International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2013): 6.14 | Impact Factor (2014): 5.611

Econometrics of Traditional Pisciculture among the Tribal Fisherfolk at Arsha Development Block of Purulia District During 2014

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Abstract: ***Agriculture and pisciculture are main two pillars of the local economy of Purulia district and people mainly derive their livelihood by exploiting the fishery resources in the water bodies thereof. A bio-economic analysis of the culture indicates the problems and pattern hidden within. A comparative methodology indicates the point of distinction. After the study,the following lacuna are identified, viz. small and medium water-bodies get dried up due to prevalent draught situations and early withdrawal of rainy seasons make the prospect of fisheries bleak. In general tribal peoples are mostly under BPL level. For this, technological and financial help and proper training and monitoring are being required to change the livelihood condition. Government's efforts in implementing a proper planning and management oriented marketing strategies are required for the sustainable development of the culture towards the upliftment of their employment generation***.

Keywords: Traditional Pisciculture, Tribal Fisherfolk, Training, Sustainable development, Employment generation

1. Introduction

In rural development which aims at developing the rural areas at par with urban regions common property management assumes greater significance owing to its specific endowment of the natural resources. For the process of development of the tribal people, it require management of land base, forest, fisheries, water resources, etc. where open access is there inefficient utilisation has resulted in faster depletion of these resources, less sustainment and as a result, environment degradation. It is evident that even if a ten percent higher efficient utilization is effected by and through avoidance of wastages, a substantial proportion of these resources can be sustainably conserved. Too much crowding for resource exploitation and lack of competitive prices have resulted in an uneconomical infrastructure, superfluous competitions misidentification of priorities lack of appropriate technologization, underplay of local interest and several other problems. Proper management of the commons imply more opportunities for the poor and better distribution of power. This is also essential to really decentralise the overall decision making process and avoid over concentration of various interests. The government by its different departments try to develop the situation. In this context income generation through fisheries plays a crucial role. The traditional fish farming is still being adopted by most of the farmers in the country. Though many advances have been made in aquaculture, an investment based fish farming industry could not be developed. It is obvious that we need to evolve a satisfactory, feasible, viable, adoptable and successful technology which can ensure a sustained high fish production in the ponds. The important facets of successful fish culture include selection of site, proper designing and construction of ponds, selection of fish species, judicious stocking of fish, seed management and maintenance of water quality, nutritive food and feeding etc. Efficient fish farm management entails special preparation of ponds to receive fish seed to new environment. For the proper, designing of fish pond/farm one should have information regarding species, stage, population and life cycles of fish for which pond is to be made. Depending upon this the depth, volume, size etc. have to be decided. For operational convenience grow-our ponds, meant for raising table size fish should be rectangular, preferably having length: breadth as 3:1, if possible. Small ponds are preferable as they facilitate effective control of environment. Drying up of such water bodies in summer months help mineralization, removal of excess organic matter and automatic destruction of predators, minnows etc., that usually abound in perennial ponds. Keeping these in view a calendar of operation is proposed (subject to change in different agro climatic zones of India).There are mainly five approaches which have been employed so far in the welfare of tribals in India. The approaches are Viz: i) Political approach, ii) Administrative approach, iii) Religious approach with special reference to missionary approach, iv) Voluntary agencies approach, v) Anthropological approach. [1].

2. Materials and Methods

The present study is based on an intensive fieldwork conducted in Arsha block of Purulia district, West Bengal during the months of February 2014 to July 2014. Before the commencement of fieldwork, a pilot study was conducted during the month of January 2014. Based on that pilot study, Arsha block 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 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 $22^0$42'35" and $23^0$42'0" north latitude and $85^0$49'25" and $86^0$54'37" east longitude. Midnapore, Bankura and Burdwan district of West Bengal and Dhanbad, Bokaro, Hazaribagh, Ranchi, West Singbhum, East Singbhum 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 [2]. Using random sampling method around 10 tribal fisher folks were selected for final study.

3. Results and Discussion

3.1 General Discussion

In the recent days fishery has played a crucial role for the development of tribal community in different parts of West Bengal, where the country share a major policy. A Comparison in the livelihood status specially in the economic upliftment was carried out in the tribals of Purulia district. The western districts Purulia with red laterite soil and primarily being rain fed have fallen behind the rate of growth in terms of productivity in this field. But this district has large number of water bodies mainly in the form of reservoirs and pond and there is immense scope of integration of fish culture with other husbandry practices. As total no of BPL families in rural areas of Purulia are 197381 (43.65 %) of which SC families are 40645 (20.59 %) and ST families are 47666 (24.15 %), there is immense scope of employment generation and economic upgradation through scientific fish farming. The growth patterns and the relationship among the different input variable was under study.

3.2 Social Parameters

Considering the age parameter, the maximum percentage of tribal fish farmers were within medium age group (i.e. between the age group 25 to 45 years). The involvement of the age group of 25-35 years is mainly due to unemployment. Regarding Education it may be noted that, historically, Purulia is one of the moderately literate districts in West Bengal. Among all scheduled tribes, 43.4 % of the population has been returned as literate, which is lower than the national average 47.1 %.

3.3 Different Economical Parameters

In the case of **Stocking,** availability of required quantity of fish seed of desired species is one of the most important pre-requisite for successful fish farming. The overall price value (Traditional culture) of stocking in Arsha Dev. Block shows the maximum value of Rs. 1600 and a minimum value of Rs. 1500 having an average value of Rs. 1550. Similarly, in the case of descriptive statistics of said block, the value of mean and standard deviation are Rs 1550 and 52.70 respectively. Considering the case of ***Transportation***, it clearly shows the overall price value (Traditional culture) of transportation in Arsha Dev. Block. It shows the maximum value of Rs. 4500 and a minimum value of Rs. 1750 having an average value of Rs. 3100. Similarly, in the case of descriptive statistics of said block, the value of mean and standard deviation are 3100 and 1028.75 respectively. For ***pond preparation*** the Pond should have perennial fresh water source and water level in the pond is to be maintained up to depth of 2m. The water level should not be allowed to go down below 1m. It could be a new pond or existing pond which could be de silted and deepened. In the case of traditional fish culture, they do not use pond preparation process. In the case of ***Raw Cow Dung*** from (Table 1 and 2), it clearly shows the overall price value (Traditional culture) of raw cow dung in Arsha Dev. Block. It shows the maximum value of Rs. 625 and a minimum value of Rs. 250 having an average value of Rs. 252.50. Similarly, in the case of descriptive statistics of said block, the value of mean and standard deviation are 252.50 and 202.28 respectively. Considering ***Liming*** from (Table 1 and 2), it clearly shows the overall price value (Traditional culture) of liming in Arsha Dev. Block. It shows the maximum value of Rs. 400 and a minimum value of Rs. 90 having an average value of Rs. 204. Similarly, in the case of descriptive statistics of said block, the value of mean and standard deviation are 204 and 130.99 respectively. In the case of **feeding** from (Table 1 and 2), it clearly shows the overall price value (Traditional culture) of feeding in Arsha Dev. Block. It shows the maximum value of Rs. 5250 and a minimum value of Rs. 1400 having an average value of Rs. 2275. Similarly, in the case of descriptive statistics of said block, the value of mean and standard deviation are 2275 and 1708.68 respectively. In ***Netting,*** periodical netting is required for the optimum growth of the fish. But, due to scarcity of labour and high cost of labour charge maximum farmers are avoid this method. **Medicines** used in fish farming are supplementary or complete but it requires a current knowledge about the dose of application or optimum dose. In most of the cases, the farmers do not have any effective knowledge and thus solely depend upon the advice of technicians of the medicine company. They were used to add medicine to the culture practice motivated by other farmers in the locality.In the case of traditional fish culture, they do not use any medicine/prophylactics during culture period. From (Table 1 and 2), it clearly shows the overall price value (Traditional culture) of **labour charge** in Arsha Dev. Block. It shows the maximum value of Rs. 4500 and a minimum value of Rs. 1875 having an average value of Rs. 2250. Similarly, in the case of descriptive statistics of said block, the value of mean and standard deviation are 2550 and

798.43 respectively. From (Table 1 and 2), it clearly shows the overall price value (Traditional culture) of **Harvesting cost** in Arsha Dev. Block. It shows the maximum value of Rs. 337.5 and a minimum value of Rs. 270 having an average value of Rs. 289.75. Similarly, in the case of descriptive statistics of said block, the value of mean and standard deviation are 285.75 and 20.26 respectively.

3.4 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 Traditional fish Culture.

From (Table 3) it depicted the bivariate inter-correlation among all the variables (average value calculated for 1,333.33m2 area, in all the cases) viz. stocking, transport, raw cow dung, liming, feeding, labour charge, harvesting cost, total input and total output under consideration.

Firstly, considering the correlation between Stocking with other variables, there exist a significant high positive correlation with Transport (Seed, Feed, Manure etc.), low positive correlation with Labour charge and Harvesting cost, high negative correlation with Feeding, moderate negative correlation with Raw cow dung, low negative correlation with Liming, total output and Total output. Secondly, considering the correlation between Transport (Seed, Feed, Manure etc.) with other variables, there exist a significant low positive correlation with Labour charge, high negative correlation with Feeding, moderate negative correlation with Raw cow dung and Total input, low negative correlation with liming, Harvesting cost and Total output. Thirdly, considering the correlation between raw cow dung with other variables, there exist a significant high positive correlation with liming, moderate positive correlation with feeding, harvesting cost, total input and total output, low positive correlation with labour charge. Fourthly, considering the correlation between liming with other variables, there exist a significant low positive correlation with feeding, total input and total output, low negative correlation with labour charge and harvesting cost. Fifthly, considering the correlation between feeding with other variables, there exist a significant moderate positive correlation with total input and total output, low positive correlation with labour charge and harvesting cost. Sixthly, considering the correlation between labour charge with other variables, there exist a significant high positive correlation with harvesting cost, total input and total output. Seventhly, considering the correlation between harvesting cost with other variables, there exist a significant high positive correlation with total input and total output. Finally, considering the correlation between total inputs with other variables, there exists a significant high positive correlation with total output.

The linear regression equation taking total input as dependent variable and other variables viz. Stocking, transport, raw cow dung, liming, feeding and harvesting cost as independent variables. The equation revealed as below:
Total Input = -10500.000 +(2.250 x Stocking) + Transport (Seed, Feed, Manure etc.) + Raw Cow Dung + Liming + Feeding + (39.889 x Harvesting cost).

The equation clearly indicates that the most important variables (average value calculated for 1 bigha area, in all the cases) are stocking and harvesting cost. Both of them have positive impact upon total input. The linear regression equation taking total Output as dependent variable and other variables viz. stocking, transport, raw cow dung, liming, labour charge, total input as independent variables. The equation revealed as below:

Total Output = -7350.465 + (11.266 x Stocking) + (-.434 x Transport, Seed,Feed,Manure etc.) + (-.374 x Raw Cow Dung) + (1.206 x Liming) + (.351 x Labour Charge) + (.599 x Total Input)

The equation clearly indicates the most important variables (average value calculated for 1 bigha area, in all the cases) are stocking and liming. Both of them have positive impact upon Total output.

4. Conclusion

The district is bestowed with large number of water bodies which are utilized for Pisciculture activities. Some of the water bodies have been restored and renovated to make them useful for irrigation purposes also. This water bodies can be more effectively utilized for pisciculture activities which can really supplement the income of the rural poor to a considerable level.The following lacuna are identified, viz. small and medium water-bodies get dried up due to prevalent draught situations and early withdrawal of rainy seasons make the prospect of fisheries bleak; Excessive usage of surface water for the irrigation purposes by the cultivators at the upper reaches, resulting in inadequate water for the tail reach of the cannel system, which works as a potential hindrances for the fisheries; Due to deficiency of water volumes in the water bodies' fisheries has become largely a seasonal activity and thus renders the fishermen jobless for a larger part of the year.

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References

[1] Final Report, July 2009, Impact Assessment of Agriculture Interventions in Tribal Areas in Madhya Pradesh.
[2] District Statistical Handbook, 2013. Bureau of Applied Economics & Statistics, Purulia, Govt. of West Bengal.

Appendix

Table 1: Average Economics of all Tribal Fish Farming (Traditional Culture) at Arsha Dev. Block, Purulia: Schedule Depicted on Average Farm Size of 1 Bigha (1,333.33 m^2)

Farmer's No	Stocking	Transport (Seed,Feed,Manure etc.)	Raw Cow Dung	Liming	Feeding	Labour Charge	Harvesting cost	Total Input	Total Output
1	1500	2500	250	250	3500	1875	270	10145	15475
2	1600	3500	00	90	1400	2700	288	9578	15850
3	1600	4500	400	400	00	2700	288	9888	15850
4	1500	2250	300	250	3500	1875	270	9945	15275
5	1600	3500	00	00	1400	2700	288	9488	15850
6	1500	2500	350	250	2800	1875	270	9545	14900
7	1500	1750	625	250	5250	4500	337.5	14212.5	18950
8	1500	2000	300	250	3500	1875	270	9695	15475
9	1600	4500	300	300	00	2700	288	9688	15850
10	1600	4000	00	00	1400	2700	288	9988	15850

Table 2: Descriptive Statistics for Average Economics (unit 1,333.33 m2) comprising all traditional culture of Arsha Block in connection with Tribal Fish Farming

	Mean	Std. Deviation	N
Stocking	1550.00	52.70	10
Transport (Seed,Feed,Manure etc.)	3100.00	1028.75	10
Raw Cow Dung	252.50	202.28	10
Liming	204.00	130.99	10
Feeding	2275.00	1708.68	10
Labour Charge	2550.00	798.43	10
Harvesting cost	285.75	20.26	10
Total Input	10217.25	1419.99	10
Total Output	15932.50	1108.37	10

Table 3: Correlation Matrix for Average Economics (unit 1,333.33 m^2) comprising all traditional culture of Arsha Block in connection with Tribal Fish Farming

	Stocking	Transport (Seed,Feed, Manure etc.)	Raw Cow Dung	Liming	Feeding	Labour Charge	Harvesting cost	Total Input	Total Output
Stocking	1								
Transport (Seed,Feed,Manure etc.)	.922(**)	1							
Raw Cow Dung	-.586	-.432	1						
Liming	-.370	-.090	.802(**)	1					
Feeding	-.885(**)	-.968(**)	.480	.061	1				
Labour Charge	.198	.023	.354	-.073	.154	1			
Harvesting cost	.117	-.054	.407	-.043	.230	.997(**)	1		
Total Input	-.365	-.464	.664(*)	.159	.633(*)	.829(**)	.871(**)	1	
Total Output	-.078	-.243	.505	.029	.417	.952(**)	.971(**)	.946(**)	1

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Author Profile

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.