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Fisheries Cooperative Governance Quality Index: A novel methodology for assessing primary fisheries cooperative societies

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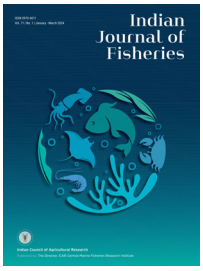

Abstract

The governance of cooperative societies is an important facet as it indicates success or failure for any cooperative society. The present study was conducted in the purposively selected Pune District of Maharashtra State with randomly selected 41 Primary Inland Fisheries Cooperative Societies (PIFCSs) for assessing quality of governance using novel Fisheries Cooperative Governance Quality Index (FCGQI). The study found that the majority (51.22%) of PIFCSs had medium governance quality scores (0.56-0.70), followed by 34.15% of PIFCSs showing low (<0.55) level of governance quality. The governance quality in PIFCSs perceived by the executive body (0.57) and the general body (0.55) members was found closely aligned. There were significant opinion differences among the executive body (0.47) and the general body (0.40) members about the quality of leadership in IPFCSs. The quality of governance in selected fisheries cooperatives positively correlated with younger leadership, trained executive body members, availability of basic infrastructure, greater interactions with other organisations and higher levels of women empowerment. The regression model with selected independent factors found best fit (R^2=0.78). Ensuring regular staff, basic infrastructure, diversified income generating activities, enhancing women and youth participation, along with building leadership capacity and stronger collaborations with research and development institutions would strengthen fisheries cooperatives and sustain member's livelihoods.

Introduction

A cooperative is a collectively owned, democratically controlled society of individuals who come together on their own accord to pursue shared economic, social, and cultural objectives (Anbumani, 2008). Fisheries cooperative societies are the most potential organization to provide livelihood and enhance fishers' socio-economic status (Ambilikumar, 2017). The fisheries cooperative organisational structure in India is broadly three-tiered. There is one National Level Federation, 22 State Level Federations, 9 Regional level federations, 147 District level federations, and 28,226 primary fisheries cooperative societies with a membership of 39.66 lakhs (FISHCOPFED, 2025). Since 1913, efforts to form number of fisheries cooperative societies in India have shown some positive impacts, but largely functioned as the channels for transferring Government subsidy benefits to its members. Fisheries cooperatives are underperforming in socio-economic aspects, governance and business growth which is not promising (Chandrashekar, 2012). The sustainable development of fisheries cooperatives is essential for well-being of fishing communities and achieving desired targets of production and income in fisheries and aquaculture sector (Unal *et al.*, 2009). Fisheries cooperatives can play a significant role in the global economy and address socio-economic and environmental challenges in the sector. However, their governance is often overlooked (Basterretxea *et al.*, 2020). Most governance studies on cooperatives assume a dominant corporate

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governance model, ignoring the diverse organizational forms used to structure economic activity (Smith and Collin, 2017). Moreover, cooperative governance addresses critical business challenges by clearly defining roles and responsibilities, establishing mechanisms for setting expectations and ensuring accountability, and guiding community-owned businesses toward socio-economic and cultural success. Cooperative governance is multidimensional, comprising democratic control, accountable empowerment, effective leadership and teaming (Scholl and Sherwood, 2014). Good cooperative governance promotes long-term cooperative growth and competitive advantage, provides opportunities to minimise risks, and adds value to successful business monitoring (Tripathy *et al.*, 2021).

Past research studies on fisheries cooperatives largely focused on financial performance and management (Upadhyay *et al.*, 2013; Ambilikumar, 2017), socio-economic status of cooperative members (Sapovadia, 2007; Mathews, 2018; Taniu *et al.*, 2024), financial sustainability and marketing (Nair *et al.*, 2007; Anbumani, 2008; Thrishma and Veerakumaran, 2020), member's participation and perception towards cooperatives (Arundhekar, 2017), success and failures (Unal *et al.*, 2009; Sharma *et al.*, 2018) and challenges faced by cooperatives (Fujita *et al.*, 2010; Chandrashekar, 2012; Wielgus *et al.*, 2014; Alberio and Soubirou, 2022). Globally, strategic leadership, good governance, gender mainstreaming, and diversified economic activities are perceived as key factors for the success of cooperatives. There is a dearth of studies focussing on assessment of governance quality in cooperatives considering teaming, accountable empowerment, democratic participation, and strategic leadership. Moreover, no standardised or validated indices exist to assess the governance quality of fisheries cooperatives. Therefore, the present study is an earnest effort to develop Fisheries Cooperative Governance Quality Index (FCGQI) for assessing the governance quality in Primary Inland Fisheries Cooperative Societies (PIFCSs) in Maharashtra.

Materials and methods

Selection of the state, region, district and PIFCSs

Maharashtra State was purposively selected as the study area as it has the second-highest number of PIFCSs in India and has a robust presence of potential inland fisheries resources (Fig. 1). In Maharashtra, there are 3,315 primary fisheries cooperative societies with a total membership of 3.33 lakhs which contributes to 57% of the fisher population in the State. Among 3,315 primary fisheries cooperatives in Maharashtra, about 2,603 inland fisheries cooperative societies are spread over five administrative regions (Chhatrapati Sambhajinagar - 833, Nagpur - 662, Amravati - 584, Pune - 376, and Nashik - 263) of the Maharashtra State (DoF, 2023). The Pune region was selected purposively from the five administrative regions because it has the third-highest overall inland fish production (20,396 t) and the fourth-highest number of PIFCSs. Pune District was selected for the study owing to its highest inland fish production (7255 t) in the region followed by Sangali (4055 t), Solapur (3600 t), Satara (2779 t) and Kolhapur (2707 t) as well as strong presence of fish farming and cage aquaculture activities (DoF, 2022).

Out of the 52 registered PIFCSs in Pune District, 41 were found functional with active membership, based on consultation with fisheries development officers and presidents of cooperative societies, and were selected for the study. About 11 PIFCSs were found inactive, defunct, or lacked a minimum requirement of 10 active members and were therefore excluded from the study. A sample of 41 PIFCSs was considered adequate to ensure representation of nearly all taluks in the Pune District, while maintaining feasibility in terms of time and resources. This sample size is above the conventional 30-unit minimum often recommended for regression analysis.

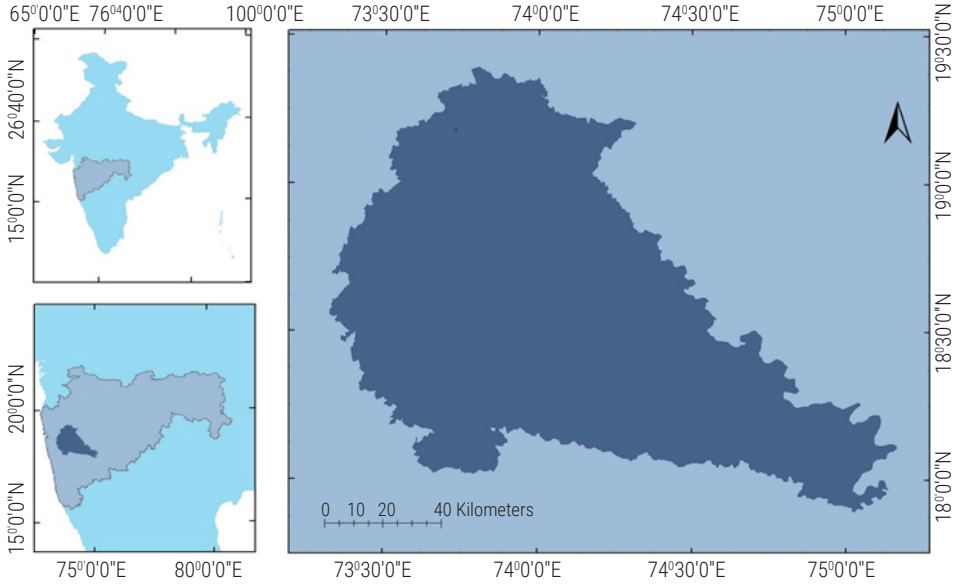

Fig. 1. Locale of study

The data were collected separately from the group of executive body and general body members of each selected cooperative society using focused group discussions during the months of April-June, 2023. In total, 82 focused groups discussions were held in 41 selected cooperatives covering 656 Members.

The statistical techniques used in this study include average, frequency, percentage and correlation. The statistical analysis was done with the help of MS-Excel Spreadsheet and IBM Statistical Package for the Social Sciences (SPSS) 22.0 software. A multiple linear regression model was applied with governance quality (dependent/outcome variable) to highlight the factors (independent/explanatory variables) significantly affecting the quality of governance in selected PIFCSs. The explanatory variables were chosen based on cooperative governance theory and prior empirical studies indicating that organizational resources (staff position, membership fee, share capital, infrastructure, welfare and income generating activities), leadership profile (age, education, experience, training), and participatory practices (meeting attendance, external contacts, women's involvement) influence governance quality in fisheries cooperatives. These factors were also validated from experts and consistently recorded across the surveyed PIFCSs, ensuring reliable data availability.

The explanatory variables in this study were measured using structured definitions and standardised scoring to ensure comparability across inland primary fisheries cooperative societies (PIFCSs). Organizational characteristics included the society registration status, recorded as the exact date and registration number provided by cooperative staff, and staff position, captured as the number of permanent or temporary employees engaged in daily operations. Membership status and fee referred to the total number of full-time registered members, both fishermen and fisherwomen, along with the membership fee fixed by the society. Total share capital represented the accumulated share money contributed by members. Governance practices were reflected in the society meeting pattern, which detailed the frequency (fortnightly to yearly), timing (morning/afternoon/evening), venue (office, temple, school), and average attendance in executive and general body meetings over the previous year. The profile of executive body members captured demographic and experiential attributes such as age, education, training/skills, and years of membership experience. External engagement and resources were assessed through the extent of contact with other organizations, scored on a three-point scale (Always = 2, Sometimes = 1, Never = 0) for participation in activities of fisheries departments, training centres, federations, and similar institutions. Unit index scores were computed and categorised as low (<0.33), medium (0.34–0.66), or high (>0.66). Infrastructure facilities measured the availability (1) or absence (0) of key amenities such as office buildings, utilities, computer systems, sanitation, storage, transportation, and marketing facilities; societies were likewise classified into low, medium, and high infrastructure categories using the same index thresholds. Societal services and empowerment were captured through welfare and income-generating activities, scored as available (1) or not (0) for services like training, credit, insurance, and welfare schemes, and through women empowerment, evaluated with literature-based indicators on a three-point continuum (Always = 2, Sometimes = 1, Never = 0) and similarly grouped into low, medium, and high empowerment levels based on unit index score. This structured approach provided consistent, quantifiable measures of all explanatory variables for regression analysis.

Model robustness was analysed using model fit statistics (R^2, Adjusted R^2), and multicollinearity was examined through Variance Inflation Factor (VIF). The multiple linear regression model is;

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_{13} X_{13} + \varepsilon_i$$

where, Y_i = Dependent variable (Governance Quality)
$X_1 \ldots X_{13}$ = Independent variables (Staff position; Membership fee; Total share capital; Attendance in meeting (Executive body); Attendance in meeting (General body); Young aged executive body members; Education of executive body members; Membership experience; Training status of executive body members; Infrastructure facilities; Welfare and income generating activities; Extent of contact/linkage with other organisations; Women empowerment)
β = Regression coefficient
ε = Error term

Results and discussion

Development of FCGQI

The present study adopted a five-step procedure to develop the FCGQI which include, (i) Selection of dimensions, (ii) Selection of indicators, (iii) Standardisation of the index, (iv) Administration of index and (v) Computation of the composite index. A comprehensive literature review was undertaken on cooperative governance to select relevant dimensions and respective indicators. This review focused on identifying indicators used in studies of cooperative governance, which could either be directly applied or adjusted for inland fisheries cooperative societies.

Selection of dimensions

A review of literature and consultation with experts in fisheries extension facilitated the identification of four relevant dimensions for assessing the quality of governance in fisheries cooperatives. The appropriate dimensions to measure inland fisheries cooperative governance were selected and defined with suitable modifications (Table 1).

Table 1. Dimensions selected to measure governance quality

Dimensions	Operational definition	Author
Democratic Control	The extent of successfully practicing, protecting, promoting, and perpetuating member's involvement in the cooperative societies.	Scholl and Sherwood (2014)
Accountable Empowerment	The extent of successfully empowering members while also holding them accountable for the power granted.	
Leadership	The extent to which the cooperatives effectively articulate its direction/ purpose and establish the organization to move in this direction.	
Teaming	The extent of successfully working together to achieve common purpose.	

Selection of indicators

About 110 indicators/statements relevant to the selected dimensions were gathered from literature survey. Additionally, the researchers, cooperative experts, and extension experts were consulted for the purpose of selecting indicators. About 110 collected indicators were scrutinised and edited as per 14 informal criteria suggested by Edwards (1957). Finally, 70 indicators were eliminated; and 40 indicators were retained after editing for inclusion in the index (Table 2).

Standardisation of the index

The validity of the index was ascertained through standardisation of the index, with content validity assessed based on expert judgement. The content of the index was developed through a thorough literature scan and based on expert opinions. The indicators with a minimum of 80% agreement among judges were retained. As the scale values, relevancy weightages and mean relevancy scores of all the selected dimensions and indicators demonstrated discriminating power, the index was considered a valid measure of the desired dimension.

Administration of index

Each dimension of the FCGQI comprised an equal number of indicators. The final index consisting of 40 indicators/statements was administered to the executive and general body members of each selected inland fisheries cooperative society. Data were collected through focused group discussion. Each indicator was measured separately on three continuums *viz., To great extent, To some extent* and *Not at all* with a score of 2, 1 and 0, respectively.

Computation of the composite index

After data collection, the responses for each indicator were quantified and normalised to maintain uniform measurement units. The overall possible maximum and minimum score ranges between 80 to 0. Scores were summed up to get the total score

Table 2. Dimension-wise selected indicators to measure governance quality

Sl. No.	Dimension and indicators	Author (s)
A.	Democratic Control	
	The organizational structure of a cooperative society is well designed	Tripathy *et al.* (2021)
	The registration procedure is transparent and professionally managed	Tripathy *et al.* (2021)
	Membership is open to all active fishers and voluntary	Guttmann (2020)
	Members have equal right of voting and participating in the cooperative election	Naik (2006)
	All the executive body members are elected	Thavai (2023)
	Regular conduct of executive/general body meetings	Kavya (2007)
	All the decisions happen in the presence of quorum of members	Barman (2004)
	All rights and responsibilities of members are defined	Naik (2006)
	Representation of youth, marginalised and vulnerable people in society	Thavai (2023)
	Free flow of information to each member without any discrimination	Naik (2006)
B.	Accountable empowerment	
	All the members are empowered to express their views/opinions	Kavya (2007)
	Delegation and distribution of authority among executive body members to hold them accountable	Thavai (2023)
	Regular assessment of member's technical and functional skills	Arundhekar (2017)
	Performance benchmarking with local and regional cooperatives	Guttmann (2020)
	Access to safety standards, healthcare and social welfare services to members	Thavai (2023)
	Following standard operating procedures for all the cooperative activities	Thavai (2023)
	Regular maintenance of record books and statutory registers	Thrishma and Veerakumaran (2020)
	Cooperative performance and financial reports are published regularly	Naik (2006)
	Financial and social audits of society happen at regular interval	Thavai (2023)
	A cooperative society is free from debt and non-performing assets	Thrishma and Veerakumaran (2020)
C.	Leadership	
	The leaders are educated, trained and responsible for their work	Naik (2006)
	Inclusion of women members in executive body (at least 33%)	Tripathy *et al.* (2021)
	Leaders have good rapport building and networking skills	Tyagi *et al.* (2013)
	Leaders demonstrate transparency and fairness in decision-making and financial matters	Ravichandran (2015)
	Leaders identify opportunities and develop strategies to capitalize on them	Wielgus *et al.* (2014)
	Leaders possess strategic thinking skills to address issues and challenges	Wielgus *et al.* (2014)
	Leaders handle timely grievances of members and ensure accountability	Tripathy *et al.* (2021)
	Leaders strive hard to diversify the services and income generating activities of society	Thavai (2023)
	Leaders keep informing members about the society functioning and welfare/subsidy schemes	Resmy (2002)
	Leaders rehabilitate defunct operations and promote cooperative start-ups	Thavai (2023)
D.	Teaming	
	The general body members and executive body members have group harmony	Kavya (2007)
	All the cooperative members stand together to resolve common issues	Kavya (2007)
	Members show mutual support and cooperation when a task is to be performed for society	Kavya (2007)
	Members have confidence on each other and trust among them all the cooperative members stand together to resolve common issues	Naik (2006)
	Cooperative members maintain political and religious neutrality	Thavai (2023)
	Cooperative society members are committed to the society's welfare	Jyotishi *et al.* (2020)
	Link with other societies and fostering collaboration	Thavai (2023)
	Members are satisfied with the society's functional activities	Kavya (2007)
	Society shares financial and other benefits among all members	Thavai (2023)
	Society works in line with District and State level cooperative bodies/federations	Thavai (2023)

for governance quality for each cooperative society. The obtained score was converted into index score using following formula:

$$U_{ij} = \frac{Y_{ij} - Min\ Y_{ij}}{Max\ Y_j - Min\ Y_j}$$

where,
U_{ij} = Unit score of the i^{th} cooperative society on j^{th} dimension
Y_{ij} = Obtained score of the i^{th} cooperative society on the j^{th} dimension
Max Y_j = Maximum possible score on the j^{th} dimension
Min Y_j = Minimum possible score on the j^{th} dimension

Thus, the governance quality index score ranges from 0 to 1 *i.e.* when U_{ij} is minimum, the score is 0 and when U_{ij} is maximum the score is 1. Based on index score, cooperative societies were categorised into low (up to 0.55), medium (0.56-0.70), high (0.71-0.80) and very high (> 0.80) quality of governance. A conceptual framework for the development of the FCGQI is shown in Fig. 2 .

Profile summary of PIFCSs

Profile of executive and general body members

The profile summary of executive and general body members is presented in Table 3 . The mean age of the executive body members was around 50 years, indicating more experienced members, while general body members are relatively younger with an average age of 40 years. The majority of executive body members (88.85%) had completed higher secondary education, whereas most general body members (60%) had only primary education. Few members in both groups had received formal training. Executive body members had an average of 20 years of membership experience, while general body members had an average membership experience of 15 years.

Staff, registration, membership fee, share capital and audit grade status

The study found that the PIFCSs had neither permanent nor temporary staff positions in place, which might be affecting the routine activities of cooperative societies. The essential staff positions need to be filled for improving the functioning and governance quality of inland fisheries cooperative societies. Table 4 provides insights into the establishment period and membership fees of PIFCSs. The establishment of the National Federation of Fishers Cooperatives Ltd. (FISHCOPFED) in 1982 appears to have influenced the establishment of PIFCSs in India, with 85.37% established after that year. The average membership fee has significantly increased from ₹60 to ₹775/-. The membership fee charged in PIFCSs was found in accordance with the byelaws.

Table 3. Profile summary of executive and general body members of PIFCSs

Profile variables	Executive body	General body
Age (Mean)	50 years	40 years
Literacy level	Higher secondary	Primary
Training status	Few trained	Few trained
Membership experience (Mean)	20 years	15 years
Major occupation	Mostly fishing	Fishing + Agriculture

There were a total 2405 members in selected 41 PIFCSs consisting of executive (415) and general (1990) body members. Men predominated in both the executive (83.13%) and general (91.46%) body of PIFCSs.

An overview of the existing share capital within inland primary fisheries cooperative societies shows that, among the selected 41 PIFCSs, 56.10% (23 societies) possessed a share capital of less than ₹10,000/- followed by 29.27% with a share capital of more than ₹20000/-The majority of IPFCSs had share capital below the minimum required amount of ₹25000/- as stipulated in the cooperative bye-laws.

As per Cooperative Societies Act, 1960, section 81 (1) (a) the primary cooperative societies are obligated to arrange for the audit of its accounts at least once during each financial year. All the cooperative records include membership details, meetings, accounting documentation, operational and inventory registers, as

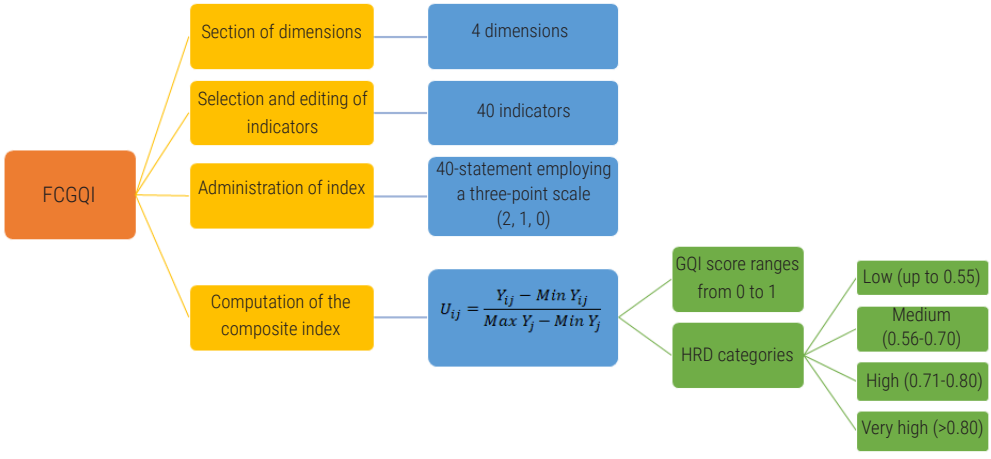

Fig. 2. A conceptual framework for the development FCGQI

Table 4. Registration period and membership fee of PIFCSs

Registration period	Registered cooperative societies		Average membership fee (₹)	
	Frequency (n = 41)	Percentage	At beginning	At present
Before 1982	06	14.63	60	625
After 1982	35	85.37	363	775

n = Sample size

well as bank passbooks and every financial transaction are subject to thorough review by both internal and government auditors. Cooperative societies that maintain accurate and complete records as well as financial documentation are given an "A" Grade. "B" Grade is given to cooperative societies that maintain adequate records, while a "C" Grade is given to those that only keep the minimum essential financial records. The majority (60.98%) of the IPFCSs received "B" grade, followed by 39.02% with a "C" grade. None of the cooperative societies obtained "A" grade, indicating a need for improvement in record keeping and maintenance.

Extent of contact with organizations, infrastructure, income and welfare activities

The unit scores in Table 5 indicate the extent of contact between cooperative societies and various organizations, as well as the state of their infrastructure, income, and welfare activities. These unit scores reflect the level of interaction or engagement that cooperative societies have with each of the listed organizations. The Department of Fisheries (DoF) demonstrates the highest unit score (0.71), signifying a strong level of contact. Input supply and services, including essential equipment like gears and insulated boxes, hold the highest unit index score of 0.90 indicating a high extent of input supply and services availability in cooperatives. Under income-generating activities, retail/wholesale shops hold the highest unit score of 0.71, indicating a relatively strong engagement and effectiveness in contributing to income generation. With respect to welfare activities, the PMMSY (Pradhan Mantri Matsya Sampada Yojana)- Group Accident Insurance Scheme for fishers showed the highest unit score of 0.56.

Table 5. Extent of contact with organizations, infrastructure, income and welfare activities

Organization-wise contact unit score of cooperative societies	Unit score
Department of Fisheries (DoF)	0.71
Other primary cooperatives	0.46
State cooperative federation	0.26
Krishi Vigyan Kendras (KVKs)	0.15
District cooperative federation	0.11
Infrastructure-wise unit score of cooperative societies	
Input supply and services (Gears, Insulated Box)	0.90
Computer and related accessories	0.29
Boat and gear repair facility	0.27
Society office	0.24
Fish transportation vehicle	0.22
Meeting hall	0.05
Income generating activities	
Retail/wholesale shop	0.71
Aquarium/ornamental shop	0.07
Other (General stores)	0.05
Cage/pen culture	0.02
Welfare activities	
PMMSY - Group Accident Insurance Scheme for fishers	0.56
Credit facilities	0.17
Kisan Credit Card	0.15

Women empowerment

The findings represent a set of indicators measuring the extent of women's empowerment within cooperative societies (Table 6). "Women have access to cooperative society resources and assets," with a unit score of 0.56 and "Women members get equal opportunities and benefit sharing" with a unit score of 0.52 demonstrated medium extent of women empowerment. These show that, in comparison to other dimensions, women's empowerment is higher in two areas: the right to use resources and assets, and equal opportunities and benefit sharing. Hence, there is a need to focus on other indicators of women's empowerment in inland fisheries cooperative societies.

Dimension-wise extent of governance quality in PIFCSs

Fig. 3 provides an overview of the dimension-wise extent of governance quality in PIFCSs. In "Democratic control", about 39.02% of the cooperative societies had a medium level of democratic control quality followed by low (34.15%). It was noteworthy to highlight that 19.51 and 7.32% of PIFCSs had high and very high levels of democratic control quality, respectively. In" Accountable empowerment", 39.02% of PIFCSs had high accountable empowerment quality followed by 31.71% of them exhibiting low accountable empowerment quality. In "Leadership", the majority (82.93%) of PIFCSs possessed low leadership qualities followed by medium (14.63%). According to Persson (2010), a high level of membership participation places pressure on leaders and staff to effectively carry out their respective responsibilities.

In "Teaming", the teaming quality was found low in 39.02% of the societies while 39.02% of PIFCSs had medium teaming quality. It was noteworthy to highlight that 14.64 and 7.32% of PIFCSs had very high and high levels of teaming qualities, respectively. The overall governance quality was found medium in 51.22% of PIFCSs followed by 34.15% had low overall governance quality. It was noteworthy to highlight that 12.19 and 2.44% of PIFCSs had high and very high levels of overall governance qualities, respectively.

Table 6. Women empowerment indicators-wise unit score of PIFCSs

Women Empowerment Indicators	Unit score
Women have access to cooperative society resources and assets	0.56
Women members get equal opportunities and benefits sharing	0.52
Women members are allowed to speak during a meeting	0.51
Women have an equal say in all cooperative decisions	0.46
Cooperative meeting held at women-friendly time and place	0.46
Women members are given preference to attend skill development training	0.44
Mean Women Empowerment Index	0.49

The mean governance index scores of cooperative societies across different dimensions perceived by the executive body and general body members are presented in Fig. 4 . There was no significant difference between mean index score of governance (0.57 and 0.55) and its dimensions perceived by executive and general body members of selected PIFCSs. This demonstrated that there was no perceived discrepancy in the quality of governance in PIFCSs among executive and general body members. Tripathy *et al.* (2021) reported that performance of cooperatives is significantly correlated with the timely implementation of strategic diversification, which improves accountability, transparency, predictability, rule of law and participation. Their findings concluded that good governance positively impacts the performance of Primary Agricultural Credit Societies in Kerala.

Table 7 and Fig. 5 present the ranking of selected PIFCSs as per their governance quality unit index scores. Notably, Ambika Cooperative Fisheries Business Society Ltd., Bhigwan, secured the highest index score (0.81), signifying a very high level of governance quality. Five

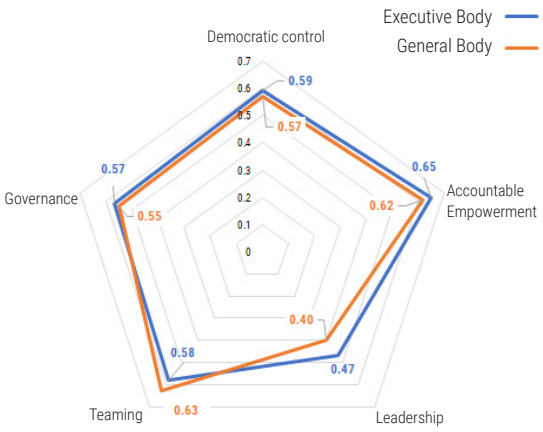

Fig. 4. Dimension-wise mean governance quality index score perceived by members

Cooperative societies had a high level of governance quality, 25 had medium; while 14 societies had low level of governance quality. The cooperative societies were ranked based on their governance quality index scores, enabling an assessment of their relative performance in terms of governance. Tripathy *et al*. (2021) reported that a competitive process driven by good governance is a key determinant of cooperative growth and development.

Factors affecting governance quality of PIFCSs

The correlation analysis revealed that external networking/contacts and women empowerment variables exhibited the strongest positive associations with governance quality (Table 8). Contact and linkage with other organisations showed the highest correlation

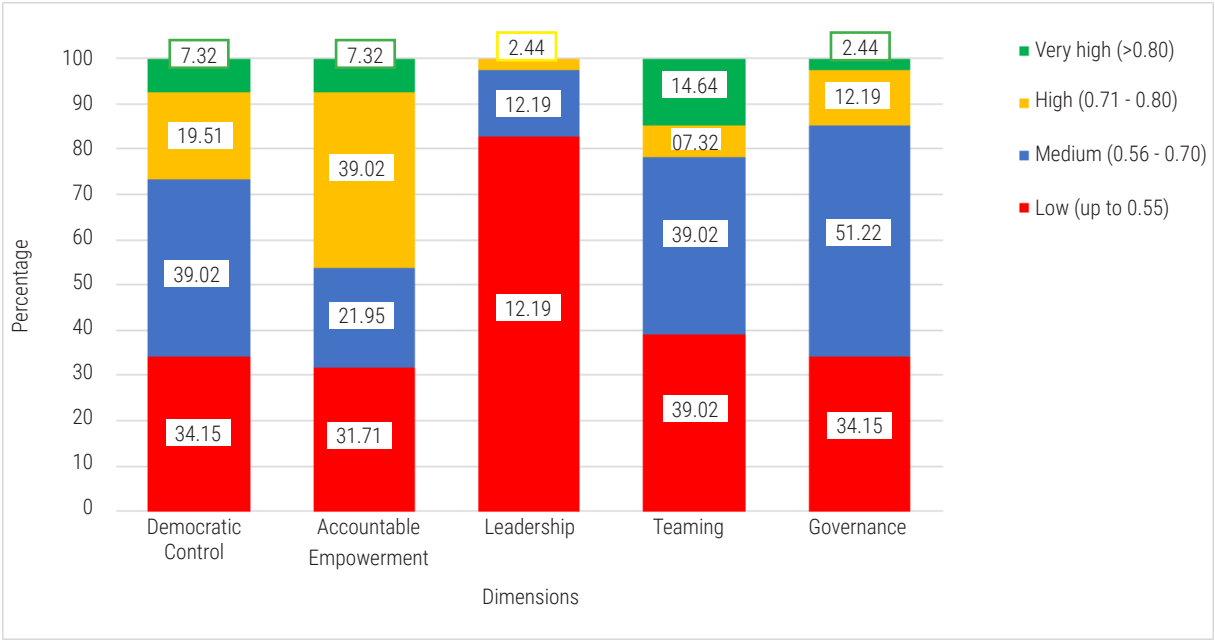

Fig. 3. Dimension-wise extent of governance quality of fisheries cooperatives societies

(r=0.73, p<0.001), highlighting the critical role of partnerships with government agencies, financial institutions and marketing agencies. Women's empowerment (r = 0.57, p<0.001) and training status of executive body members (r=0.53, p<0.001) were also strongly related to improved governance. Infrastructure facilities (r=0.48, p<0.01) and welfare/income-generating activities (r=0.47, p<0.01) emerged as other important predictors. Moderate but significant associations were observed for attendance in general body meetings (r=0.41, p<0.01) and attendance in executive body meetings (r=0.34, p<0.05), indicating that regular participation enhances decision-making transparency and member accountability. Conversely, staff position, membership fee, total share capital, and demographic attributes such as age, education and membership experience of executive members showed weak or non-significant relationships with governance quality. These results suggest that financial strength or member demographics alone do not guarantee effective governance. The findings underline the need for targeted policy interventions of: (i) strengthening institutional linkages of PIFCSs; (ii) implementing mandatory leadership and governance training for executive members; (iii) promoting women's participation in decision-making through reserved leadership roles and dedicated schemes; and (iv) improving physical infrastructure of PIFCSs using Central and State Government development funds.

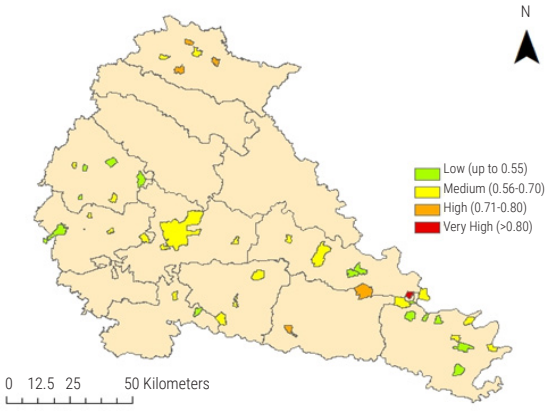

Fig. 5. Map depicting governance quality of selected PIFCSs in Pune District

Table 7. Ranking of selected PIFCSs based on governance quality index score

Rank	Name of the PIFCS	Index score	Governance quality
1	Ambika Cooperative Fisheries Business Society Limited, Bhigwan	0.81	Very high
2	Muktabai Adivasi Cooperative Fisheries Society Limited, Kusur	0.76	
3	Jai Tulja Bhavani Cooperative Fisheries Limited, Baramati	0.76	
4	Ajit Dada Cooperative Fisheries Limited, Vaki	0.76	High
5	Shree Kudakeshwar Cooperative Fisheries Society Limited, Gholwad	0.74	
6	Shree Kavdadhara Cooperative Fisheries Society Limited, Kolwadi	0.74	
7	Shivai Devi Cooperative Fisheries Society Limited, Kusur	0.69	
8	Bhoiraj Cooperative Fisheries Limited, Kasaba Peth	0.69	
9	Jai Tulja Bhavani Cooperative Fisheries Limited, Warvand	0.68	
10	Shree Mauli Adivasi Cooperative Fisheries Society Limited, Tejur	0.68	
11	Dr. Babasaheb Ambedkar Cooperative Fisheries Society Limited, Parinche	0.66	
12	Bhavanimata Backward Class Cooperative Fisheries Society Limited	0.66	
13	Rajmata Cooperative Fisheries Society Limited, Nathachiwadi	0.65	
14	Mahurjai Cooperative Fisheries Society Limited, Mahur	0.65	
15	Bhagyalakshxmi Cooperative Fisheries Society Limited, Khanote	0.65	
16	Mulashi Taluka Cooperative Fisheries Society Limited, Paud	0.65	
17	Shree Ganesh Cooperative Fisheries Society Limited, Ballalwadi	0.64	Medium
18	Dr. Babasaheb Ambedkar Cooperative Fisheries Society Limited, Bijwadi,	0.63	
19	Shivshambho Cooperative Fisheries Society Limited, Adhale Khurd	0.62	
20	Kalashi Cooperative Fisheries Society Limited, Kalashi	0.62	
21	Priyadarshani Cooperative Fisheries Limited, Bhairavnagar	0.60	
22	Shaha Cooperative Fisheries Society Limited, Shaha	0.59	
23	Mhashweshwar Cooperative Fisheries Society Limited, Bhugav	0.59	
24	Malva Bhoisamaja's Cooperative Fisheries Limited, Perane	0.58	
25	Shree Aikvira Cooperative Fisheries Society Limited, Behergaon	0.57	
26	Shivganga Cooperative Fisheries Society Limited, Kelavade	0.56	
27	Malati Cooperative Fisheries Limited, Madanwadi	0.56	
28	Adivasi Pawana Cooperative Fisheries Society Limited, Thakursai	0.55	
29	Bhairavnath Cooperative Fisheries Society Limited, Pipaloli	0.54	
30	Indrayani Adivi Cooperative Fisheries Limited, Takave Khurd	0.48	
31	Pirsaheb Cooperative Fisheries Society Limited, Dalaj No 3	0.44	
32	Bhoiraj Cooperative Fisheries Business Limited, Shetfal Haweli	0.44	
33	Jay Tuljabhawani Cooperative Fisheries Society Limited, Meragalwadi	0.43	
34	Eklavya Cooperative Fisheries Society Limited, Indori	0.39	
35	Palasdev Cooperative Fisheries Society Limited, Palasdev	0.38	Low
36	Malhar Cooperative Fisheries Society Limited, Bhadalwadi	0.37	
37	Firangimata Cooperative Fisheries Society Limited, Kurkumbh	0.34	
38	Jay Kalika Cooperative Fisheries Society Limited, Tarangwadi	0.30	
39	Vardhani Cooperative Fisheries Society Limited, Takrarwadi	0.26	
40	Vaghajaimata Cooperative Fisheries Society Limited, Vaghajaiwadi	0.26	
41	Jai Yedeshwari Cooperative Fisheries Limited, Bandewadi	0.21	

The regression assessed how 13 organisational and socio-economic predictors (Table 9) relate simultaneously to the governance quality index of PIFCSs. Contact/linkage with other organisations

Table 8: Correlation of selected independent variables with governance quality of PIFCSs

Independent variables	Governance quality	
	Correlation coefficient (r)	'p' value
Staff position	0.27	0.089
Membership fee	-0.01	0.959
Total share capital	-0.15	0.352
Attendance in meeting (Executive body)	0.34*	0.028
Attendance in meeting (General body)	0.41**	0.008
Age of executive body members	-0.01	0.947
Education of executive body members	-0.02	0.895
Membership experience	-0.15	0.359
Training status of executive body members	0.53***	0.000
Infrastructure facilities	0.48**	0.002
Welfare and income generating activities	0.47**	0.002
Contact/linkage with other organisations	0.73***	0.000
Women empowerment	0.57***	0.000

*p<0.05; **p<0.01; ***p<0.001 (two-sided test).

(β = 0.38, p = 0.021) was the only statistically significant positive predictor after controlling for all other factors, indicating that a 0.10 unit increase in external linkages is associated with a 0.038 unit increase in governance quality, holding all else constant. Women empowerment (β = 0.32, p=0.082) shows a sizeable positive effect, approaching significance, suggesting practical importance even if slightly above the 5% threshold. Training status of executive body

Table 9: Multiple linear regression analysis with governance quality of selected PIFCSs

Independent variables	Standardised coefficient (β)	Standard error (SE)	Significance (p)
Staff position	0.12	0.037	0.462
Membership fee	-0.05	0.000	0.710
Total share capital	-0.13	0.000	0.427
Attendance in meeting (Executive body)	0.05	0.034	0.728
Attendance in meeting (General body)	0.05	0.040	0.765
Age of executive body members	-0.15	0.008	0.273
Education of executive body members	0.03	0.004	0.826
Membership experience	0.02	0.010	0.890
Training status of executive body members	0.19	0.012	0.174
Infrastructure facilities	0.14	0.012	0.417
Welfare and income generating activities	-0.08	0.031	0.685
Contact/Linkage with other organisations	0.38	0.013	0.021
Women empowerment	0.32	0.007	0.082
Constant	0.41	0.228	0.079

Model statistics: R^2 = 0.78; Adjusted R^2 = 0.63
F (17, 23) = 4.95; RMSE = 0.094; n = 41

members (β=0.19, p=0.174) also trends positively. Variables such as membership fee, share capital, welfare activities, attendance, and demographic attributes (age, education, experience) are weak or negative but non-significant. This suggests that financial scale or member demographics alone do not ensure better governance, likely because decision-making transparency and network support outweigh mere resources or seniority.

Multicollinearity was checked using Variance Inflation Factors (VIF); all predictors had max VIF<5, indicating no serious multicollinearity. Residual plots showed no heteroscedasticity and approximate normality, supporting the assumptions of linear regression. The root mean square error (RMSE=0.094) is small relative to the governance quality scale, indicating good predictive precision. Taken together, these statistics and diagnostics demonstrate that the regression model is well specified, meets key assumptions, and provides a reliable basis for interpreting the influence of cooperative characteristics on governance quality.

The regression analysis confirms that network building is the single most powerful driver of governance quality in PIFCSs, while women's participation and leadership training offer additional, though less certain, gains. Investments in social capital and institutional linkages is likely to yield greater governance improvements than focusing solely on membership size, financial resources, or demographic characteristics.

Strategies suggested for strengthening PIFCSs

The essential staff positions such as treasurer, accountant and clerk, need to be filled in inland fisheries cooperatives to ensure effective record keeping, financial management and smooth functioning. Women's participation can be increased through gender-sensitive interventions, including scheduling cooperative society meetings at times and location that are convenient and accessible for women, to ensure their active participation. Fishers/fish farmers need to be motivated to become members of inland fisheries cooperatives to improve collective strength and share capital status of cooperatives. The financial status of inland fisheries cooperatives needs to be strengthened through government support and by promoting diversified income-generating activities in the cooperatives. All the executive and general body members need to be sensitised for attending society meetings regularly and participating actively. Strategic leadership needs to be improved through dynamic leadership skill development training among executive body members for taking cooperatives to new heights. The capacity building and skill development of cooperatives members through targeted skill development training programs for men and women needs to be undertaken to promote diversified income-generating activities in the cooperatives which will reduce the dependency on fisheries resources. The extent of contact of inland fisheries cooperatives with organizations like Krishi Vigyan Kendras (KVKs) as well as Fisheries R&D institutions of the Indian Council of Agriculture Research (ICAR), New Delhi. needs to be strengthened through effective collaborations and convergence initiatives. The basic infrastructure facilities like society office, water and electricity as well as storage and transportation, need to be established for rejuvenating the cooperative functioning in the inland fisheries sector. Cooperative societies should adopt

income-generating and welfare activities such as cage/pen culture, ornamental fish culture, and the provision of credit facilities to support their members' livelihoods and overall well-being. Regular monitoring and evaluation of performance are needed for ensuring continuous improvement within fisheries cooperative societies.

The Fisheries Cooperative Governance Quality Index (FCGQI) developed in this study provides a comprehensive and evidence-based tool to assess and compare the governance performance of Primary Inland Fisheries Cooperative Societies (PIFCSs). Dimension-wise analysis highlights relatively better performance in democratic control and accountable empowerment, whereas leadership and teaming remain weaker areas that require focused interventions. Training status of executive body members, availability of infrastructure, the extent of contact with other organizations, and the level of women's empowerment emerged as the most influential factors, jointly explaining 78% of the variance in governance scores. These findings emphasise that strengthening human capacity, improving physical infrastructure, enhancing inter-organizational linkages, and promoting gender inclusion are critical for advancing cooperative governance. Regular attendance of members in meetings, although positively related, plays a comparatively smaller role, suggesting that structural and capacity-building measures yield more substantial improvements than participation alone. Overall, the FCGQI offers policymakers, development agencies, and cooperative leaders a practical framework for monitoring, benchmarking, and enhancing governance. Its adoption can guide evidence-based interventions that build resilient, inclusive, and financially robust fisheries cooperatives, an imperative step toward empowering fishing communities and ensuring the long-term sustainability of India's inland fisheries sector.

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