

Performance evaluation of Primary Fishermen's Cooperative Societies in North 24 Parganas district of West Bengal

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Abstract

Benefits from Primary Fishermen's Cooperative Societies (PFCSs) have not been sustained as was expected in terms of amelioration of socio-economic condition of fishermen members and contribution to fish production basket. The present study evaluated the performances of PFCSs in the district of North 24 Parganas with special emphasis on fish production. The study will help in arriving at policy decisions with respect to standardization of performance audit. It will aid in designing approaches to fill the gaps in cultural practices adopted by PFCSs and formulate best suited need based functional technologies for them. Overall performances of 39 functioning PFCSs were evaluated based on collected information through specially designed questionnaire. General functioning of PFCS was operationalized in terms of active members, trained members, members with insurance coverage, old and infirm pensioners, water area, annual turn-over and productivity. Information on culture practices adopted, production and productivity data of water bodies managed by PFCSs were also studied. Sewage fed societies fared much better than freshwater PFCSs with respect to general functioning as well as productivity studies. Except sewage fed societies, rest of PFCSs failed to achieve the minimum target of fish production. Adoption of culture-based fishery through composite fish farming and multiple harvesting, and multiple stocking by the PFCSs can result in the augmentation of fish production to considerable levels. Parameters considered in the present study should be addressed while monitoring the functional inadequacies of PFCSs and establishing dogma for time bound performance audit. This shall also aid in carrying SWOT analysis of PFCSs.

Key words: Fish production of PFCS, Performance of fishery cooperatives, PFCS

Highlights

- Ranking of PFCSs based on parameters that define their functioning and overall performance and its use in SWOT analysis of fishery cooperatives.
- Sewage fed PFCSs in the district fared better in terms of general performance as well as productivity-based performance than their counterparts.
- Higher fish productivity from the sewage fed PFCSs was attributed to the fact that fish farming in sewage system involves little investment with higher yield.
- Water bodies under PFCSs in North 24 Pgs. are diverse in nature and are considered as common pool resources, making it difficult to adopt all the recommended culture practices; nevertheless, even a medium input or fertilizer and feed-based system, if adopted, can result in higher yields.

INTRODUCTION

Fishery cooperatives are considered instrumental in increasing fish production, employment generation and amelioration of the socio-economic condition of fishermen. The fishery cooperative movement made impressive progress, especially since the first Five Year

Plan in 1950-1951 (Rao, 1973). However, benefits from fishery cooperative societies to its members have not been sustained as was expected.

Fishery cooperatives are important tools for providing economic assistance to the fishermen, who are at greater disposal for exploitation by

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the merchants and middlemen, than those following agriculture pursuits (Shetty and Sreedhara, 2011). Positive and stable growth in the Fishermen's Cooperative Societies of India over a period of 7 years (2007-2014) was reported with a variable but growing membership, clearly indicating that the fisher community is interested in forming and sustaining such cooperative societies (Chandrashekar, 2014). Unfortunately, considering the overall performance of the fishermen's cooperatives, the results have not been very encouraging (Prakash, 2000).

Earlier (Sapovadia, 2004), it was noted that it is the cooperative folds that can enable fishermen to improve and acquire technical knowledge, and marketing and management skills. Continued growth in the fishery cooperative sector, which is so vital to the economy and well-being of poor people, is feasible with appropriate coordination amongst the Central and State governments (Chandrashekar, 2014). Brummett and Williams (2000) emphasized the need for mutual cooperation and linkage between all the stakeholders to develop an integrated system for sustainable fisheries management. Tyagi *et al.* (2013) corroborated the need to work in close liaison of the state fisheries departments with the members of the cooperative societies for a better perception of the functioning of the PFCSSs. This necessitates extensive studies on the functioning of the fishermen's cooperatives. Mahanayak *et al.* (2017) emphasized on the need for making the fishermen's cooperatives dynamic through training on the latest culture technologies, avoiding political intervention in management and easy access to credit facilities. Major impediments in attaining the desired outcome from fishery cooperatives can be attributed to poor management, inadequate skill enhancement mechanisms, discouraging production trends, insufficient infrastructure facilities, problematic finance management and poor linkages amongst concerned organizations (Planning Commission, 2002).

There has been a significant increase in the number of fishery cooperatives in West Bengal

over the years. Currently, 1215 fishery cooperatives with a water area of 27153.62 ha and 131578 fisher members are operating in the state. Unfortunately, the overall status of the societies is sombre, as only 38% and 13% have been reported to be functional and semi-functional, respectively, whereas the remaining 49% fall under non-functional, not-interested and not-traceable categories (Directorate of Fisheries, 2017). Around 6.31% of the total impounded water resources in West Bengal is under the cultural possession of PFCSSs, but their contribution to the fish production basket accounted for a meager 3.30% of the total inland fish production of 15.57 LT (lakh tonnes) in 2017-18 (Department of Fisheries, 2019). Augmentation of fish production in big water bodies of 5 acres and above, the majority of which are under the possession of PFCSSs, can contribute towards bridging the deficit gap in fish production and demand. The total fish production of North 24 Parganas district was 206983 metric tonnes (MT) in 2017-18, ranking third amongst all the districts in West Bengal (Department of Fisheries, 2019), corroborating the significance of fishery enterprises in the region.

In absence of any standardized methodology for analysing the performance of PFCSS, the present study was envisaged to evaluate the overall functioning of the cooperatives in the district of North 24 Parganas, in respect of specific parameters, with special emphasis on their contribution to fish production basket. The study will help in arriving at policy decisions pertaining to standardization of parameters for conducting performance audit and will help the PFCSSs in recognizing their strengths and weaknesses. Further, it will aid in designing approaches to fill the gaps in cultural practices adopted by PFCSSs and formulate best suited need based functional technologies for them.

MATERIALS AND METHODS

Study area and data collection: The present study was conducted in North 24 Parganas district of West Bengal, India for three years during April 2017 to March 2020. The study area is located in the tropical zone from 22°

112 63 - 23° 152 23 N and longitude 88° 20' - 89° 5' E.

Pre-tested structured interview schedules in local language, developed and designed especially for this purpose, were used for conducting the formal and non-formal surveys to collect primary data through the office bearers of the societies. Single questionnaire was assigned to each PFCS, and collective response through mutual consensus was reflected against each questionnaire.

Variables and their measurement: List of all the registered PFCSs in North 24 Parganas was collected from the office of the Assistant Director of Fisheries, North 24 Parganas, Govt. of West Bengal. For the present investigation, only functional PFCSs were taken into consideration. Out of the total 40 functional PFCSs, data were collected from 39, as the only ornamental-fisheries society in the district was not brought under the ambit of the present study.

General performance of PFCSs: The overall performances of the functioning PFCSs (N=39) were evaluated based on the collected information. General functioning of PFCS was operationalized in terms of active members, trained members, members with insurance coverage, old and infirm fishermen pensioners, water area, annual turn-over (average of 3 years from 2017-18 to 2019-20) and productivity of water body (based on average fish production of three years, i.e., from 2017-18 to 2019-20).

For evaluating the performance of PFCS methodology adopted by Nair *et al.*, 2010 was followed with necessary modifications. Every PFCS was graded against each parameter on a scale ranging from 0 to 1. The best PFCS for a particular parameter got a grade of 1.0, and the worst got 0.0, while the rest of PFCSs got a grade between the two limits. Now, based on the total score, the PFCSs have ranked accordingly.

Culture practices adopted: Suitable questionnaire schedules were designed to gather necessary information on the culture practices adopted, production and productivity data of water bodies managed by PFCSs (N=39). Aspects pertaining to the management protocols comprising of pre-stocking management, stock management and post-stocking management adopted in fish culture were covered. Methodology adopted by Biswas *et al.* (2018) was adopted with necessary modifications. Alterations adopted, if any, in the different stages of management practice in fish farming, from the advocated package of practices by the Fisheries Department, Govt. of West Bengal (SFTC, 2011), were noted. The data were compared using suitable statistical tools like mean and percentage.

RESULTS

North 24 Parganas accounts for 6.09% of the total registered fishermen cooperatives in West Bengal. In terms of percentage of functional PFCSs, North 24 Parganas is better placed in comparison to West Bengal state average (Table 1).

Table 1. Overall status of PFCSs in North 24 Parganas vis-a-vis West Bengal

	Total no. of Co-ops	Functional	% of functional PFCS	Semi functional	Non- functional	Not interested	Not traceable
West Bengal	1215	469	38.60	159	393	10	184
North 24 Parganas	74	39	52.70	12	15	0	6
% North 24 Parganas w.r.t. West Bengal	6.09	8.31	---	7.54	3.81	0	3.26

Table 2. General performance-based ranking and Productivity-based ranking of Functional PFCs in North 24 Parganas

Name of PFCs	GENERAL PERFORMANCE RANKING							PRODUCTIVITY RANKING				
	Active members to total numbers	Trained members	Members with insurance coverage	Number of old & infirm pensioner	Ratio of water area to member	Average annual turnover	Average productivity	Total score	Ranking	Effective water area (ha)	Average productivity (Kg/ha/yr)	Ranking
Bonhooghly	0.85	0.85	0.74	0.40	0.35	0.48	1.00	4.68	1	10.75	6026.33	1
Bara Chhayanavi	1.00	1.00	0.00	0.24	0.70	0.91	0.78	4.63	2	26.40	4709.89	4
4 No Bhery	1.00	0.14	1.00	0.09	0.38	0.53	0.86	4.00	3	54.00	5208.41	2
Chaker Bhery	1.00	0.05	0.00	0.00	0.75	1.00	0.83	3.63	4	31.20	4976.44	3
Tentulia Bilbally	1.00	0.17	0.00	0.66	0.82	0.65	0.11	3.41	5	19.00	680.48	21
Sundarban	0.40	1.00	0.00	0.54	0.60	0.27	0.36	3.17	6	10.15	2142.56	7
Akaipur Darbashini	1.00	0.31	0.00	0.67	0.49	0.13	0.27	2.88	7	22.60	1624.35	10
Kujarbagi Adibasi	1.00	0.60	0.00	0.54	0.56	0.08	0.09	2.87	8	16.00	531.25	30
Meherani	1.00	0.51	0.00	1.00	0.18	0.03	0.10	2.81	9	5.00	586.00	25
Dey Para	1.00	0.73	0.00	0.59	0.20	0.05	0.15	2.72	10	6.15	916.67	17
2/2 No Patrabad	1.00	0.21	0.00	0.00	0.63	0.20	0.61	2.64	11	6.75	3663.63	5
Pirojpur Petrapole	1.00	0.39	0.00	0.58	0.51	0.07	0.09	2.64	11	30.00	527.33	31
Biipur	0.60	0.00	0.00	0.86	0.96	0.13	0.06	2.61	12	31.00	348.39	37
Kola	1.00	0.24	0.16	0.56	0.16	0.07	0.29	2.46	13	11.20	1744.64	9
Sashadanga	1.00	0.40	0.00	0.31	0.42	0.08	0.23	2.45	14	42.05	1392.56	13
Media Govt. Colony Udvastu	0.88	0.07	0.00	0.17	1.00	0.04	0.16	2.34	15	53.30	975.61	14
1 No. Patrabad	1.00	0.17	0.00	0.18	0.48	0.14	0.35	2.32	16	32.91	2130.81	8
Panchita	0.81	0.25	0.00	0.23	0.89	0.07	0.06	2.32	16	120.00	371.25	36
Sindrani	1.00	0.00	0.00	0.43	0.29	0.13	0.27	2.11	17	44.00	1603.23	11
Hariharpur Chandpara	1.00	0.35	0.00	0.45	0.03	0.02	0.16	2.01	18	1.00	951.00	15
Padmabeel	1.00	0.00	0.00	0.41	0.44	0.06	0.08	1.99	19	40.50	505.78	35
Chamardaha	1.00	0.07	0.00	0.29	0.38	0.09	0.15	1.98	20	32.00	931.25	16

Cont. Table 2.

Table 2., Cont. ...

Name of PFCS	GENERAL PERFORMANCE RANKING							PRODUCTIVITY RANKING				
	Active members to total numbers	Trained members	Members with insurance coverage	Number of old & infirm pensioner	Ratio of water area to member	Average annual turnover	Average productivity	Total score	Ranking	Effective water area (ha)	Average productivity (Kg/ha/yr)	Ranking
Mostafapur	1.00	0.03	0.00	0.44	0.33	0.05	0.10	1.96	21	16.00	615.63	22
Malidaha Noapara												
Beledanga	0.85	0.02	0.00	0.25	0.55	0.14	0.12	1.93	22	55.00	719.54	20
Barrackpur												
Panchpota	1.00	0.00	0.00	0.20	0.49	0.07	0.09	1.86	23	23.00	566.96	26
Angrail	0.66	0.30	0.00	0.30	0.35	0.07	0.14	1.82	24	36.00	833.33	18
Kanchrapara	0.67	0.10	0.18	0.33	0.32	0.06	0.13	1.79	25	92.00	812.12	19
Refugee												
Goberia	1.00	0.18	0.00	0.40	0.05	0.05	0.10	1.78	26	4.05	589.96	24
Lake Town	0.83	0.33	0.00	0.00	0.24	0.08	0.24	1.73	27	4.05	1444.20	12
Thakurdari	1.00	0.00	0.00	0.27	0.04	0.02	0.39	1.72	28	4.72	2351.69	6
Neoradighi G.S.	1.00	0.06	0.00	0.00	0.46	0.06	0.09	1.68	29	8.40	555.29	27
Udbastu Colony												
Chamta	1.00	0.12	0.00	0.15	0.32	0.05	0.04	1.68	29	44.58	259.18	39
Chalk Kanthalia	1.00	0.07	0.00	0.00	0.30	0.04	0.09	1.50	30	11.76	552.53	28
Hati Banda	0.83	0.00	0.00	0.35	0.17	0.02	0.09	1.47	31	10.70	514.06	33
Gopalpur	0.98	0.00	0.00	0.11	0.22	0.03	0.10	1.44	32	71.00	591.96	23
Duma	0.80	0.00	0.00	0.04	0.48	0.02	0.04	1.38	33	270.00	265.43	38
Jaleswar Union	0.69	0.00	0.00	0.17	0.24	0.08	0.09	1.27	34	45.00	542.13	29
Ghatpatila	1.00	0.00	0.00	0.00	0.13	0.02	0.09	1.24	35	5.40	514.81	32
Paschim Baranagar	0.34	0.21	0.00	0.00	0.03	0.04	0.08	0.71	36	1.08	510.19	34

The ranking of the PFCSSs based on their general performances, evaluated against a set of parameters is depicted in Table 2.

Active members: It refers to the extent of participation of the members in regular functioning of the PFCSSs. Active members participate in the AGMs on a regular basis and exercise their voting rights during elections to the Board of Directors and express their opinion in the day-to-day business of society. 88.23% of members were found to be active out of the combined total membership of 6218 in the functioning PFCSSs in the district. 100% of the members were observed to be active in 25 PFCSSs, whereas for the rest 14 PFCSSs, the percentage of active members varied between 34% to 98%. Paschim Baranagar accounted for the least percentage of active members (34.48%). Duma had the highest total membership of 998 and 2/2 No. Patrabad had the lowest number of members (19).

Trained members: It was found that only 766 members of PFCSSs in total, had received training pertaining to fish culture, which accounts for only 12.32% of the total membership of 6218. Members of around 10 PFCSSs had not received any substantial training with respect to fish farming. All the members of Bara Chhayanavi (67 nos.) and Sundarban (30 nos.) had received training with respect to pisciculture in some form or the other.

Members with insurance coverage: A total of 403 members were covered under insurance, which accounts for just 6.48% of the total fisherfolk members. 4 No. Bhery was an exceptional, wherein all its members (253) were covered under the insurance scheme. Only three other PFCSSs, viz., Kanchrapara, Bonhooghly and Kola had 17.71%, 74.04% and 15.74% of its members covered under the insurance scheme out of the total membership of 508, 54 and 127, respectively.

Old and infirm pensioners: A total of 278

(4.47%) fishermen members availed the benefits under the old and infirm pension scheme. Kanchrapara had the maximum members (31) covered under the scheme followed by Sindrani (21). In terms of percentage of old and infirm pensioners with respect to total members, Meherani recorded the highest (18.37%), and seven PFCSSs had none of their members covered under the scheme.

Ratio of water area to total member: Out of the total recorded water area of 1799.06 ha under the possession of the PFCSSs, the effective water area was 1348.70 ha (74.96%). Duma accounted for the maximum recorded water area of 287 ha, and Hariharpur had a minimum of 1 ha, showing a highly skewed distribution of water resources amongst the PFCSSs (Table 2). The ratio of water area (in bighas) to total members varied from 0.13 in case of Hariharpur FCS to 4.25 in Media FCS. Taking into consideration all the 39 PFCSSs, the average ratio between the water area (in bighas) to the total members was 1.74.

Annual turnover: The highest average annual turnover was recorded by 4 No. Bhery (Rs. 241.85 lakhs), followed by Chaker Bhery (Rs.131.42 lakhs), Bara Chhayanavi (Rs.109.66 lakhs) and Sindrani (Rs.62.86 lakhs). The lowest was accounted by Hariharpur Chandpara (Rs.1.88 lakhs). Per head annual turnover (Rupees in lakhs/year/member) was seen to be maximum in case of Chaker Bhery (1.80), followed by Bara Chhayanavi (1.64) and Tentulia Bilbally (1.17). Lowest per head annual turnover was recorded by Duma (0.03) (Table 2).

Average productivity: It was revealed from the study that the average production from all the functional PFCSSs in North 24 Parganas was 1.10 tonnes/ha/yr. The four sewage fed societies, viz., Bonhooghly, Bara Chhayanavi, 4 No. Bhery and Chaker Bhery, with an effective water area of 122.35 ha, recorded an average

production of 5.11 tonnes/ha/yr, whereas the average production of the 35 freshwater societies with an effective water area of 1226.35 ha was much lower and accounted to 0.70 tonnes/ha/yr. Combined average productivity of all functional PFCSs (39 nos.), fresh water PFCSs (35 nos.) and sewage fed societies (4 nos.) were 1.40 tonnes/ha/yr, 0.96 tonnes/ha/yr and 5.23 tonnes/ha/yr, respectively.

General performance-based ranking: The four sewage fed societies occupied the top rankings with respect to the general functioning of the societies (Table 2). It is evident from the results that Bonhooghly, a sewage fed society, was ranked first amongst all the 39 functioning PFCSs. Tentulia Bilbally occupied the top position amongst the 35 freshwater societies. Paschim Baranagar was ranked the last considering all the functional PFCSs.

Performance with respect to productivity: As depicted in Table 2, the sewage fed PFCSs performed much better than the freshwater societies in terms of productivity. The fish productivity from the PFCSs in the district varied from 0.25 tonnes/ha/yr in Chamta to a maximum of 6.02 tonnes/ha/yr in the case of Bonhooghly which happens to be a sewage fed society. The highest productivity recorded for the freshwater society was 3.66 tonnes/ha/yr in case of 2/2 no. Patrabad.

The results in Table 4 clearly indicate that except the sewage fed societies, rest of the PFCSs have failed to achieve the minimum target of fish production as fixed by the Fisheries Department, Govt. of West Bengal (Department of Fisheries, 2014).

DISCUSSION

Preliminary data (Table 1) revealed that only 38.60% for West Bengal and 52.70% for North 24 Parganas, respectively are Functional PFCSs, while the rest belong to Semi-Functional, Non-Functional, Not interested and Not traceable categories. It emanated from the present study on the 39 Functional PFCSs in

North 24 Parganas that there is also an urgent need for addressing other categories.

Categorization of fishery cooperatives based on three basic parameters of holding Annual General Meeting (AGM), conducting Audit and carrying out fish farming, is imperative for designing any policy aiming for better performance. Focused attempts are needed to analyze the status of 16.66% of the semi-functional and 20.27% of the non-functional PFCSs in the district and to assess the scope of their revival, followed by formulation of phase-wise comprehensive plan for converting them into functional societies.

Detailed analysis of performance and productivity-based ranking of PFCSs revealed that general performance and productivity ranking might not necessarily be the same. Bonhooghly stands at number 1 on both counts whereas Tentulia Bilbally ranks 5 for general performance and 21 for productivity. Paschim Baranagar, on the other hand, scored 36 and 34 for general performance and productivity ranking, respectively. The difference between the general performance and productivity rankings elicits that performance status is dependent on factors that require diligence of PFCS members, whereas productivity is majorly related to quantum and quality of the water body as well as the management practice adopted.

A properly functioning and performing society can infuse a sense of integration among the members of the fishermen society (Nair *et al.*, 2010). PFCSs by virtue of their organizational structure and mode of functioning, can bring about the positive impact both in terms of socio-economic upliftment of members and augmenting fish production. It is crucial to conduct time bound performance audit of PFCSs based on various diverse factors that guide their internal functioning and in turn their output towards fulfilling the dual objective of amelioration of socio-economic conditions and enhancement of production. Standardization of evaluating the performance of PFCS is much needed for designing and implementation of time bound performance audit.

Table 3. Management practices followed by majority of Freshwater PFCSs vis a vis standard package of practises

Variables	Standard package of practises for composite fish farming as advocated by Fisheries Department, Govt. of WB	Farming practices adopted by PFCSs
Pre stocking		
Excavation of pond	Yes	No
Racking /Ploughing	Yes	No
Use of Mohua oil cake	2500 kg/ha/mt	No
Doses of agricultural lime	200-250 kg/ ha	100-150 kg/ha
Use of cow dung	10000 kg/ha	No
Use of inorganic fertilizers	SSP (40-45 kg/ha), Urea (30-40 kg/ha)	No
Physico-chemical analysis of soil and water	Yes	No
Eradication of aquatic insects	Use of soap-oil emulsion/Netting	No
Eradication of aquatic weeds	Manual	Yes
Eradication of predatory and weed fishes	Repeated netting/Mohua oil cake/sun drying the pond bed	No
Stocking		
Seed quality test	Yes	No
Disinfection of seed before release	Yes	No
Number of species	6	4 to 5
Fish species	Catla, Rohu, Mrigal, Silver carp, Grass carp, Common carp	Catla, Rohu, Mrigal, Grass carp, Common carp
Stocking density (nos./ha)	7500-10000	1000 nos/ha
Stocking ratio	1:3:1.5:2:1:1.5	No specific ratio maintained
Stocking frequency	1	1
Stocking size	25-30 gm	25-30 gm
Post Stocking		
Liming	40 - 75 kg/ha/month	Sporadic use of lime
Cow dung	1000 kg/ha/month	Yes
Use of inorganic fertilizers	SSP (40-45 kg/ha/month), urea (30-40 kg/ha/month)	No
Supplementary feeding	Rice bran + mustard oil cake	No/ Only when Govt. assistance is available
Supplementary feeding rate	3-1.2% of body weight (gradual decrease of feeding percentage with increase in body weight)	No
Feeding frequency	Twice daily	No
Disease management	Preventive care + use of prophylactics	No
Netting	Monthly twice (every 15 days)	Multiple
Harvesting frequency	1	Multiple (driven by market as well as local demand)
Productivity (kg/ha/yr)	4000-5000	967.59

Table 4. Comparative difference between the recorded fish production and minimum target production set by Fisheries Department

Sl. No.	Type of water body	Target minimum production of fish (kg/ha/year)	Recorded fish production of PFCSS		
			Average production (kg/ha/year)	Number of PFCS	Total water area (ha)
1	Beel Fisheries (above 5 ha)	1500	695.21	29 nos.	1206.45
2	Pond/Tank/Bundh Fisheries (>1 ha and up to 5 ha)	2500	1207.37	5 nos.	18.9
3	Sewage Fed Fisheries (5 ha and above)	3000	5113.55	4 nos.	122.35
4	Pond/Tank Fisheries (up to 1 ha)	4000	951.00	1 no.	1

The societies should ensure membership of genuine fishermen by profession, who will actively participate in the activities of the society. Dependency of the members on other non-fishery economic activities outside the society stems from the fact that cooperatives cannot provide them with year-round employment (Panigrahi, 2012). High percentage of active participation of the members in PFCSSs, as revealed from the present study, has not transpired to satisfactory fish production in the majority of the societies.

In order to sustain and compete in business environment, the fishery cooperatives must adopt latest technological advancements in fish farming. Effective roles by training institutes and concerned government agencies are thus required for dissemination of technology through need-specific training programmes (Sapovadia, 2004). Lower percentage of trained members in the present study corroborated the findings that inadequate effective training amongst the fisher members is one of the major hindrances in proper management and operation of fishery cooperatives (Nair *et al.*, 2010).

Apart from providing livelihood, ensuring social security to its members is one of the prime objectives of any cooperative. The meagre numbers under the Old and Infirm Pension Scheme as well as insurance coverage amongst the members of PFCSSs in the district, are

indicative of the need for implementing welfare measures for their social transformation (Nasar *et al.*, 2021). The societies need to take proactive role in bringing its members under the ambit of available governmental insurance schemes, such as Fishermen Group Accident Insurance Scheme, to protect the families of fishermen in case of accidental death or disability.

Minimum of 10 active fishermen with a total area of 10 acres of water bodies, subject to the condition that each member should have at least one bighas of potentially viable water body for the purpose of pisciculture, which is a prerequisite under the existing norms of registration of an Inland Fishermen's Cooperative Society (Directorate of Fisheries, 2017). As evident from the present study majority of functioning PFCSSs in the district fulfil this criterion barring 10 societies. It is imperative that strict adherence to the rules and regulations is made while registering the cooperatives. The effective water area rather than the recorded water area needs to be considered while determining the number of members.

In all likelihood, the annual turnover of PFCSSs is directly dependent on fish production and sales, and in ideal situations, it should reflect in the annual income of the fishermen who are solely dependent on fishery activities of the society (Panigrahi, 2012). The average per head

annual turnover of the PFCSSs in the district was observed to be Rs. 0.28 lakhs/annum, which is significantly low.

The ranking of PFCSSs based on parameters that define its functioning and overall performance will aid in SWOT analysis, i.e., identifying their strengths, weaknesses, opportunities and threats, by which the societies will be able to reorient and better their positions.

The State Government desires to fulfil the demand of fish intake of West Bengal from its own water resources, and for achieving this, a scientific approach towards sustainable fish farming in all the available water bodies is of utmost importance. Special emphasis on enhancement of fish production as well as production of big-sized fishes from the water bodies under the PFCSSs is thus essential. The lower productivity from the societies is indicative of poor management of water resources possessed by these cooperatives.

The higher fish productivity from the sewage fed PFCSSs is obvious as fish farming in sewage system involves little investment with higher yield. Since the requirement of fertilizers and supplementary feed is minimum in such systems, the operational cost is significantly reduced, and at the same time, the growth rate of fish is also faster.

Water bodies under the possession of PFCSSs in the district are all culture based. Lack of proper management (i.e., proper stocking, feeding strategy, cycle planning, record keeping) is one of the key factors hindering production from these potential water resources as highlighted in Table 3.

Stringent management practices, viz., stocking at regular intervals, maintaining appropriate stocking size, frequent liming, strict fishing schedule, fish size regulation at capture and vigilance against poaching need to be adopted by the PFCSSs to achieve higher productivity levels. Since the water bodies under the PFCSSs are diverse in nature and are considered as common pool resources, it is difficult to adopt all the recommended culture practices; nevertheless, even a medium input

or fertilizer and feed-based system, if adopted, can result in higher yields (CIFRI, 2000). Majority of the societies in the district have water areas above 5 ha, and if minimum target fixed by Fisheries Department is achieved, it will yield doubling the fish production (Table 4). It is essential that the nature of the water body is also taken into consideration while assessing the productivity potential of PFCSSs.

Performance of functional PFCSSs in the district has been far from satisfactory in fulfilling their primary objectives of augmentation of fish production and socio-economic uplift of the fishermen community. Necessary steps are therefore needed to revamp the PFCSSs of North 24 Parganas. Standardization of performance audit is essential to monitor the functional inadequacies of the PFCSSs. Also, identifying specific factors that determine the functioning of PFCSSs is a necessity for helping societies to focus on their weaknesses and recognise their strengths. Lower productivity from water bodies under PFCSSs suggest that they have failed to be ideal organizations for promoting fisheries. Adoption of culture-based fishery through composite fish farming and multiple harvesting, and multiple stocking by the PFCSSs can result in the augmentation of fish production to considerable levels.

Future scope of work: Findings of the present study clearly highlighted the areas with future scope of research on developing best-suited area specific package of management practices for sustainable utilization of water resources under PFCSSs and business diversification of PFCSSs aiming for higher profitability and creating year-round employment for fishermen in rural areas.

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MKP: Involved in data curation, supervision and editing.

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REFERENCES

- Biswas B, Das SK, Mondal I and Mandal A, 2018. Composite fish farming in West Bengal, India: redesigning management practices during the course of last five decades. *Int J Aquac*, 8(12): 90-97, doi: 10.5376/ija.2018.08.0012
- Brummett RE and Williams MJ, 2000. The evolution of aquaculture in African rural and economic development. *Ecol Econ*, 33(2): 193-203, doi: 10.1016/S0921-8009(99)00142-1
- Chandrashekar BS, 2014. Fishery co-operative societies in India: problems and prospects. *Global J Res Anal*, 3: 92-94
- CIFRI, 2000. Ecology and Fisheries of Beels in West Bengal. Central Inland Capture Fisheries Research Institute, ICAR, November 2000, Bull No-103, pp 73
- Department of Fisheries, Govt. of West Bengal, 2014. Hand Book on Government Water Bodies. Directorate of Fisheries, Government of West Bengal, pp 134
- Department of Fisheries, Govt. of West Bengal, 2019. Handbook of Fisheries Statistics 2017-2018. Directorate of Fisheries, Government of West Bengal, pp 200
- Directorate of Fisheries, 2017. Directory of PFCS/CFCS in West Bengal 2017. Directorate of Fisheries, Government of West Bengal, pp 284
- Mahanayak BM, Chakraborty S and Panigrahi AK, 2017. Preliminary survey on the Primary Fishermen Co-operative Societies (PFCS) of Murshidabad district of West Bengal. *Indian J Biol*, 4 (2): 142-145, doi: 10.21088/ijb.2394.1391.4217.12
- Nair SR, Pandey SK, Sharma A and Salim SS, 2010. An Evaluation of the Business Performance of Fishery Cooperative Societies in Vasai Taluka of Thane District, Maharashtra. *Indian Cooperative Review*, pp 224-233
- Nasar R, Das SK and Pati MK, 2021. Investigations on the need matrix of Primary Fishermen's Cooperative Societies in the district of North 24 Parganas, West Bengal. *Indian J Anim Health*, 60(1): 31-39, doi: 10.36062/ijah.60.1.2021.31-39
- Panigrahi AK, 2012. An analysis of the non-fisheries activities of the co-operative fishers. *Tamilnadu J Vet Anim Sci*, 8(1): 1-5
- Planning Commission, Government of India, 2002. Report of the Working Group on Fisheries for the Xth Five Year Plan (2002-2007). Planning Commission, Government of India, pp 63-64
- Prakash M, 2000. Role of Fisheries Cooperatives. *Fishcoops*, 14(4): 195-198
- Rao PS, 1973. Problems of Management of Fish Marketing and Cooperatives. FAO/SIDA Course on the Management of Fishermen's Cooperatives, FAO/Swedish International Development Authority, Sweden, 73(10), pp 2-17
- Sapovadia V, 2004. Fishermen Cooperatives: A tool for socio economic development. *IIFET*, July 21-30, 2004 Japan Proceedings: 1-11
- SFTC (State Fisheries Training Centre), 2011. Compendium of Lectures on In Service Training for the W.B.J.F.S. Gr-II Officers of the Directorate of Fisheries-2011. Govt. of West Bengal, Kulia, Kalyani, Nadia, West Bengal, pp 285
- Shetty P and Sreedhara TN, 2011. Women empowerment and cooperatives- A comparative study of general cooperatives and fisheries cooperatives. *Int J Res Comm Manag*, 2(6): 62-67
- Tyagi LK, Bisht AS, Pal A and Lal KK, 2013. Functioning of fishing cooperative societies in selected states of India. *J Commu Mob Sustain Dev*, 8(1): 90-93