

# Bio-Economic Analysis of Bheri Fisheries in and Around Topsia Canal of East Kolkata Region in West Bengal during 2014-'15

S. Sahu<sup>\*1</sup>, A. Mondal<sup>2</sup>, A. Aziz<sup>3</sup>, B. K. Das<sup>4</sup>, S. Chowdhury<sup>5</sup>

HOD, Department of Fishery Economics and Statistics, Faculty of Fishery Sciences, WBUAFS, Kol, India<sup>1</sup>

Associate Professor, Department of Fishery Economics and Statistics, FFSc, WBUAFS, Kol, India<sup>2</sup>

PG Student, Department of Fishery Economics and Statistics, FFSc, Kol, India<sup>3</sup>

Professor & Dean, Faculty of Fishery Sciences, WBUAFS, Kol, India<sup>4</sup>

Assistant Professor, Department of Fish Processing Technology, FFSc, WBUAFS, Kol, India<sup>5</sup>

**Abstract:** The East Kolkata Wetlands provide a range of ecosystem services which form the base of ecological security of the entire region and livelihoods of dependent communities. Being a dynamic ecosystem, the bheri is also subject to influence from various natural as well as human factors. Integrated management of the East Kolkata bheris and its catchments is crucial for maintaining the rich productivity of the wetland ecosystem as well as achieving wise use of resources by communities. It is essential to implement conservation measures for proper management of the aquatic resources and suitable measure to be taken for up-gradation of breeding ground, feeding zones and migration area. The bheri fisheries can take a role in the development of fisheries in the state as well as contribute towards the socio economic up liftment of the poor people of the area.

**Key words:** *Econometrics, Bheris, Productivity, Resources, Market Economy, Up liftment.*

## I. INTRODUCTION

The fisheries sector usually makes a valuable contribution of economic development of world economy. Indeed, in many countries, fish export is a major contributor to foreign exchange earnings, often ranking far higher than other agricultural commodities. FAO statistics recorded 10 million tons of inland fish catch per year worldwide. People in coastal countries depend on healthy fisheries for their livelihood. Gross revenue globally from marine fisheries has been estimated during the last decade at \$80 billion to \$85 billion annually. (FAO, 2010). The fisheries sector contributes 1.21 percent to the total GDP and 5.37 percent to the GDP of the agriculture sector. (Handbook on Fisheries Statistics). The export of marine products had grown to greater proportion as one of the important item of India's exports, accounting for approximately 4% of the total export from India. (Kumar *et al.*, 2002). The bheris constitute one of the important fishery resources in the estuarine bheris of the upper and lower Sunderbans of West Bengal. With a waterspread area of about 33,000 ha spanning the low, medium and high salinity zones, the bheris form a major shrimp and fish production system in India. The total number of bheris in West Bengal is about 1,334 covering an area of 33,000 ha spread over three salinity zones, namely the medium salinity zone (15,613 ha), low salinity zone (9,844 ha) and high salinity zone (7,472 ha). The bheris are irregular in shape and range in size from 2 ha to 267 ha, the average

size being in the range 15–34 ha in the three salinity zones. The bheries are of seasonal and perennial types. Seasonal bheris dry up during November-December and are left exposed to sun for about a month till next season starts. Both fish and paddy are raised in the same unit in a sequential manner, sometimes in conjunction (Chattopadhyay *et al.*, 2002).

## II. MATERIALS AND METHOD

To conduct the study of "Econometrics of Bheri Fisheries in East Kolkata at Topsia Pumping Station, West Bengal during 2014-'15." scientifically, a suitable research design was evolved in order to arrive at an authentic conclusion. The Topsia Canal is situated at 8°-80'-15'' E, 7°-70'-25'' E and 4°-40'-45'' N, 2°-20'-25'' N. The maximum temperature during summer rises around 39°C, while minimum temperature during winter is around 10°C. The average temperature during most part of the year is around 30°C during day time.

The Plan of work sequence is:

- 1) Designing the Sampling Frame
- 2) Selection of two Bheris from the Topsia area
- 3) Selecting the bheri fishery farmers to be interviewed
- 4) Cross verification with the block/district level government officials
- 5) Drawing of Inference
- 6) Find out the Management Strategies on the basis of the study.

## III. PROPOSED SAMPLING FRAME

Stage	Selected Zone	Sampling Procedure	Number of Unit	Data Collection
Bheri Selection	2 bheris near <b>Topsia Canal</b> a) Captain Bheri b) Collector Bheri	Purposive Sampling	2 Bheris	Secondary Data
Fish farmer selection (20 farmer from each bheri i.e. in total 40 farmers interviewed)	Data From each Bheri	Purposive Sampling	Bheri Officials & member	Questionnaire & Interview

Data collection were made by two ways; collection of existing data (secondary data) such as published literature, books, research articles and maps etc. of institutions. The present status, current problems and related legislation were collected from the literature survey. The collection of new data by filling of questionnaires was carried out. The collected data are later analyzed statistically.

#### IV. RESULT & DISCUSSION

The present dissertation gives a spectrum of information, identification of important input variables, threats and the required management for the sustainability of bheri fishery near by Topsisia area (Station 1) in East Kolkata area. The value of construction cost in station 1 is Rs 4743.895. But in the year 2015 the expenditure of construction in that area is Rs 7000 . For electric installation the average cost is Rs 290.19 in 2014 but in the year 2015 the expenditure are in Station 1 is Rs 329.99. For watchmen shed the collected data is Rs 182.84 but in the year 2015 the expenditure is 213.35. The collected data on Lease amount in Station 1 is Rs 9117.42, but in the year 2015 the expenditure is Rs 9938.92. The collected data on Liming & Manuring is Rs 10784.08 in 2014. But in the year 2015 the expenditure is Rs 12218.28. The collected data on chemicals Station 1 is Rs 4280.93. But in the year 2015 the expenditure is in Station 1 is Rs 5368.4. For cost of seeds the collected data is Rs 32767.93 in 2014. But in the year 2015 the expenditure is Rs 35197.01. The collected data on Fuel charge in Station 1 is Rs 103.43 in 2014. But in the year 2015 the expenditure are in Station 1 is Rs 118. The collected data on Electricity charge in Station 1 is Rs 511.42 in 2014. But in the year 2015 the expenditure are in Station 1 is Rs 423.56. The collected data on Labour charges in Station 1 is Rs 3908.39 in 2014. But in the year 2015 the expenditure are in Station 1 is Rs 5700.75. From (Table 2), which represent the Correlation matrix considering all the variables under consideration, the results are depicted in the following manner. Firstly, considering the correlation between Stocking with other variables, there exist a significant high positive correlation with equipments, total capital cost ,moderate positive correlation with watch man, low positive correlation with construction, electrification, high negative correlation with Miscellaneous, total variable cost, total input, total output, lease amount, cost of seed, moderate negative correlation with liming and manuring, chemical, fuel charge, electric charge, annual maintenance and repair, profit and low negative correlation with labour charge, and Miscellaneous. Secondly, considering the correlation between Construction with other variables there exist a significant moderate positive correlation with watch man, total capital cost, annual maintenance, profit low positive correlation with equipments, high negative correlation with electrification, Miscellaneous, Chemicals, Fuel charges, Labour charges, moderate negative correlation with Cost of seeds, Electricity charges, Total Variable Cost, Total Input, low negative correlation with Total Output, Miscellaneous, equipments. Thirdly, considering the correlation between Electric installation with electrification other variables there exist a significant moderate positive correlation. Fourthly considering the correlation between Equipments with

electrification other variables there exist a significant high positive correlation. Fifthly considering the correlation between Watchman shed with electrification other variables there exist a significant high positive correlation. Sixthly considering the correlation between Miscellaneous with electrification other variables there exist a significant high positive correlation with Total Capital Cost, high negative correlation with Lease amount and other variables. Seventhly considering the correlation between Total Capital Cost with electrification and other variables there exist a significant high positive correlation with Lease amount and other variables. Eighthly considering the correlation between Lease amounts Cost with electrification other variables there exist a significant high positive correlation with other variables. Ninthly considering the correlation between Liming and manure Cost with electrification other variables there exist a significant high positive correlation with Chemicals and other variables. Tenthly considering the correlation between Chemicals Cost with electrification and other variables there exist a significant high positive correlation with Cost of seeds and other variables. Eleventh considering the correlation between seeds with electrification and other variables . Twelfth considering the correlation between Fuel charges with electrification and other variables there exist a significant high positive correlation with Labour charges and other variables. Thirteenth considering the correlation between Electricity charges with other variables there exist a significant high positive correlation with Miscellaneous and other variables. Fourteenth considering the correlation between Labour charges with electrification other variables there exist a significant moderate positive correlation with Total Variable Cost, Total Input, and low positive Miscellaneous, total out put, low negative correlation with Annual maintenance and repairing cost, Profit. Fifteenth considering the correlation between Annual maintenance and repairing cost with electrification other variables there exist a significant high positive correlation with, moderate positive correlation with Miscellaneous, total output, low positive with correlation with Variable Cost ,Total Input. Sixteenth considering the correlation between Miscellaneous with electrification other variables there exist a significant high positive correlation with Total Variable Cost, Total Input, Total Output, moderate positive correlation with profit. Seventeenth considering the correlation between Total Variable Cost with electrification other variables there exist a significant high positive correlation with Total Input, Total Output, and low positive correlation with profit. Eighteenth considering the correlation between Total Input electrification other variables there exist a significant high positive correlation with Total Output, and low positive correlation with profit. Ninetieth considering the correlation between Total Output electrification other variables there exist a significant high positive correlation with profit.

#### V. CONCLUSION

Among the Inland fisheries sector, Bheri plays a crucial role through its' production system and maintaining Bio-diversity. These are one of the crucial natural resources. Bheris are areas of land that are either temporarily or

## APPENDIX

permanently covered by water. This means that a bheri is neither truly aquatic nor terrestrial; it is possible that bheris can be both at the same time depending on seasonal variability. Thus, bheris exhibit enormous diversity according to their genesis, geographical location, water regime and chemistry, dominant plants and soil or sediment characteristics. Because of their transitional nature, the boundaries of bheris are often difficult to define. Bheris do, however, share a few attributes common to all forms. Of these, hydrological structure (the dynamics of water supply, throughput, storage and loss) is most fundamental to the nature of a bheri system. It is the presence of water for a significant period of time which is principally responsible for the development of a bheri. Anti-poaching measures should be adopted for controlling of bio-diversity. Integrated agri-aquaculture approach for effective utilization of resources. Gender neutralizing approach to bring the women to the main stream of development. Special emphasis on production. So lastly, it may be concluded that by implementing the above measures, the bheri fisheries can take a role model in aquaculture field for the development.

## REFERENCES

- [1] FAO (1995). Aquaculture production statistics. FAO Fisheries Circular 815, Rev. 7. FAO, Rome: Fishery Information, Data and Statistics Service. 1984–1993.
- [2] Handbook on Fisheries Statistics, Ministry of Agriculture, Government of India and unpublished data from Department of Animal Husbandry and Dairying, Ministry of Agriculture, Government of India. 2000.
- [3] Kumar, Anjani, P.K. Joshi and Badruddin.. Export performance of Indian fisheries sector: Strengths and challenges ahead, Working Paper 3, National Centre for Agricultural Economics and Policy Research, New Delhi. 2002
- [4] Chattopadhyay, B., A. Chatterjee and S.K. Mukhopadhyay, Bioaccumulation of metals in the East Calcutta Wetland Ecosystem. Aquatic Ecosyst. Health Manage., 5: 191-203. DOI: 10.1080/14634980290031848. 2002.

Table 1 Average Economics of bheri fisheries near by Topsia Pumping Station during 2014-15

Sl. No.	Particulars	2014 (June-December)	2015(Jan-July)	Comments
A.	<b>Capital Cost</b>	<b>Amount (Rs.)</b>	<b>Amount (Rs.)</b>	
1	Construction	4743.895	5380.222	
2	Electric installation with electrification	290.19	329.9863	
3	Equipments(net,handi,boat etc)	1934.595	2279.353	
4	Watchman shed	182.84	213.3581	
5	Miscellaneous	1258.865	1776.989	
6	<b>Total</b>	<b>8410.385</b>	<b>9979.91</b>	

B.	Variable Cost	Amount (Rs.)	Amount (Rs.)	Comments
1.	Lease amount	9117.415	9938.927	
2.	Liming and manure (Fertilise and productivity purpose)	10784.08	12218.28	
3.	Chemicals (weed infestation)	4280.93	5368.4	
4.	Cost of seeds	32767.93	35197.01	
5.	Cost of feed	6097.322	7555.162	
6.	Fuel charges	103.4273	118.0065	
7.	Electricity charges	511.4245	423.5615	
8.	Labour charges	3908.39	5700.75	
9.	Annual maintenance and repairing cost	356.383	464.1702	
10.	Miscellaneous	107.3682	147.165	
	<b>Total</b>	<b>68034.67</b>	<b>77131.43</b>	
	<b>Total Input (capital cost + variable cost)</b>	<b>76445.06</b>	<b>87111.34</b>	

Table 2: Correlation Matrix for Average Economics (unit 1Ha) comprising two bheri fisheries culture at Topsia canal of East Kolkata during - 2014 (June-Dec)

	Construction	Electric Installation	equipments	Watchman shed	Miscellaneous	Total capital cost	Lease amount	Liming and manure	Chemicals	Cost of seeds	Cost of Feed	Fuel charges	Electricity charges	Labour charges	maintenanc e /repairing cost	Mis ce ll a ne o us	Tot al Variabl e Cost	Tot al Input	Tot al Output	Pr of it	
Construction	1																				
Electric installation	.869	1																			
equipment s	.981	.949	1																		
Miscellaneous	.993	.803	.950	1																	
Watchman shed	.774	.986	.882	.692	1																
Total Capital Cost	.988	.935	.999	.962	.862	1															

Lease amount	.983	.763	.928	.998*	.643	.943	1													
Liming and manure	.553	.893	.705	.448	.956	.674	.389	1												
Chemicals	.474	.847	.636	.363	.924	.603	.302	.996	1											
Cost of seeds	-.745	-.319	-.602	-.821	-.155	-.635	-.856	.143	.234	1										
Cost of Feed	.995	.817	.957	1.000*	.708	.968	.996	.469	.385	-.807	1									
Fuel charges	.002	.496	.197	-.119	.635	.155	-.183	.834	.882	.665	-.096	1								
Electricity charges	.937	.987	.987	.888	.946	.980	.856	.809	.751	-.466	.898	.351	1							
Labour charges	-.014	.482	.181	-.135	.622	.139	-.200	.825	.874	.677	-.112	1.000*	.336	1						
maintenance /repairing	.975	.957	1.000*	.942	.894	.998*	.918	.723	.656	-.580	.949	.222	.991	.206	1					
Miscellaneous	.867	1.000**	.948	.801	.986	.933	.760	.894	.849	-.315	.814	.500	.986	.486	.956	1				
Total Variable Cost	.431	.820	.598	.318	.905	.564	.256	.990	.999*	.281	.340	.903	.718	.896	.619	.823	1			
Total Input	.569	.901	.718	.466	.961	.689	.407	1.000*	.994	.124	.486	.823	.820	.814	.736	.903	.987	1		
Total Output	.063	.548	.256	-.059	.681	.215	-.124	.866	.909	.618	-.035	.998*	.407	.997*	.281	.551	.928	.856	1	
Profit	-.132	.375	.063	-.251	.525	.021	-.314	.753	.810	.759	-.229	.991	.222	.993	.089	.379	.838	.740	.981	1

\*\* Correlation is significant at the 0.01 level (2- tailed)

\* Correlation is significant at the 0.05 level (2 tailed)

**Table 3: Correlation Matrix for Average Economics (unit 1Ha) comprising 2 bheri fisheries culture at Topsia canal during -2015 (Jan- July)**

	Construction	Electric installation	equipments	Watchman shed	Miscellaneous	Total Capital Cost	Lease amount	Liming and manure	Chemicals	Cost of seeds	Cost of Feed	Fuel charges	Electricity charges	Labour charges	maintenance /repairing cost	Miscellaneous	Total Variable Cost	Total Input	Total Output	Profit	
Construction	1																				
Electric installation	.920	1																			
equipments	.876	.995	1																		
Miscellaneous	.997	.948	.911	1																	
Watchman shed	.268	.624	.699	.343	1																
Total Capital Cost	.947	.997*	.985	.969	.563	1															
Lease amount	.723	.394	.300	.666	-.472	.463	1														
Liming and manure	.698	.923	.957	.752	.877	.891	.010	1													
Chemicals	.585	.856	.904	.647	.938	.815	-.137	.989	1												
Cost of seeds	-.077	-.320	.413	.002	.940	.248	-.744	.661	.764	1											
Cost of Feed	.490	.109	.009	.420	-.708	.184	.957	-.282	-.420	.907	1										
Fuel charges	.516	.810	.865	.581	.964	.763	-.220	.973	.997	.815	-.494	1									
Electricity charges	.997*	.947	.910	1.000**	.340	.969	.668	.750	.645	.000	.423	.579	1								
Labour	.366	.7	.769	.438	.995	.645	-.922	.9	.9	-.9	-.986	.435	1								

charges		01					.379		69	00	.632									
maintenance/repairing	.621	.879	.922	.681	.921	.840	-.092	.995	.999	.734	-.378	.992	.679	.957	1					
Miscellaneous	.757	.953	.978	.806	.832	.927	.096	.996	.973	.593	-.198	.950	.804	.885	.982	1				
Total Variable Cost	.524	.816	.870	.590	.961	.770	-.209	.976	.997	.809	-.485	1.000**	.587	.984	.993	.953	1			
Total Input	.578	.852	.900	.641	.941	.810	-.146	.988	1.000*	.769	-.428	.997*	.639	.971	.999*	.971	.998*	1		
Total Output	.617	.876	.920	.677	.924	.837	-.098	.994	.999	.738	-.384	.992	.674	.958	1.000**	.981	.994	.999*	1	
Profit	.325	.669	.740	.398	.998*	.611	-.419	.904	.957	.918	-.665	.978	.395	.999*	.943	.864	.976	.959	.945	1

### Author Profile



Dr. Somen Sahu, M.Sc. (Statistics), M.B.A., Ph.D.  
Head & Associate Professor,  
Dept. of Fishery Economics and Statistics.

Faculty of Fishery Sciences, West Bengal University of Animal  
and Fishery Sciences,  
5, Buderhat Road, Panchasayar, Kol

**Dr. Somen Sahu** completed B.Sc. Honours in Statistics from Ramkrishna Mission Residential College, Narendrapur (Calcutta University) in 1991, Post-graduated in Statistics from Burdwan University in 1993, M.B.A. from National Institute of Personnel Management in 1995 with Gold Medal. He completed his Ph.D. from Jadavpur University in 2006. He was a National Scholar. He published number of articles in National & International Journals, and edited and contributed to several significant publications. His areas of interest are Bio-Statistics, Statistical Software Handling, Biomonitoring, Management Information System and Extension Education in different Agricultural fields. He introduced a new Model viz. Dr. Sahu's Networking Model which was adopted by Department of Fisheries, Government of West Bengal. He is the founder Secretary of International Organisation of Biological Data Handlers. He has life membership with various scientific & professional societies & organizations. He is currently working as an Associate Professor and Head in the Department of Fishery Economics and Statistics, Faculty of Fishery Sciences, West Bengal University of Animal and Fishery Sciences, Kolkata for last 15 years.