

**STATISTICAL ANALYSIS AND A COMPARATIVE STUDY OF TRIBAL FISHERFOLK'S LIVELIHOOD STATUS AFTER IMPLEMENTATION OF TRIBAL SUB PLAN (TSP) IN DIFFERENT BLOCKS OF PURULIA DISTRICT**Abhishek Majhi¹, Dr. Subhasis Bhattacharya²

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Abstract: Fish and fisheries is an important sector in most of the developing and developed countries of the world from the stand point of income and employment generation. The role of fisheries in Indian economy is gaining momentum as a result of introduction of advanced techniques to increase the yield per unit area of water and due to its role in earning foreign exchange. The study was conducted to investigate the socio-economic condition, livelihood status and comparative study of the fishermen around the two blocks of purulia district from February 2017 to July 2017. Fifty fishermen were randomly selected from the areas who were solely involved in fishing in the rivers. Several PRA tools were used to collect the data from the fishing communities such as, personal interview, crosscheck interview with extension agents, older persons, and transect walk and case study. A Comparison in the livelihood status specially in the economic upliftment was carried out in the tribals of Purulia district. The growth patterns and the relationship among the different input variable was under study in both cases that is before adoption of Tribal Sub Plan and after enjoying Tribal Sub Plan to judge whether there is any significant different between the two. For the socio economic upliftment of tribal people, Tribal Sub Plan (TSP) was formulated and adopted in different districts. From the research work carried in the district of Purulia it clearly shows a positive impact upon the culture and subsequently to the farmers. To be more specific the following schemes are mainly emphasized viz, economic upliftment of tribal people through operation of integrated pisciculture development, socio-economic upliftment of tribal people through operation of pisciculture development scheme in tribal areas by providing dwelling house to the tribal people etc. are in operation.

Key Words: Statistical modeling, Tribal Sub Plan, Tribal Fisher folk, correlation, Economic Upliftment.

I. INTRODUCTION

Total fish production in the world which was around 20 million tonnes in the 40's increased to over 110 million tonnes in 1990 (FAO 2004. The State of World Fisheries and Aquaculture). In this, the increase in marine fish catch is higher than that of inland source. After the seventies, there has been a diminishing increase in marine fish catch. In the seventies and early eighties, the rate of increase was less than one per cent a year. The main reason for decline in the annual rate of increase has been the limited size of stocks of fish species. Some of these species are already overexploited while others are nearing the limits of capacity. Meanwhile the vulnerability of the production system and the necessity to diversify the existing production process beyond the conventional methods incorporated. Further, most of the potential expansion in marine fish catch would come from increased fishing, requiring a huge capital investment in fishing boats and gear which might entail in declining returns per unit of effort for all fishermen (FAO, Committee on Fisheries). The developed countries account of about 60 per cent of fish catch with a per capita fish consumption of over 30 kgs per annum (Handbook of Fisheries Statistics 1991, Ministry of Agriculture, Govt. of India, New Delhi, 1991). Whereas, in some developing countries the per capita consumption could be less than 5 kgs. with the establishment of exclusive economic zones within 200 nautical miles of the shorelines.

Fisheries management has to be improved by developing and adhering to the eco-system conservation principle called unit management wherein all associated species, relevant habitats and spread outs and necessitated areas are jointly managed. Regulation of catch, entry of vessels, developing endogenous technology for management and provision of marketing and other infrastructures to both capture and artisanal fishermen would improve sustainability and pollution control of the coastal areas. Losses in catch, storage and transport have to be minimised. Improving aquaculture technology would sustain fisheries so as to supplement agriculture and biodiversity.

Unlike agricultural production which can be greatly expanded by the use of suitable technology, productivity of marine organism is limited by the chemical and physical properties of ocean water (Swaminathan, 1985). The realisation of limited fish stock has necessitated ocean enclosure movement called exclusive economic zone of the coastal countries. The open

access characteristics in addition to the limited quantity of resources that can be effectively exploited give rise for a better management. The objectives of such management are to maximise the social and economic benefits of fisheries to concerned marine population and their habitats and to improve international relations thereby (Varma, 1992). Effective management depends on the availability of relevant data which seem to be lacking in many countries. In the case of freshwater aquaculture resources in India it comprises of small and large seasonal and perennial ponds and tanks, beals, jheels, lakes, canals, reservoirs, rivers, swamps, paddy fields and a few brackish water bheris, which have been recently added in the freshwater community. In the past water resources in the rural areas had harboured abundant wild fish. These wild fish were used to meet the requirement of the people and due to this people showed little interest in fish culture. Even then fish farming had been a traditional practice dating back to several centuries, when the country was ruled by Hindu kings. The rulers used to excavate ponds and tanks for drinking, bathing and sometimes for small scale irrigation purposes. These ponds and tanks were used for fish keeping aimed for recreation and games rather than for commercial purposes. Tanks were also found in the temple boundaries and fish from natural resources were caught and reared in those temple tanks. People coming to the temple used to feed the fish and fish were caught and auctioned periodically after 4-5 years. The money earned was used for the welfare of the temple owners. History narrates that fish culture in India was on a limited scale since 300 B.C. Attempt on scientific fish culture was first made in Madras somewhere in 1911 and culture on scientific lines was practised in Bengal during the same period. In the 20th century fish culture practices were extended to other parts of the country through establishment of Fisheries Departments in the states. It was then established that the success in aquaculture can be achieved by good breed, quality seed and nutritive feed as green revolution in agriculture was achieved by quality seed, suitable fertilizer and proper irrigation. Fisheries represent a vital sector in the thrust Programme of West Bengal Government for rural development through production of fish and other ancillary activities thereby generating rural employment and improvement of socio economic status of the fishers who are the prime contributors of fisheries production.

II. MATERIALS AND METHOD

The present study is based on an intensive fieldwork conducted in Arsha & Bagmundi blocks of Purulia district, West Bengal during the months of February 2017 to July 2017. Before the commencement of fieldwork, a pilot study was conducted during the month of January 2014. Based on that pilot study, Arsha & Bagmundi blocks of Purulia district were selected for final study. Purposive sampling method was used while selecting the study area.

Purulia came into force as a district of West Bengal in 1956. Purulia is the western-most district of West Bengal with an all-India significance because of its tropical location, its shape as well as function like a funnel. It funnels not only the tropical monsoon current from the Bay to the subtropical parts of north-west India, but also acts as a gateway between the developed industrial belts of West Bengal and the hinterlands in Orissa, Jharkhand, Madhya Pradesh and Uttar Pradesh. This district is between 22°42'35" and 23°42'0" north latitude and 85°49'25" and 86°54'37" east longitude. Midnapore, Bankura and Burdwan district of West Bengal and Dhanbad, Bokaro, Hazaribagh, Ranchi, West Singhbhum, East Singhbhum district of Jharkhand State bound this district. The total geographical area of the district is 6259 sq. kms. Out of which the Urban and Rural areas are 79.37 sq. kms (1.27%) (Municipalities & Non-Municipalities) and 6179.63 sq. kms (98.73 %) respectively. Physiographically, Purulia, the westernmost district of West Bengal, is well known as a drought prone district and falls within the semi-arid region of the state. Cultivation of this district is predominantly mono-cropped. Out of total geographical land 52.47 % are used for agriculture. 29.69 % are under forest coverage (including social forestry) and 10.15 % are identified as Wasteland. Soil erosion is the most prominent phenomenon of the district resulting huge deposition of fertile soil in the valley region. Vast areas of land remained uncultivable wasteland. Out of the total agricultural holding about 73 % belongs to small and marginal farmers having scattered and fragmented smallholding. About 90 % of the population lives in villages and about 44 % of the rural population is below poverty line. As per 2001 census total population of the district is 2535516, out of which 89.93 % are residing in rural areas and 10.07% are in urban areas. About 51.18 % of the populations are males and 48.82% are female. The percentage of Scheduled Caste and Scheduled Tribes are 18.29% and 18.27%. Total no of BPL families in rural areas of this district are 197381 (43.65 %). Out of which SC families are 40645 (20.59 %) and ST families are 47666 (24.15 %). Total no. of BPL families in Purulia and Jhalda Municipality are 2573 (11.31 %) and 571(15.98 %) respectively (District Statistical Handbook, 2013. Bureau of Applied Economics & Statistics, Purulia, Govt. of West Bengal)

The three main advantages of sampling are that the cost is lower, data collection is faster, and since the data set is smaller it is possible to ensure homogeneity and to improve the accuracy and quality of the data. Sampling is concerned with the selection of a subset of individuals from within a population to estimate characteristics of the whole population which is homogeneous in nature. Sampling is the process of selecting units like people, organizations from a population of interest so that by studying the sample we may fairly generalize our results back to the population from which they were chosen. Using random sampling method around 50 tribal fisher folk were selected for final study.

III. RESULT AND DISCUSSION:

3.1 Concise Analytical Discussion for Average Economics (unit 1,333.33m²) in connection with Total Output for tribal Fish Farming considering all the involved parameters over Arsha Dev. Block under Culture of Tribal Sub Plan.

From (Table 1) it depicted the bivariate inter-correlation among all the variables (average value calculated for 1 bigha area, in all the cases) viz. pond preparation, transport, raw cow dung, netting during culture, labour charge, harvesting cost, total input and total output under consideration.

Firstly, considering the correlation between pond preparation with other variables, there exist a significant moderate positive correlation with netting during culture, low positive correlation with transport and total output, low negative correlation with total output, moderate negative correlation with labour charge.

Secondly, considering the correlation between transport with other variables, there exist a significant high positive correlation with raw cow dung, moderate positive correlation with total input and total output, low positive correlation with Medicine/Prophylactics, labour charge and harvesting cost, moderate negative correlation with netting during culture.

Thirdly, considering the correlation between raw cow dung with other variables, there exist a significant moderate positive correlation with harvesting cost, total input and total output, low positive correlation with medicine/prophylactics and labour charge, moderate negative correlation with netting during culture.

Fourthly, considering the correlation between netting during culture with other variables, there exist a significant low positive correlation with medicine/ prophylactics, moderate negative correlation with harvesting cost, total input and total output, high negative correlation with labour charge.

Fifthly, considering the correlation between medicine/prophylactics with other variables, there exist a significant moderate positive correlation with total input, low positive correlation with labour charge, harvesting cost and total output.

Sixthly, considering the correlation between labour charge with other variables, there exist a significant high positive correlation with total input, moderate positive correlation with harvesting cost, low positive correlation with total output.

Seventhly, considering the correlation between harvesting cost with other variables, there exist a significant high positive correlation with total output, moderate positive correlation with total input.

Finally, considering the correlation between total input with other variables, there exist a significant moderate positive correlation with total output.

From (Table 2), The linear regression equation taking total input as dependent variable and other variables viz. pond preparation, transport, raw cow dung, netting during culture, medicine/prophylactics, labour charge and harvesting cost as independent variables. The equation revealed as below:

$$\text{Total Input} = -10500.000 + \text{pond preparation} + \text{transport} + (-5.857 \times \text{raw cow dung}) + \text{netting during culture} + \text{medicine/prophylactics} + (1.305 \times \text{labour charge}) + \text{harvesting cost}.$$

The equation clearly indicates the most important variable (average value calculated for 1 bigha area, in all the cases) is raw cow dung. It is negative impact upon Total input. All the other independent variables have positive impact upon total input. The 95% Confidence Interval i.e. the lower and the Upper boundaries are depicted as: pond preparation (-1.000, 1.000), transport (-1.000, 1.000), raw cow dung (-5.857, 5.857), netting during culture (-1.000, 1.000), medicine/prophylactics (-1.000, 1.000), labour charge (-1.305, 1.305), harvesting cost (-1.000, 1.000).

From (Table 3), The linear regression equation taking total output as dependent variable and other variables viz. pond preparation, transport, raw cow dung, netting during culture, medicine/prophylactics, labour charge and harvesting cost as independent variables. The equation revealed as below:

$$\text{Total Output} = -2937.723 + (-.014 \times \text{pond preparation}) + (.028 \times \text{transport}) + (15.801 \times \text{raw cow dung}) + (-.422 \times \text{netting during culture}) + (-3.391 \times \text{medicine/prophylactics}) + (-.732 \times \text{labour charge}) + (43.555 \times \text{harvesting cost}).$$

The equation clearly indicates the most important variables (average value calculated for 1 bigha area, in all the cases) are raw cow dung and harvesting cost. Both of them have positive impact upon Total output. All the other independent variables

viz. pond preparation, netting during culture, medicine/prophylactics and labour charge have negative impact upon total output, and transport has positive impact upon total output. The 95% Confidence Interval i.e. the lower and the Upper boundaries are depicted as: pond preparation (-4.894, 4.866), transport (-4.323, 4.379), raw cow dung (-50.512, 82.115), netting during culture (-9.680, 8.836), medicine/prophylactics (-39.557, 32.776), labour charge (-2.582, 3.285), harvesting cost (-5.520, 81.589).

3.2 Concise Analytical Discussion for Average Economics (unit 1,333.33m²) in connection with Total Output for tribal Fish Farming considering all the involved parameters over Bagmundi Dev. Block under Culture of Tribal Sub Plan.

From (Table 4) it depicted the bivariate inter-correlation among all the variables (average value calculated for 1 bigha area, in all the cases) viz. pond preparation, transport, raw cow dung, netting during culture, Medicine/Prophylactics, labour charge, harvesting cost, total input and total output under consideration.

.Firstly, considering the correlation between pond preparation with other variables, there exist a significant moderate positive correlation with transport, Medicine/Prophylactics, total input and total output, low negative correlation with raw cow dung, netting during culture, labour charge, harvesting cost.

Secondly, considering the correlation between transport with other variables, there exist a significant high positive correlation with Medicine/Prophylactics, total input and total output, low positive correlation with labour charge, high negative correlation with raw cow dung, moderate negative correlation with netting during culture, low negative correlation with harvesting cost.

Thirdly, considering the correlation between raw cow dung with other variables, there exist a significant moderate positive correlation with netting during culture, low positive correlation with harvesting cost, high negative correlation with Medicine/Prophylactics, moderate negative correlation with total input and total output, low negative correlation with labour charge.

Fourthly, considering the correlation between netting during culture with other variables, there exist a significant low positive correlation with harvesting cost, high negative correlation with Medicine/Prophylactics and total input, moderate negative correlation with labour charge and total output.

Fifthly, considering the correlation between medicine/prophylactics with other variables, there exist a significant high positive correlation with total input and total output, moderate positive correlation with labour charge, low negative correlation with harvesting cost.

Sixthly, considering the correlation between labour charge with other variables, there exist a significant moderate positive correlation with harvesting cost, total input and total output.

Seventhly, considering the correlation between harvesting cost with other variables, there exist a significant low positive correlation with total output and low negative correlation with total input.

Finally, considering the correlation between total input with other variables, there exist a significant high positive correlation with total output

From (Table 5), The linear regression equation taking total input as dependent variable and other variables viz. pond preparation, raw cow dung, netting during culture, medicine/prophylactics, labour charge and harvesting cost as independent variables. The equation revealed as below:

$$\text{Total Input} = 979.730 + (.990 \times \text{pond preparation}) + (1.507 \times \text{raw cow dung}) + (1.203 \times \text{netting during culture}) + (27.182 \times \text{medicine/prophylactics}) + (.883 \times \text{labour charge}) + (-8.291 \times \text{harvesting cost}).$$

The equation clearly indicates the most important variables (average value calculated for 1 bigha area, in all the cases) are medicine/prophylactics and harvesting cost, where medicine/prophylactics is positive impact upon Total input and harvesting cost is negative impact upon Total input. All the other independent variables have positive impact upon total input. The 95% Confidence Interval i.e. the lower and the Upper boundaries are depicted as: pond preparation (-.990, .990), raw cow dung (-1.507, 1.507), netting during culture (-1.203, 1.203), medicine/prophylactics (-27.182, 27.182), labour charge (-.883, .883), harvesting cost (-8.291, 8.291).

From (Table 6), The linear regression equation taking total output as dependent variable and other variables viz. pond preparation, raw cow dung, netting during culture, labour charge and harvesting cost as independent variables. The equation revealed as below:

$$\text{Total Output} = -23438.280 + (-7.063 \times \text{pond preparation}) + (32.486 \times \text{raw cow dung}) + (9.222 \times \text{netting during culture}) + (-.048 \times \text{labour charge}) + (-80.465 \times \text{harvesting cost}).$$

The equation clearly indicates the most important variables (average value calculated for 1 bigha area, in all the cases) are raw cow dung and harvesting cost, where raw cow dung is positive impact upon total output and harvesting cost is negative impact upon total output. All the other independent variables viz. pond preparation and labour charge have negative impact upon total output, and netting during culture has positive impact upon total output. The 95% Confidence Interval i.e. the lower and the Upper boundaries are depicted as: pond preparation (-7.063, 7.063), raw cow dung (-32.486, 32.486), netting during culture (-9.222, 9.222), labour charge (-.048, .048), harvesting cost (-80.465, 80.465).

IV. CONCLUSION

Fishermen contribute a lot in our economy. So improvement of their social life and economic condition is very important in context our national economic development. And for that proper management of capture fisheries should be done properly. Fishermen villages are mostly located in inaccessible areas, where there is little communication and developmental or social impact. There is no denying the fact that fishermen and fishing community as a whole the poorest and most disadvantaged group of Purulia. They have no other income generating activities except fishing, which cannot be carried out throughout the year and in idle periods, they lack alternative employment opportunities. Their socio-economic development is negligible. Hence it is essential to know the livelihood status of fishermen. For the overall planning, and development and implementation in fisheries sector, it is necessary to have the sound knowledge about the livelihood pattern of the related people. Relatively in any practical field, socio-economic condition illustrates the present status, standard of living and economic condition of the people. In fact income earning activities as an outcome of socio-economic pattern which are affected by the community environment, is one of the most obvious issue that had not been conducted in the area. So in this respect, this study is very much important. Therefore proper fishery management policies, effective input supply, technical and social support may improve the livelihood of the fishers which will ultimately increase the overall fisheries productivity of Purulia district as well as West Bengal.

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Table 1: Correlation Matrix for Average Economics (unit 1bigha) comprising all culture under Tribal Sub Plan of Arsha Block in connection with Tribal Fish Farming.

	Pond Preparation	Transport (Seed,Feed,Manure etc.)	Raw Cow Dung	Netting during culture	Medicine /Prophylactics	Labour Charge	Harvesting cost	Total Input	Total Output
Pond Preparation	1								
Transport (Seed,Feed,Manure etc.)	.239	1							
Raw Cow Dung	.000	.910(**)	1						
Netting during culture	.530	-.491	-.640(*)	1					
Medicine/Prophylactics	.000	.138	.258	.092	1				
Labour Charge	-.733(*)	.130	.375	-.861(**)	.181	1			
Harvesting cost	.000	.375	.500	-.557	.323	.515	1		
Total input	-.318	.508	.649(*)	-.776(**)	.463	.835(**)	.679(*)	1	
Total output	.291	.657(*)	.686(*)	-.458	.162	.203	.870(**)	.487	1

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

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

Table 2: Coefficients Matrix for Average Economics (unit 1bigha) comprising all culture under Tribal Sub Plan of Arsha Block in connection with Tribal Fish Farming.

	Unstandardized Coefficients	95% Confidence Interval for B	
		Lower Bound	Upper Bound
(Constant)	4342.857	-4342.857	4342.857
Pond Preparation	1.000	-1.000	1.000
Transport (Seed,Feed,Manure etc.)	1.000	-1.000	1.000
Raw Cow Dung	-5.857	-5.857	5.857
Netting during culture	1.000	-1.000	1.000
Medicine/Prophylactics	1.000	-1.000	1.000
Labour Charge	1.305	-1.305	1.305
Harvesting cost	1.000	-1.000	1.000

Dependent Variable: Total Input

Table 3: Coefficients Matrix for Average Economics (unit 1bigha) comprising all culture under Tribal Sub Plan of Arsha Block in connection with Tribal Fish Farming.

	Unstandardized Coefficients	95% Confidence Interval for B	
		Lower Bound	Upper Bound
(Constant)	-2937.723	-67219.396	61343.950
Pond Preparation	-.014	-4.894	4.866
Transport (Seed,Feed,Manure etc.)	.028	-4.323	4.379
Raw Cow Dung	15.801	-50.512	82.115
Netting during culture	-.422	-9.680	8.836
Medicine/Prophylactics	-3.391	-39.557	32.776
Labour Charge	-.732	-4.542	3.078
Harvesting cost	43.555	-5.520	81.589

Dependent Variable: Total Output

Table 4: Correlation Matrix for Average Economics (unit 1bigha) comprising all culture under Tribal Sub Plan of Bagmundi Block in connection with Tribal Fish Farming.

	Pond Preparation	Transport (Seed,Feed, Manure etc.)	Raw Cow Dung	Netting during culture	Medicine /Prophylactics	Labour Charge	Harvesting cost	Total Input	Total Output
Pond Preparation	1								
Transport (Seed,Feed,Manure etc.)	.720	1							
Raw Cow Dung	-.389	-.801(*)	1						
Netting during culture	-.338	-.778(*)	.531	1					
Medicine/Prophylactics	.644	.982(**)	-.811(*)	-.831(*)	1				
Labour Charge	-.202	.317	-.382	-.733	.471	1			
Harvesting cost	-.306	-.271	.125	.137	-.112	.411	1		
Total input	.668	.953(**)	-.788(*)	-.830(*)	.986(**)	.523	-.031	1	
Total output	.628	.910(**)	-.772(*)	-.700	.947(**)	.446	.098	.952(*)	1

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

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

Table 5: Coefficients Matrix for Average Economics (unit 1bigha) comprising all culture under Tribal Sub Plan of Bagmundi Block in connection with Tribal Fish Farming.

	Unstandardized Coefficients	95% Confidence Interval for B	
		Lower Bound	Upper Bound
(Constant)	979.730	-979.730	979.730
Pond Preparation	.990	-.990	.990
Raw Cow Dung	1.507	-1.507	1.507
Netting during culture	1.203	-1.203	1.203
Medicine/Prophylactics	27.182	-27.182	27.182
Labour Charge	.883	-.883	.883
Harvesting cost	-8.291	-8.291	8.291

Dependent Variable: Total Input

Table 6: Coefficients Matrix for Average Economics (unit 1bigha) comprising all culture under Tribal Sub Plan of Bagmundi Block in connection with Tribal Fish Farming.

	Unstandardized Coefficients	95% Confidence Interval for B	
		Lower Bound	Upper Bound
(Constant)	-23438.280	-23438.280	23438.280
Pond Preparation	-7.063	-7.063	7.063
Raw Cow Dung	32.486	-32.486	32.486
Netting during culture	9.222	-9.222	9.222
Labour Charge	-.048	-.048	.048
Harvesting cost	-80.465	-80.465	80.465

Dependent Variable: Total Output