Impact of Education on Fish Farming in West Bengal: A Study Report

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Abstract

The present study bears the relevance of water resource management and effective utilization of the scarce water resources in the field of pisciculture in a sustainable manner. The demand for fresh water rises many-fold due to rise in population, irrigation, urbanization, for drinking and domestic use, municipal water supply, unlimited withdrawal of ground water, less water recharge, fall in rainfall due to global warming and pollution, misuse in nuclear reactor etc. As a result the crisis of water becomes acute not only in India but also in the World. So the efficient utilization of this scarce resource through pisciculture in a sustainable manner gained priority. Multipurpose use of this scarce resource is essential to save the human society and protect the environment. Though India was blessed with vast inland natural water resources but Indian Economy faces the problem of proper utilization of these huge water resources spread over its vast stretches of land. A proper policy for utilization of these resources would become a governing direction of economic growth. The role of fisheries in the country's economic development is very important. It generates employment, reduces poverty, generates income, increases food supply and maintains ecological balance between flora and fauna. The small-scale fish farming requires less capital and more labour that is not so skilled. The woman workers may easily be engaged in fish farming and generate income. Effective basic education of the fishermen is needed to adopt the modern scientific methods of pisciculture to raise fish production.

Keywords**:** Composite Fish Culture, Education, Growth, High Yielding Variety, Project, Productivity, Small-scale

1. Introduction

According to 2011 Census, India's population increases 181 million people from 1.03 billion in 2001 to 1.21 billion in 2011(Visaria L. 2011). The decadal growth rate of population is 17.6% compared to 21.2% during 1991-2001 suggesting a slowdown of growth. The sex ratio of population has began to improve from 927 in 1991to 933 in 2001to 940 in 2011. The overall literacy rate is in 2001 is 745 with 82.1% male and 65.55 female literacy rate. The child sex ratio has fallen from 945 in 2001 to 927 in 2001 to 914in 2011. At the end of October 2011, the world population crossed over 700 crores, China 135 crores and India 124 crores. Though India possesses only 2.4% of world geographical area it covers 17.71 % of total world population. It is expected that India will become the most populous country in the world by 2030 overtaking China creating a food scarcity and a huge amount of unemployment in a massive scale. India's population size is expected to stabilize at 1.8 billion at 2041.The state Uttar Pradesh is the most populous state in India with 199.6 million people covering 16.5% of country's population. About 68% of total population spends their livelihood from agriculture and the per capita income is very low. Fisheries can play an important role in this aspect. Realizing its importance during the 5th - five year plan the Government of India introduced beneficiary-oriented programme in the form of a pilot project entitled 'Fish Farmers Development Agency' (FFDA) to provide self employment, financial, technical and extension support to fish farming in rural areas. In 1974-75 this Programme was further extended under World Bank-assisted, Inland fisheries project to cover about 200 districts of various states in India. The nutritional requirement is particularly crucial in a developing country such as India where malnutrition and starvation are the major problems faced by millions of rural dwellers. The low protein intake is an indication of shortage of high quality protein food in the diet of Indians.

1.1 *Importance of the study*

Social scientists have always identified the rural areas for investigation. In the case of India to a large number of studies have been carried out in rural situations including panchayats and co-operative societies. Though many research works have been done in the biological and marine sciences, the economic investigations of pisciculture have not yet been done so far. In this respect the present study has a clear economic importance for the upliftment of the rural economy at the grass root level. Scientists have shown that 3 bighas forest areas are equivalent to 1 bigha plank origin in water bodies which create more O_2. Thus pisciculture has a positive effect on ecology and hence to maintain ecological balance a meaningful use of unused water resources has an important role. Despite the increase in the major sources of animal protein such as livestock and poultry industries, the problem of protein deficiency still continues unabated. The protein deficiency in diet is equally associated with the inability of fish farming industry to supply the required quantity of fish. The situation causes poor health, low efficiency, low productivity and poor standard of living and decline in the contribution of fishery industry's contribution to the Gross Domestic Product (GDP). The small-scale fish farming requires less capital and more labour who are not so skilled. The woman workers may easily be engaged in fish farming.

1.2. *Literature Review*

The state of West Bengal plays an important role for the implementation of the programme. Though the two districts Burdwan and Birbhum of W.B. are primarily agricultural districts, there is huge scope for pisciculture. A few studies have been undertaken by several experts, notably, D. Prasad (1968), R. Charan (1981), A.V. Natarajan (1985), K. M. B. Rahim (1992,93), A Chakravorty (1996), I Guha and R. Neogy (1996), P.K. Ghosh (1998) and others on the economic evaluation of pisciculture. Though these are useful guides to researchers, yet there is ample scope for further works relating to pisciculture in the rural areas of W.B. Besides, there is the necessity of developing studies concerning the impact of these programmes on the rural economy. The present study is a modest attempt in remedying this inadequacy.

1.3 *Objectives*

This pilot study was conducted on the following objectives: 1)To categorize the fish farmers on the basis of fish production. ii)To estimate the level of education of the fish farmers.iii) Giving assistance to farmers both in cash and kind in obtaining lease of public sector water bodies for undertaking pisciculture. iv) For proper utilization of unused water resources. v) To find out the relation between level of education of fish farmers and fish production through pisciculture. vi)To rise in food supply and reduce mal-nutrition. vii) Identification of fish farmers suitable and willing to develop fish farming in ponds. Viii) To estimate the nature of assistance both by the Government and private. ix) To evaluate fishing and marketing scheme in the locality. x) To estimate the nature of assistance both by the Government and private. xi) To generate employment in rural India. xii) To maintain ecological balance in a sustainable manner.

2. Methodology of the study

2.1 *Selection of study area*

The present study was confined to survey (Mishra S. 1987) the rural areas of Burdwan and Birbhum districts of W. B. in respect of implementation of the programme of Fish Farmers Development Agency (FFDA). In the selection of districts following considerations weighed most: i) Both the districts are covered with water areas constituting half of the total inland water resources. ii) There is a heavy concentration of tanks and ponds in both the districts. iii) Both the districts are considered as having one homogeneous agro-climatic zone in view of the broad similarities of soils, climate and other features. Since they are also neighbouring districts a suitable comparison can easily be made. iv) In both the districts, the FFDA programmes are being implemented in full fledged form by the Government authority. v) Data from both the districts can be obtained because of my personal knowledge about the two districts.

2.2 *Selection of sample*

Keeping in view the time factor, limited fund and limited ability it was not possible to collect data from all the recorded fish farmers of the two districts. At first 5 blocks from each district have been purposefully selected. Then 10 recorded fish farmers from each block have been selected purposefully. Thus 50 fish farmers from each district have been selected for interview. For comparative analysis of data each farmer was taken as the unit. For this study data have been collected on different aspects of the programme such as farmers' income, water area, finance, total production, product price, cost of production, profit, duration of training period etc. The data have been collected by personal interview method through a questionnaire. Thus the collected data are entirely primary in nature.

2.3 *Location map of the study area*

The state of West Bengal lies between latitude $21^{0}38^{/}$ to $27^{0}10^{/}$ North and longitude $85^{0}38^{/}$ to $89^{0}50^{/}$ East. The district Burdwan lies between $22^{0}56^{/}$ and $25^{0}53^{/}$ North latitude and $86^{0}48^{/}$ and $88^{0}25^{/}$ East longitude. The district Birbhum lies between $23^{0}32^{/}30^{//}$ and $24^{0}35^{/}00^{//}$ North Latitudes and $88^{0}01^{/}40^{//}$ and $87^{0}05^{/}25^{//}$ East Longitudes. The location map is shown in figure-1.

3 Fisheries in India

Indian fisheries can broadly be divided into two categories: i) Inland fisheries & ii) Marine fisheries. Further Inland fisheries can be classified into two types: i) Capture & ii) Culture. Capture fisheries consist of rivers, lakes canals etc. where farmers do not cultivate fishes. Natural breeding process is the common phenomenon there. On the other hand, culture fisheries consist of ponds, tanks, swamps, marshes etc. In this case, farmers have to sow fish seeds, nurse it and send it to proper size before harvesting. India is the third largest producer of fish in the world and the second in inland fish production. Indian fishing resources comprising of 2 million sq.km.of EEZ for deep sea fishing, 7,520 km. of coast line, 29,000 km.of Rivers, 1.7 million Ha. of reservoirs, 1 million Ha. of brackish water and .8 million Ha. of ponds, lakes and tanks for inland and marine fish production (Giriappa S. (ed) 1994) . About 14 million fishermen draw their livelihood from fishery. During the period 1981 to 2002 the contribution of fishery to GDP has increased from Rs.1230 crores to Rs.32060 crores. The fish production increased from 0.7 million tons in1951 to 6.8 million tons in 2006.

3.1 *Fisheries in West Bengal*

West Bengal has a vast water resource potentiality. By utilizing these water resources there is a huge prospect of pisciculture. These resources can be divided into two categories: i) Inland water resources and ii) Marine water resources. Inland resources constitute ponds, rivers, marshy lands, canals, reservoirs etc. It should be noted that tanks/ponds occupy the major share i.e. 46.70% of total inland water resources of the state. But out of 2,76,202 Ha. area under ponds and tanks only 2, 20,000 Ha. i.e. 79.65% are presently used for pisciculture which means 20.35% remains unused. Moreover, out of 5, 91,476.71 Ha. total inland water resource only 2.87000 Ha. Water area (Jhingran V.G. 1991) is brought under pisciculture i.e. 48.56% are presently used and 51.44% remains unused. These unused water resources can be brought under pisciculture through proper utilization.

In West Bengal marine fishery has a substantial share (Mamoria C.B. 1979) amounting to a coast line of 158 km. inshore area up to 10 fathoms depth is 770 sq. km., offshore area (10-40) fathoms depth is 1813 sq. km. and a continental shelf up to 100 Fathom is 17049 sq. km. Out of 19 districts of West Bengal only two districts East- Midnapur and South 24-Parganas are coastal. West Bengal is on the top of the list in fish production in the country. With the passage of time, more and more people are getting themselves involved in fishery. As fish constitutes the staple food of the people efforts are being made to augment fish production.

From the period 1986 to 2000, the total fish production increased from 424000 tons to 1045,000 tons (i.e. 2.46 times). At the same period the inland fish production increased 2.25 times and marine fish production increased 4.50 times. In the year 1986, the share of inland and marine fisheries to total fish production were 91% and 9% respectively. But in the year 2000, the share of inland and marine fisheries to total fish production are 83% and 17% respectively. Thus we see that during the period 1986 to 2000, the share of inland fish to total production declined (from 91% in 1986 to 83% in 2000) and the share of marine fisheries increased (from 9% in 1986 to 17% in 2000).

Not only in fish production but also in the demand for fish West Bengal is the highest in the country. The domestic demand for fish in West Bengal is high because almost all the people of West Bengal are fish-eating. But the state has a higher demand for fish than its production of fish i.e. this state has a deficit in fish supply. To meet this gap the state West Bengal has to import fish from other states like Andhra Pradesh, Tamil Nadu etc. At the same time various efforts have been made to augment fish production to bridge this gap.

3.2 *Fisheries in Burdwan district*

The district of Burdwan is mainly an agricultural district though it is also well advanced in industrial production. It is called the 'granary' of West Bengal. The district is filled with well fertile productive land. Not only that, the district is also well endowed with a large number of water bodies in the form of rivers, ditches, canals, marshy lands, ponds, tanks etc. The principal rivers are Ajoy, Damodar and Kunur etc. There is a good prospect of pisciculture by utilizing these water resources. The of total water resources in Burdwan district is 66480.82 Ha. Though the district has huge water resources, during the period 1982-1998 only 50% of this water area was brought under scientific pisciculture. In the year 1999, the district's total fish production was 55,500 metric tons while demand in that year was 65,000 metric tons. Thus there was a deficit of 9,500 metric tons. To meet this demand the district had to import fish from neighbouring states. The district will be self-sufficient in fish production if the unused 50% water resources are brought under pisciculture.

3.4 *Fisheries in Birbhum district*

The district of Birbhum is a part of Rarh area. The district is well-drained by a number of rivers and rivulets. The principal rivers of this district are: Ajoy, Brahmani, Dwarka, Kopai, Mayurakshi etc. But most of the rivers remain dried up during a greater part of the year. Due to this adverse natural factor pisciculture has not made any significant progress in this district. Agriculture is the main occupation of the common people of this district. The main water areas for pisciculture of this district are rivers, tanks, ponds, khals, Bills, baors, reservoirs etc. The total water resources in Birbhum district is 45215.81 Ha. Though this district has a large number of water resources but during the period 1980-1999, only 46% of this water area was brought under pisciculture through FFDA. So there is a huge prospect of pisciculture by utilizing these unused water resources. In the year 1999 total number of fish farmers in this district was 2, 00747 out of which 56.5% were males and 43.5% were females. The total number of fisherman family in this district was 4,975. The average fish production of this district was 21,000 metric tons and the annual demand was 24,000 metric tons. Thus the district had a deficit (3000 mt) in fish production. To meet its own demand the district has also to import fish from the neighbouring states.

4. Classifications of fish farmers according to their level of education

Here the fish farmers are classified according to their level of education to judge the percentage of illiterate and literate farmers of the two districts. Illiterate means no education at all and Neo-literate means the person having no school education but can read and write by the help of adult literacy programme. The table-1 shows the distribution of farmers according to their level of education. The sample fish farmers have been classified into four groups according to their level of education to estimate the impact of education on fish farming. The groups are: i) Illiterate and Neo-literate, ii) Education up to Primary level (i.e. up to class IV), iii) Education up to H.S. level (i.e. up to class XII) and iv) Higher education level (i.e. Graduation and above).

5. Findings

To estimate the impact of education on fish farming χ^2 (Gujarati D.N. 2009) test was used. The test statistic

$$\chi^2 = \Sigma \frac{(f_0 - f_e)^2}{f_e}$$

where f_o = actual frequency in contingency-table, f_e = expected frequency in contingency-table with (r-1) × (c-1) d. f., r = the no. of rows in the contingency-table, c = the no. of columns the contingency-table.To use this formula we first calculate the average productivity (i.e. yield per bigha) of each fish farmer of the two districts. Then estimate the mean productivity (M) and standard deviation (σ) of the 50 fish farmers taken together of the two districts separately. On this basis of the rate of production of fish, the farmers were categorized into three groups. In case of categorization $M \pm \sigma$ ranges were used. As a result High Productive (H.P.), Average Productive (A.P.) and Low Productive (L.P.) groups were obtained. Now we compare the distribution of fish farmers of the two districts to perform our objective.

The table value of χ^2 for 2 d. f. at .05 level = 5.901 and at .01 level = 9.201Thus the obtained value of χ^2 (i.e. 8.58> 5.901) is significant at .05 level. The result indicates that the difference of distribution of fish farmers of Burdwan and Birbhum districts on the basis of the rate of production is significant. This means that the nature of distribution on the basis of fish production of the fish farmers in two districts is not uniform.

5.1 *Illiterate and neo-literate Group*

From the table-3 it is interesting to note that the rate of fish production of illiterate fish farmers in both the districts do not cross the above and below the average production lines. All 10 fish farmers belong to the average production group.

5.2 *Education up to Primary level*

The result reveals that χ^2 (=5.11) is not significant at .05 level meaning there by two groups do not differ significantly on the basis of their rate of fish production. It is also seen from the table that in Birbhum district no one of fish farmer belong to highly productive group.

5.3 *Education up to Higher Secondary level*

The value of χ^2 (=6.37) is significant at .05 level. In the present study 50 samples from each district were selected and their educational information's were also collected. It has been found from the results that approximately 70% farmers belong to secondary education group. The table indicates that the χ^2 value is significant at .05 level meaning thereby two groups of secondary educated fish farmers differ significantly on the basis of their rate of production. The table also indicates that the average production of the farmers of Burdwan district is significantly higher than that of the farmers of Birbhum district.

5.4 Higher education level

The similar conclusion can be drawn from the above table as in the case of illiterate and neoliterate group of fish farmers. All 7 fish farmers belong to the average production group. The table also indicates that the χ^2 value is not significant at .05 levels. It is interesting to note that none of the highly educated fish farmers of any of the district belong to highly productive group. It may also be concluded from the above table that highly educated fish farmers are less attentive in fish farming. They do feel some short of frustration or hesitation about the work like fish farming or they consider fish farming as a low graded profession in conformity with their education status.

6. Limitations of the study

The following are the limitations of the study: a) Regarding the change in the level of income before and after the assistance of FFDA, the statements of the fish farmers have been taken into consideration on good faith. b) Due to limited time, ability and resource constraints, data have been collected from a small number of fish farmers of the two districts and results are assumed to be the representative for the district as a whole. c) Due to difficulties in getting responses from the sample fish farmers sometimes we had to rely on the different FEOs' opinions and also on different official records on good faith. d) The observations made on the basis of collected data are obviously particularistic in nature in so far as these data relate to micro-study like the present one (i.e. only 100 fish farmers from the two districts were taken into consideration). Micro-studies do not attempt to build general theories but the utility of this type of study is that large number micro-studies may, in course of time, be helpful in constructing meaningful generalizations. Moreover, it is an explorative study which seeks to explore the conditions of fish farmers before and after the assistance of FFDA programme. A much larger study may be undertaken to vindicate the results obtained from this explorative study.

7. Suggestions

The following suggestions are made for the development of the programme: i**)** In pisciculture, fishermen are not only directly employed in fishing but also some other alternative occupations like net making, marketing of fish seed and fishery product, transport, boat making etc. many rural people earn income. Since fish is a perishable commodity proper marketing channels should be established. Hence to reduce pressure from agriculture pisciculture may be alternative occupations for generating income and employment for a large number of poor people. ii**)** In Burdwan district there are some open caste pits (OCP) in Ranigang coal belt and in Birbhum district also such pits are available at Khoirasole block, calamines at Md.Bazar block. Fish production may increase by utilizing these water resources for pisciculture purposes. iii**)** The urban waste (i.e. garbage) may be recycled as fish feed (to those ponds and water areas lying near the towns) to raise fish production and to prevent the environmental pollution in those areas. iv) Pisciculture should be made on Composite Fish Culture System. The general survibility rate of fish farming is 80%. Stocking of various species should be in a certain proportion such that various types of fishes live in various layers and eat the entire food organism which is called Composite Fish Culture. In this situation the ponds eco-system should be maintained. To use the scientific methods of pisciculture some training should be required in the grassroots level. Some Research and Training Institutes must be established. i) To make financial support for the poor fishermen bank should grant loan on a long-term basis and at a low rate of interest in proper amount and in proper time. ii**)** The selection of actual beneficiary is very much essential and it should be made on the basis of need and neutrally not in politically. iii**)** Since fish is a perishable commodity storage facilities should be provided such that the fishermen are not forced to sell their product at a lower price. iv) Prices of organic manures and fish seeds should be kept as low as possible or the Government should give more subsidies in the case of chemical fertilizers so that the poor fish farmers can buy them. **v)** For welfare measures of the rural poor fishermen some Group and Personal Insurance Schemes, Old- Age Pension Schemes should be taken and the Fishery Dept. should issue "Identity Card" to each fisherman. vi**)** Since both the districts are agricultural based we should interlink agriculture with pisciculture in the following manner. Along with pisciculture in ponds other allied culture can be inter-linked in composite farming. The concept of composite farming e.g. in the pond- there are pisciculture and on one side of the pond mulberry trees can be cultivated for the development of sericulture industry-from there silk industry can be grown. Thus the final products (i.e. silk yarn and silk cloth) come to the market and their waste materials are drained off to the pond and used as fish feed. In the same pattern on another side of the pond animal husbandry can be practiced (e.g. poultry, duccary and piggery). Their waste can be used as a valuable manure for fish feed and the residual can be utilized for agricultural production. The excreta of the animal husbandry can also be used in the bio-gas plant for fuel and light. The products of animal husbandry e.g. milk, meat and egg come to the market directly. On another side of the pond some fruit plants such as papine, guava, mango etc. can be cultivated by using the excess manure of animal husbandry and the products can be sold in the market.

7. Conclusion:

The study shows that high education is not required to raise fish production. But minimum basic education is required to acquire him to adopt the scientific modern techniques of fish production. The study indicates that the introduction of the programme of FFDA had a clear positive impact on the rural economy through employment and income generation and also through raising the standard of living and socio-economic performance of the rural community of the two districts. It is environmentally viable, sustainable and eco-friendly in nature. So for sustainable use of the scarce water resources it is very essential in the present context. Unemployment is a curse for the society today and pressure of population on agricultural sector is rising day by day. Thus fish farming may be an alternative occupation for those unemployed people and undoubtedly generate income in a viable method. To use the scientific methods of pisciculture some training should be required in the grassroots level. Some Research and Training Institutes must be established. So it is recommended that the present programme should be further spread in the rural areas by means of proper planning, adequate supervision, effective implementation and better monitoring and for effective use of the scarce water resources.

Acknowledgement: In preparation of this paper I deeply acknowledge my respected sir Prof. Jaydeb Sarkhel, Department of Commerce, Burdwan University, West Bengal, India, e-mail: jaydebsarkhel@gmail.com

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Tables and Figures

LOCATION MAP OF STUDY AREA

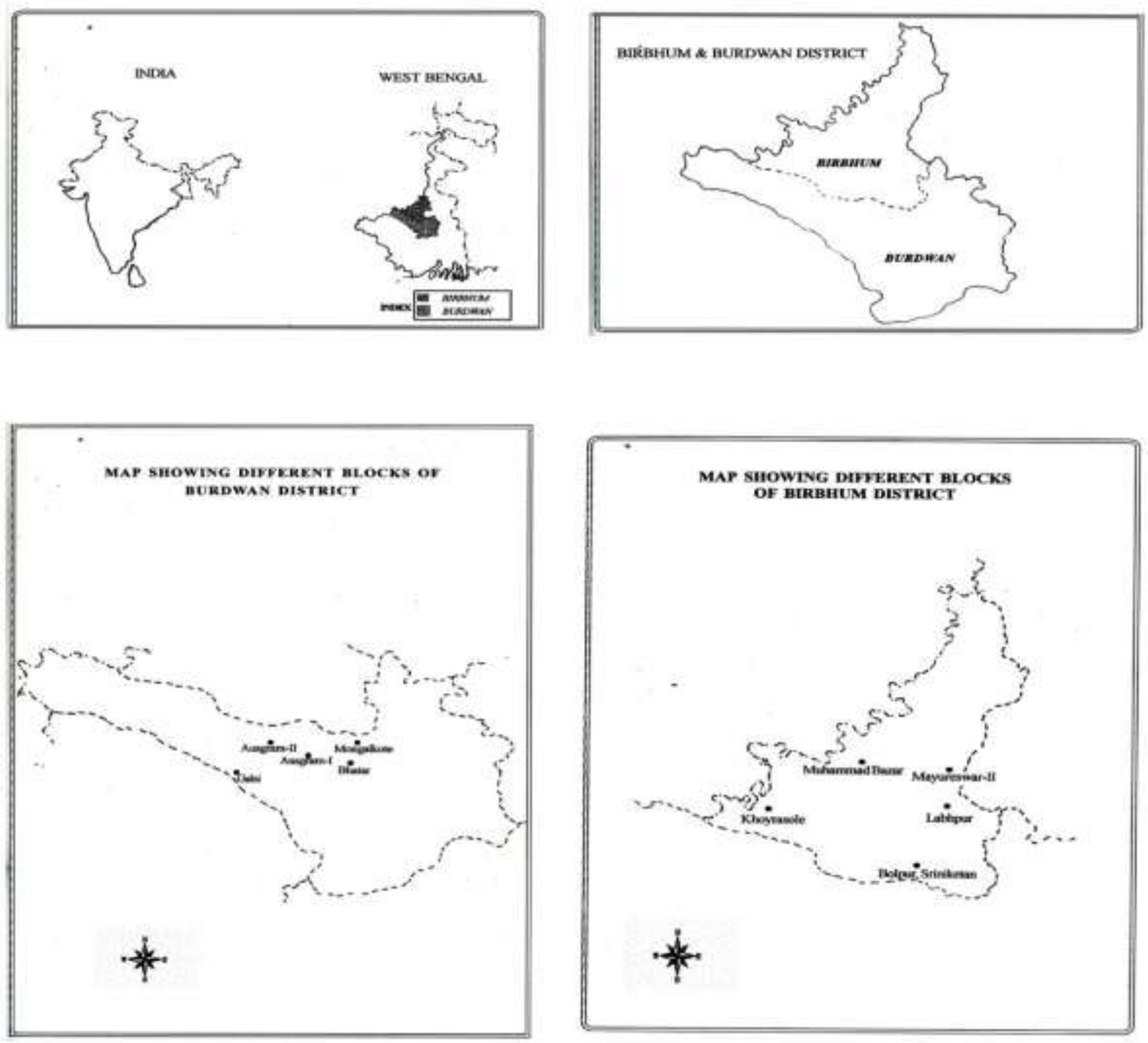

Figure-1

Table-1 Classification of Sample Fish Farmers According to their Level of Education.

N0. of farmers				
Sl.No.	Levels of Education	Burdwan District	Birbhum District	Total
1.	Illiterate	2	4	6
2.	Neo-literate	3	1	4
3.	Up to class IV	6	8	14
4.	Up to class VIII	14	22	36
5.	Up to class XII	21	12	33
6.	Graduate	4	2	6
7.	PostGraduate and above	Nil		1
Total		50	50	100

Table-2 the distribution of fish farmers of the two districts on the basis of their rate of fish production (when education status was not considered).

District	H.P.	A.P	L.P.	Total
Burdwan	8	35	7	50
Birbhum	1	46	3	50
Total	9	81	10	100

The table-3 shows the distribution of illiterate and neo-literate fish farmers of the two districts on the basis of their rate of production.

District	H.P.	A.P.	L.P.	Total
Burdwan	0	5	0	5
Birbhum	0	5	0	5
Total	0	10	0	10

The table-4 shows the distribution of primary educated fish farmers of the two districts on the basis of their rate of production.

District	H.P.	A.P.	L.P.	Total
Burdwan	2	3	1	6
Birbhum	0	8	0	8
Total	2	11	1	14

The table-5 shows the distribution of secondary educated fish farmers of the two districts on the basis of their rate of production.

District	H.P.	A.P.	L.P.	Total
Burdwan	6	23	6	35
Birbhum	1	30	3	34
Total	7	53	9	69

The table-6 shows the distribution of highly educated fish farmers of the two districts on the basis of their rate of production.

District	H.P.	A.P.	L.P.	Total
Burdwan	0	4	0	4
Birbhum	0	3	0	3
Total	0	7	0	7

Source: All tables' data are computed from Field Survey.