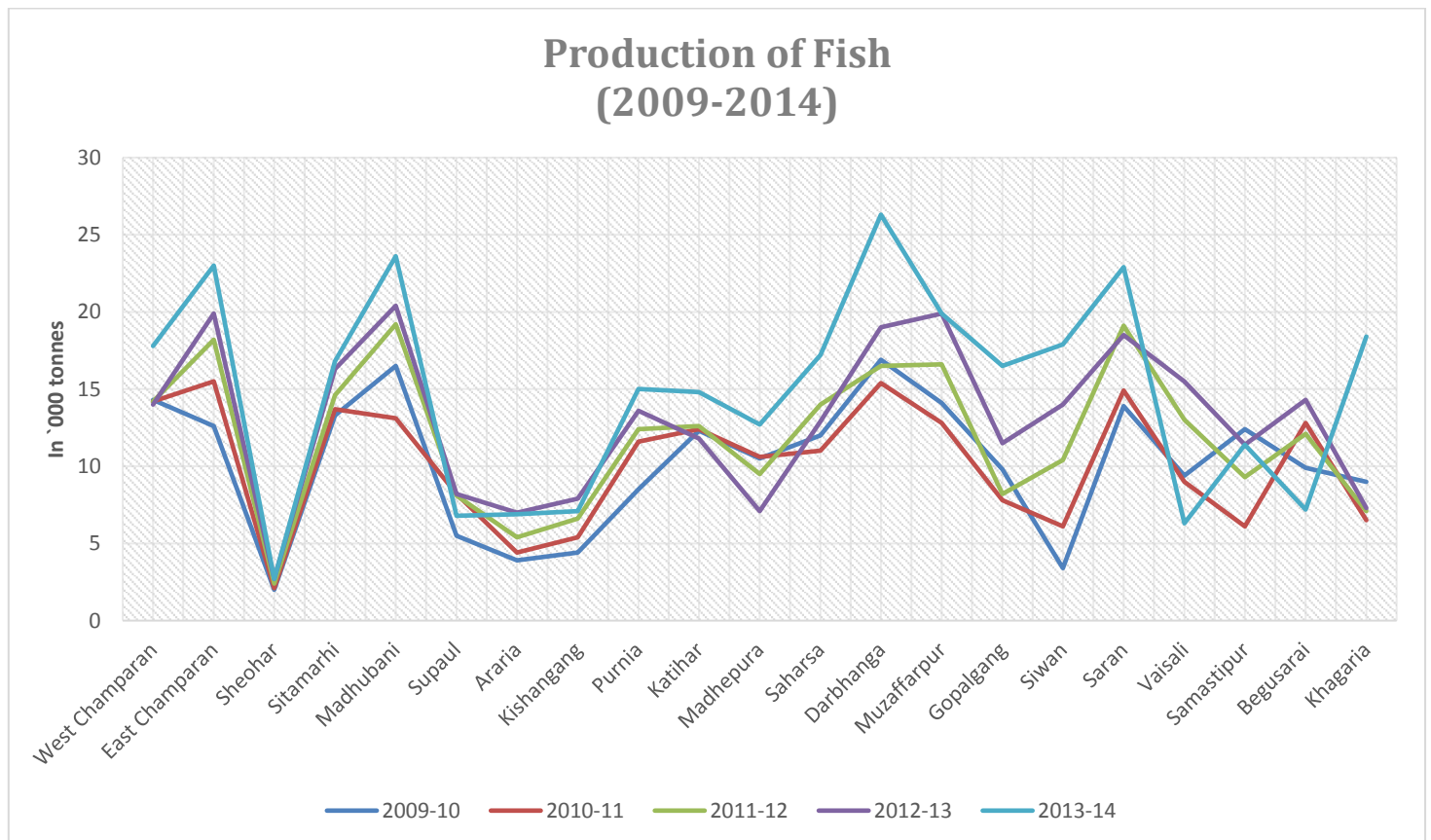


Fig. 2: Showing Distirct Wise Fish Production since 2009-2014.

the year 2010-2011. During the period between 2011-12 to 2013-2014, there has a continuous increase in fish production in study area due to awareness of fish production. The data reveals that districts falling in Mithala region, namely Darbhanga, Madhubani, Sitamarhi and Samastipur are major producers of fish (Fig. 2). The share of fish production in state as 5.68%, 5.54% and 4.17%, namely Darbhanga, Madhubani and samastipur respectively. Thus, during the last four years the fish production had made a quantum leap and doubled itself. Upto 2014, the fish production in North Bihar was 311.2 lakh tonnes. In 2011-12, it was 249.5 lakh tonnes and 2012-13 it come to 273.2 lakh tonnes.

Table 1: District Wise Production of Fish since 2009-2014. (000 tonne).

District	2009-10	2010-11	2011-12	2012-13	2013-14
West Champaran	14.3	14.2	14.2	14.0	17.8
East Champaran	12.6	15.5	18.2	19.9	23.0
Sheohar	2.0	2.1	2.4	2.7	2.7
Sitamarhi	13.3	13.7	14.6	16.3	16.8
Madhubani	16.5	13.1	19.2	20.4	23.6
Supaul	5.5	8.2	8.1	8.2	6.85
Araria	3.9	4.4	5.4	7.0	6.86
Kishangang	4.4	5.4	6.6	7.9	7.1
Purnia	8.5	11.6	12.4	13.6	15.0
Katihar	12.3	12.4	12.6	11.8	14.8
Madhepura	10.5	10.6	9.5	7.1	12.7
Saharsa	12.0	11.0	14.0	12.9	7.2
Darbhanga	16.9	15.4	16.5	19.0	26.3
Muzaffarpur	14.1	12.8	16.6	19.9	19.9
Gopalgang	9.8	7.8	8.2	11.5	16.5
Siwan	3.4	6.1	10.4	14.0	17.9
Saran	13.9	14.9	19.1	18.5	22.9
Vaisali	9.4	9.0	13.0	15.5	6.3
Samastipur	12.4	6.1	9.3	11.4	11.4
Begusarai	9.9	12.8	12.1	14.3	7.22
Khagaria	9.0	6.5	7.1	7.3	18.4
North Bihar	214.6	213.6	249.5	273.2	311.2

Source: Department of Animal Husbandry, Govt. of Bihar.

5.2 FISH CULTURE IN PONDS

The major portion of fish production in North Bihar is from ponds and tanks. Ponds of water spread area less than 10 ha in sizes that can be classified as ponds. In fact, the main culture fishing resources lie in over 30 thousand number of ponds and variable sizes covering a total area of over 43631 lakh hectare which is account for 63 percent of North Bihar Table 2. North Bihar is the most potential region in terms of total number of ponds 74 % and the water spread area 63%. An estimate of District wise pond resource in North Bihar is given in (Fig. 3). The present mean fish productivity in ponds is about 2.2 tonnes/ha/year in the North Bihar. The districts of the Darbhanga Division (Darbhanga, Madhubani, Samastipur) are major producers of fish. The state government has recently taken some steps to empower the fish farmers through onsite training, and exposure visits to various places throughout India to develop technical, managerial and participatory skills. The fishermen of the study area have been sent to Andhra Pradesh and West Bengal for upgradation of their skills for modern fishing techniques. For fish seed, Siwan topped the list with 750 lakh seeds, followed by Darbhanga with 650 lakh seeds. The development of ponds and 'chaur' have given below for fish culture and fish seed production.

Table 2: District Wise Number of Ponds in North Bihar

District	Water spread area (ha)	Number of Ponds		
		Government	Private	Total
West Champaran	5212.00	1833	1100	2913
East Champaran	4003.54	519	341	660
Sheohar	289.30	232	105	337
Sitamarhi	2398.72	1354	1582	2936
Madhubani	3408.50	3430	1753	5183
Supaul	1542.15	147	447	594
Araria	390.00	NA	NA	634
Kishangang	558.85	NA	NA	NA
Purnia	3447.85	691	1773	2864
Katihar	4175.89	212	1445	1657
Madhepura	1509.17	79	357	436
Saharsa	1057.13	81	860	941
Darbhanga	4144.02	1623	2301	3924
Muzaffarpur	1822.10	744	187	931
Gopalgang	997.88	209	30	239
Siwan	811.66	630	564	1194
Saran	1530.00	908	1300	2208
Vaisali	972.69	667	438	1105
Samastipur	1386.13	607	157	764
Begusarai	1033.96	150	80	230
Khagaria	3140.20	158	115	273
North Bihar	43631.74 (63.40)	14654 (72.52)	14935 (84.34)	30223 (74.59)

Source: Department of fisheries, Govt. of Bihar; NA- Not Available,

Note: Figures in the Brackets indicate percentage.

5.2.1 Sakri Chaur: - Sakri Chaur is located at Jandaha in Vaishali district. As a measure of contingent plan for draught period, culture of exotic catfish, *Pangasius sutchi*, was attempted in the rearing pond (140 m²) of the carp hatchery complex of NAIP project site. The pond bottom was dressed evenly and lining with low cost polythene sheet was done to prevent leaching loss. The plastic sheet was covered by a layer of 4-5 inch soil. Lime (3.5 kg) was applied at the rate of 250 kg/ha and cow dung (140kg) was used 10.0 tonne/ha. The rearing pond was filled with pumped ground water. After 15 days, pond was stocked with fingerlings 210 numbers of exotic catfish, *Pangasius sutchi*, which can sustain low water depth, high temperature and high stocking density. The stocking density was 15000 fingerlings per ha. They were fed with a commercial floating pellet at 5% of live weight. The innovation indicated encouraging results. After 6 months, 120 fishes (60% survival) corresponding to 61 kg were obtained. The final average length and weight of fish was 37.5 cm and 510 gm. Thus in a pond of one hectare, a total of 9000 fishes with a total weight of 4.59 tons could be obtained.

5.2.2 Kalwara Maun: - Three hectare maun at Kalwara of Rosera, District Samastipur was converted into fish pond by making two dams on two sides with outlet-inlet facility. Total 6 ha land was used and comprises of 52 beneficiaries. On pond dyke, mango (Amrapali, Maldah and Mallika) was planted and pigeon pea was taken as intercrop. Thirty thousand fingerling of common carp was added into the reshaped 3 ha fish pond which yielded 1.2 tonne and fetched Rs. 2,04,000 to farmers by selling fish at the rate of Rs. 170/kg.

5.2.3 Kusheshwar Chaur: - Kusheshwar sthan group of chours have shown great potential in terms of fish culture. Kusheshwar sthan is one of the best wetlands in North Bihar. It spreads over the area of about 20 km². The water spread area extends during the monsoon months (June to October) till 100 sq. km. It is located at a distance of about 65 km. from Darbhanga town. Fishing activities, in these chours, have long history and are a traditional means of livelihood for thousands of fishermen living in and around kusheshwar sthan. The period between November and June is the main period for fishing in these chours, while the period from end June to October has negligible fishing due to flooded condition of the chours.

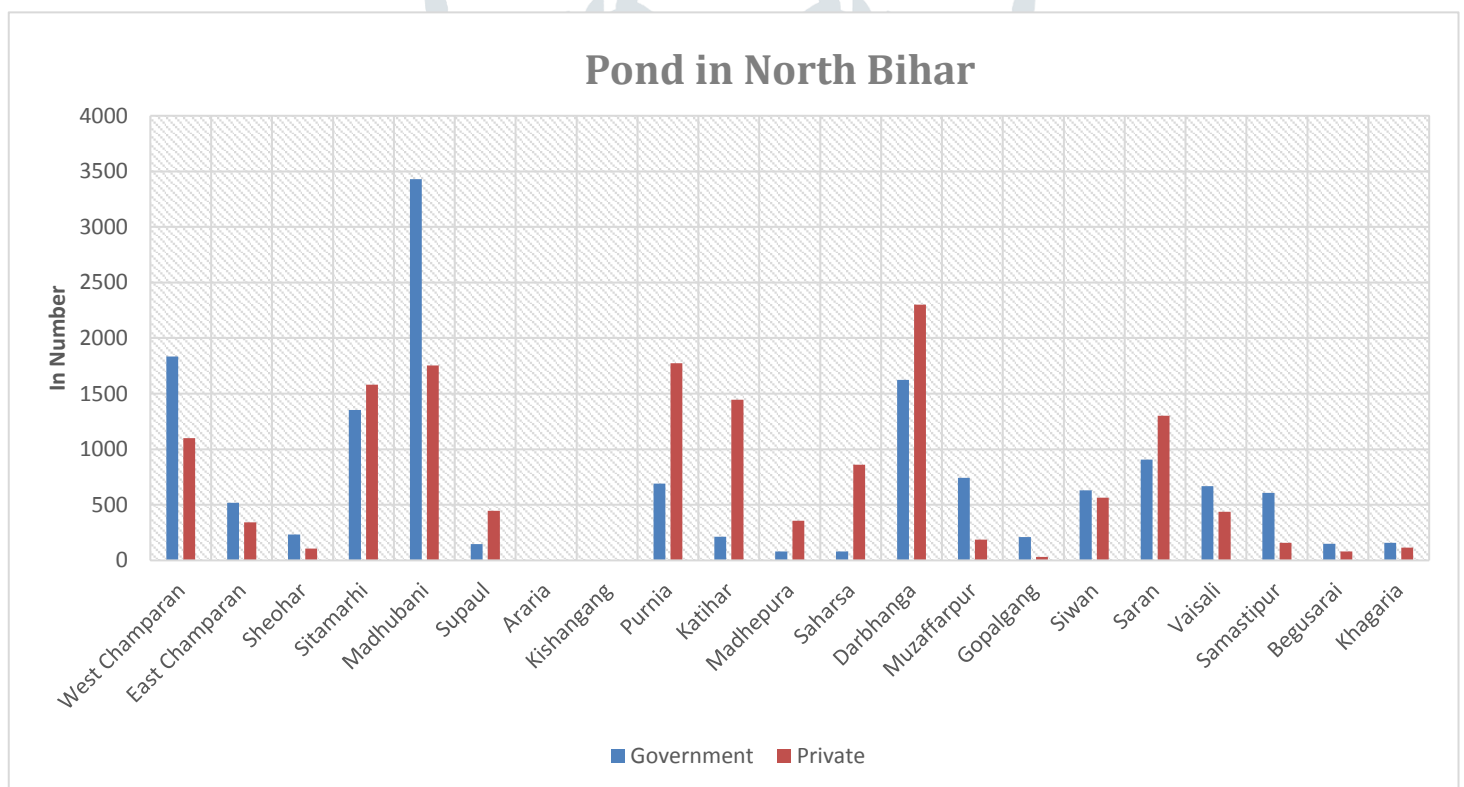


Fig. 3: Showing Distirict Wise Pond Resource in North Bihar.

5.3 Fish Cultural in Mauns

Mauns or Ox-bow lakes, which are the cutoff portions of river meanders, form an important fishery resource in Bihar, with annual fish yield potentials ranging from 1,500 to 2,000 kg/ha. The distribution of mauns in different Districts of the

region is given in Table 3. Apart from directly providing fishing grounds, the oxbow lakes of North Bihar also facilitate auto-stocking of riverine fish due to their connectivity to rivers. However, currently these water bodies are in various stages of eutrophication, on account of natural and anthropogenic factors, as evidenced by the presence of thick stands of macrophytes (3 to 20 kg/m²). Most of the lakes also remain unconnected to rivers as the connecting channels have become non-functional. Construction/repair of inlet and outlet channels would be essential to restore connectivity of oxbow lakes with rivers. Considering that 10 million advanced fingerlings will be required to stock 5,000 ha of oxbow lakes, they are produced in

Table 3: Spread of Mauns in North Bihar Plain.

District	Number and area of mauns						Total Number	Total Area (ha)
	10-50		50-100		100-500			
	Number	Area (ha)	Number	Area (ha)	Number	Area (ha)		
WestChampan	3	83	1	52	2	626	6	761
East Champan	10	276	8	586	7	1130	25	1992
Muzaffarpur	21	436	3	185	0	0	24	621
Samastpur	4	143	1	98	3	702	8	943
Katihar	21	507	3	212	1	156	25	875
North Bihar	59	1445	16	1133	13	2614	88	5192

Source: CIFRI, Barracopore.

situ in pens or cages set up in the lakes. The number and size of the cage/pen units would vary depending upon the quantity of stocking materials to be raised to stock the oxbow lakes concerned or a cluster of them in the vicinity.

CONCLUSION

It has been observed that the present annual fish production in North Bihar plain is 311.2 lakh tonnes. It increased substantially every year from 214.6 lakh tonnes to 311.2 lakh tones but declined trend has also been observed in the year 2010-2011. In study area, there is much scope for developing culture based fisheries in mauns and bringing ponds into intensive and semi-intensive culture to attain the desired level of population. In addition, it will create employment to fishermen community. The

consumer preference in the study area is mainly for the three Indian major carps, viz., Rohu, Catla, Pangasius, Mrigal, Silver carp.

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