



Research Article

Client's Perception of Aquaculture Extension Service in a Selected Sub-District of Bangladesh

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ARTICLE INFO

ABSTRACT

Article history

Received: 27 March 2026

Accepted: 24 September 2026

Published: 30 September 2026

Keywords

Perception;
Aquaculture;
Extension;
SERVPERF;
Bangladesh

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Aquaculture extension, a critical pathway for transferring modern technologies and knowledge to rural farmers, is crucial for food security and the economy of Bangladesh. This study examines the perceived quality of public aquaculture extension services in a selected sub-district of Bangladesh. The SERVPERF scale data were collected based on a seven-point Likert type scale from 230 randomly selected fish farmers who resided in the 15 selected villages under Barishal Sadar upazila (sub-district) of Barishal district. The findings indicate that the aquaculture extension service performs satisfactorily in assurance, responsiveness and tangible dimensions, whereas the performance is relatively low in the dimensions of reliability and empathy. The logistic regression findings confirm that among the dimensions of SERVPERF, responsiveness, reliability and empathy significantly influence the client's overall satisfaction with the aquaculture extension service. The factor analytic results show that among the 20 statements of SERVPERF, nine statements grouped into three factors can be a viable tool for measuring the quality of aquaculture extension service. This study recommends individualized client care, the development of extension skills and the intention of the extension agents to provide need-based prompt service and to arrange extension programs considering the clients convenience.



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Introduction

Bangladesh is predominantly an agrarian economy endowed with vast inland and marine water resources, making it one of the most suitable regions globally for aquaculture and fisheries development. The fisheries sector plays a vital role in the national economy, contributing approximately 3.57% to the national GDP and around 26.50% to the agricultural GDP in recent years (DoF, 2024; FAO, 2022). The sector has demonstrated remarkable growth, with total fish production reaching about 5.018 million metric tons in FY 2023–2024, of which aquaculture contributes more than 59% (DoF, 2024). Bangladesh is now among the top fish-producing countries globally and has recently ranked second in freshwater fish production according to the FAO's State of World Fisheries and Aquaculture report (FAO, 2024). However, despite fish production having shown significant progress compared with the past days, fish production has ample scope for improvement (Shamsuzzaman et al., 2017). For

instance, Bangladesh's per capita annual fish consumption is about 14 kg/year against a recommended minimum requirement of 18 kg/year (Rashid et al., 2019). Thus, to meet the soaring food demand for the burgeoning population, there is an urgent need to increase fish production in Bangladesh, as fish is one of the major protein sources for the people of Bangladesh (World Fish, 2023).

Fish production depends upon various aspects such as input availability, favorable weather and climate, the skill and ability of the producers, and the value chain of aquaculture products. In addition to these factors, fisheries extension service also plays a decisive role in ensuring better yield and income from fish farming (Chowdhury et al., 2016). Various extension agents from the public, private, and NGO sectors, provide extension services to fish farmers in Bangladesh (Afrad et al., 2019). However, in Southeast Asian countries, public fisheries extension services are the major players in fisheries extension services (Ferrer et al., 2021).

Cite This Article

Hossain, S., Sadat, N., Chowdhury, A.R., and Rashid, M.M.U. 2026. Client's Perception of Aquaculture Extension Service in a Selected Sub-District of Bangladesh. *Journal of Bangladesh Agricultural University*, 24(3): 346-354. <https://doi.org/10.3329/jbau.v24i3.93916>

Therefore, the performance of public fisheries extension services is crucial from national macroeconomic, food, and nutrition security perspectives. Deplorably, the public fisheries extension organizations, with their services, faced many challenges while improving their quality. Thompson et al. (2005), in a study in Gazipur, claimed that many ponds still need to be utilized due to a lack of proper and timely fisheries extension service. A recent study also identified a lack of knowledge and inefficiencies in all the sectors of fisheries as major weaknesses hindering fisheries sector development in Bangladesh (Larvie-Light Castle, 2021). Therefore, improving the quality of public fisheries extension services in the country is an urgent priority to enhance the knowledge and efficiency of the stakeholders in the fisheries sector (Ahmed et al., 2018).

Improving fisheries extension services requires a systematic assessment of their service quality. However, empirical research evaluating the quality of public fisheries extension services in Bangladesh remains limited. Addressing this gap, the present study adopts the SERVPERF model developed by Cronin and Taylor (1992), a widely used performance-based framework for measuring perceived service quality in a selected sub-district of Bangladesh. Moreover, this research also reveals the effect of service quality dimensions on clients' satisfaction with aquaculture extension services in the study area. The findings of this study are expected to provide evidence-based guidance for policymakers, extension planners, researchers, and development partners to advance the quality and effectiveness of aquaculture extension services in Bangladesh. By identifying key dimensions influencing clients' perceptions and satisfaction, the study assists informed decision-making aimed at enhancing service delivery and stakeholder outcomes. Furthermore, it contributes to the literature by constructing a context-specific framework for assessing service quality in the fisheries extension sector, offering a practical foundation for future research, policy formulation, and continuous service improvement.

Theoretical Framework

The SERVQUAL model developed by Parasuraman et al. (1988) has remained a dominant framework for measuring service quality for several decades based on the disconfirmation paradigm. Despite its widespread application, researchers have increasingly questioned its suitability across diverse contexts and sectors. Previous studies argue that SERVQUAL lacks comprehensiveness in measuring service quality consistently across different service environments and often produces inconsistent results (Dabholkar et al.,

1996; Seth et al., 2005; Brady & Cronin, 2002; Ladhari, 2009; Shahin & Samea, 2010). Furthermore, the need to measure both expectations and perceptions results in repetitive measurement procedures that may increase respondent confusion and reduce data quality (Ko & Chou, 2020). Cultural disparities also challenge the universal applicability of SERVQUAL dimensions, necessitating structural modifications across contexts (Mahmoud et al., 2019).

To address these limitations, Cronin and Taylor (1992) introduced the SERVPERF model, which conceptualizes service quality as a performance-based construct measured exclusively through customers' perceptions of actual service performance. They argued that service quality represents clients' attitudes toward service experiences and that performance-only measures provide a more precise assessment than expectation–perception comparisons. The SERVPERF model retains the five dimensions originally proposed in SERVQUAL—reliability, responsiveness, tangibility, assurance, and empathy—but evaluates them solely from consumers' perceived experiences.

Subsequent empirical evidence increasingly supports the superiority of performance-based measures over disconfirmation-based approaches. Studies show that perception-only measurements often produce more reliable and valid results compared to expectation–perception gap measures (Sultan & Wong, 2011). Similarly, performance-based measures demonstrate stronger explanatory power and better discriminant validity when assessing service quality (Brady et al., 2002; Seth et al., 2005). Consequently, several researchers have confirmed that SERVPERF represents an appropriate instrument for measuring service quality across diverse service organizations (Amoah-Mensah, 2016). In agricultural and rural extension contexts, SERVPERF has demonstrated considerable relevance as it allows researchers to identify specific service improvement areas and evaluate customer satisfaction more effectively. Simões et al. (2020) contended that adapting service quality measurement tools to agricultural contexts augments their practical relevance for evaluating extension services, technical support, pest management, and agribusiness-related interventions. Consequently, SERVPERF has increasingly been recognized as an appropriate framework for agricultural extension assessment. Abdel-Ghany (2012) applied SERVPERF to agricultural extension centers in Egypt and reported valuable policy implications. Additional studies similarly highlight its usefulness for diagnosing service quality perceptions, identifying client needs, and improving service delivery within agricultural systems (Kirchner, 2012; Kannan & Saravanan, 2012).

Therefore, considering the conceptual strengths and empirical support for performance-based measurement, this study adopts the SERVPERF model to assess the quality of public fisheries extension services in the Barishal Sadar sub-district of Barishal district in Bangladesh

Methodology

Study location and participants

This study's location was in the district of Barishal, situated in the south-central coastal region of Bangladesh. Barisal is one of the riverine districts on the bank of the Kirtankhola River. The district has a high potential for fish production due to the availability of various water bodies and year-round water. A sub-district called Barishal Sadar was purposively selected, from which fifteen villages, namely Mongolkata, Raypasha, Shibpasha, PurboKornokhati, Somraji, Charkronja, Asthakhati, Chandipur, Hijoltola, Bisarad, Makorkathi, Dhormadi, Veeduria, Chadpura, and Mojidpur were randomly selected for sampling. In general, all the clients connected with the public aquaculture extension service at least once a year formed the population of this study. Rather than the whole population, this study used a sampling frame to draw the sample of this study. A list of 375 fish farmers was prepared with the help of the Upazila (Sub-district) Fisheries Office. At a 95% level of confidence and a 5% margin of error, the required sample size was 231. Therefore, this study selected 230 farmers as the sample of the study.

Data collection and procedures

This study adopted the SERVPERF model. The initial survey instrument comprised 22 items (Appendix 1) derived from the SERVQUAL dimensions: reliability, tangibility, assurance, responsiveness and empathy (Parasuraman et al., 1985). These dimensions encompass the clients' perception of Tangibles: physical facilities, personnel appearance and equipment of the extension service provider; Reliability: the ability to

deliver promised service precisely and reliably; Responsiveness: the intention to assist clients and provide prompt services; Assurance: employees' knowledge, politeness and capability to bear trust and assurance; Empathy: taking care of the individual client. According to SERVPERF, service quality can be expressed as:

$$SQ_i = \sum_{j=1}^k P_{ij}$$

Where:

SQ_i - Perceived service quality of individual "i" k – Number of attributes/items

P - Perception of individual "i" with respect to performance of a service firm on attribute "j" (Cronin & Taylor, 1992).

Perception-only items were measured using a seven-point Likert type scale (7 = strongly agree; 1 = strongly disagree). The dependent variable, clients' overall satisfaction with extension services, was assessed on a five-point scale (5 = very satisfied; 1 = very dissatisfied). This study used a structured interview schedule to collect data. The schedule was composed of two sections. The first section collected information on respondents' socio-economic and farming characteristics, including age, gender, education, marital status, annual income, farming objectives, farm size, farming experience, and contact with government extension services. The second section sought information on service quality and client satisfaction. Items of service quality were adapted from Mamun-ur-Rashid et al. (2018). The initial interview schedule was developed in English and translated into Bengali. A pilot test with 30 randomly selected clients was conducted to evaluate its validity and applicability. Based on the results, several items were revised for clarity. The reliability of the schedule was measured using Cronbach's alpha, with values ranging from 0.609 to 0.717, indicating generally acceptable internal consistency, although the empathy dimension showed comparatively lower reliability (Table 1).

Table 1. The reliability of the data collection instrument based on the Cronbach's α value

Quality dimension	Items (initial)	Items (retained)	Cronbach α
Tangibles	4	3	0.674
Reliability	5	5	0.666
Responsiveness	5	5	0.717
Assurance	4	4	0.644
Empathy	4	3	0.609

Data analysis

This study adopted a quantitative approach. Therefore, to explain the characteristics of the respondents, this study applied descriptive statistics, such as frequency, mean, standard deviation, median and range. Kaur et al. (2018) explained descriptive statistics as a vital first step to summarize data in an organized manner. This study adopted factor analysis to reveal the crucial factors for aquaculture extension service quality among SERVPERF statements. The main purpose of factor analysis encompasses the summarization of information contained in a large number of variables into a small number of factors (Bajpai, 2016). This study adopted logistic regression to explore the effect of service quality dimensions on client satisfaction. For logistic regression, the Likert scale-based data on overall satisfaction were converted to a binary response (Very dissatisfied to Neutral = No satisfaction; and very satisfied to satisfied = Satisfaction). Logistic regression is useful to estimate the association of two or more predictor (independent) variables with a binary criterion (dependent) variable (Vetter & Schober, 2018).

Result

Sample demographics

The total number of clients interviewed in this research was 230, of whom 79.6% were male and 20.4% were female. This low percentage of women respondents might be due to the reason that in Bangladesh, women's participation in public aquaculture extension services is remarkably low compared to the crop and livestock sector (Mamun-ur-Rashid et al., 2017). A recent assessment of gender dynamics in aquaculture and agriculture in Northwest Bangladesh also found that women have less access to extension services (Haque, 2020). Most respondents (93.5%) were married, while 47.4% had secondary-level education (47.4%). An almost equal proportion of the respondents came from lower middle-income (47.8%) and middle-income (48.7%) categories. Most (61.3%) of the farmers engaged in fish farming for commercial and family consumption. However, details of other characteristics related to the respondent's background are shown in Table 2.

Table 2. Descriptive characteristics of the respondents (N=230)

Variable	Scale	Category	Freq.	%	Mean	S	Med.	Range
Age	Year				44.82	1.24	45	21-70
Gender	Nominal	Male (1)	183	79.6				
		Female (0)	47	20.4				
Marital status	Nominal	Married (1)	215	93.5				
		Unmarried (0)	15	6.5				
Education	Year of schooling	Illiterate (0)	5	2.2	7.59	3.20	8.00	0-16
		Primary (1-5)	83	36.1				
		Secondary (6-10)	109	47.4				
		SSC & above (>10)	33	14.3				
Annual income	'000' Taka	Poor (36-50)	8	3.5				
		Lower middle (50.1-120)	110	47.8	124.5	43.42	120	40-220
		Middle (>120)	112	48.7				
Experience in fish farming	Years				8.82	6.19	7.0	1-30
Objective of fish farming	Nominal	Family consumption	64	27.8				
		Commercial purpose	25	10.9				
		Both	141	61.3				
Freq. of contact with extension	Nominal	Every two weeks	42	18.3				
		Monthly	142	61.7				
		Tri monthly	45	19.6				
		Half yearly	1	0.40				
Fish farm size	Ordinal	Homestead based	71	30.9				
		Small (< 1 acre)	101	43.9				
		Medium (1.00-2.00 acres)	49	21.3				
		Large (>2 acres)	9	3.90				

Client's Perception of Service Quality

Table 3 reveals that clients' perceptions of service-quality dimensions in public extension is satisfactory, as the mean values of the dimensions are above four. The highest mean and median values are scored by assurance, followed by responsiveness, tangibility,

reliability, and empathy. Hence, assurance had the highest mean score among the five dimensions. Supporting our findings, Abdel-Ghany and Abdel-Salam (2012) found assurance as the dimension having the lowest service gap in a study in Egypt. The least mean score (4.76) was for empathy, indicating that

aquaculture extension may be performing relatively low in providing individualized service to their clients and

understanding their needs and wishes.

Table 3. Perceived service quality dimensions (N=230)

Dimension	Mean	Median	Std.	Range	Scale
Tangibles	5.20	5.25	0.748	2.75-6.75	Score
Reliability	4.93	5.00	0.887	3.00-7.00	Score
Responsiveness	5.39	5.60	0.885	2.80-6.80	Score
Assurance	5.63	5.75	0.661	3.50-7.00	Score
Empathy	4.76	4.87	1.04	2.00-6.50	Score

Source: Field study

Factor analytic results of SERVPERF scale

For a precise explanation of the results, 20-items scale was factor analyzed and the results are visible in Table 4. The principal component method following VARIMAX rotation was adopted to clarify the relationship among factors (The SAGE Encyclopedia of Communication Research Methods, 2018). The suitability of the data was evaluated before conducting factor analysis. The correlation matrix confirmed many coefficients equal to or above 0.5. The Kaiser-Meyer-Olkin (KMO) value is 0.763, which exceeds the suggested value of 0.60 (Kaiser, 1970, 1974). The value of Bartlett's Test of

Sphericity (Bartlett, 1954) showed statistical significance ($p < 0.001$), which supports the suitability of the correlation matrix. Echoing the recommendation of Hair et al. (2010), all the variables having commonalities of less than 0.50 and all the cross-loaded items were dropped from further analysis. The final analysis results confirm the presence of three components that jointly explained 60.04% of the variance. This value is higher than the suggested 50% level, which confirms that this three-factor solution can measure the quality of aquaculture extension service.

Table 4. Rotated factor analysis results of SERVPERF scale (N=230)

Factors		Loading	Eigenvalue	Variance (%)	C* α
F₁			2.924	32.492	0.712
RSQ ₁₀	Staff inform farmers about the extension programs at the right time	0.730			
RSQ ₁₁	Extension staff provide prompt service to the clients	0.718			
RSQ ₁₂	Extension staff are always willing to help farmers	0.664			
EQ20	The location of the extension program is convenient for all the clients				
F₂			1.436	15.955	0.637
TQ3	Communication materials (e.g., posters, leaflets, etc.) supplied by the extension office are attractive	0.813			
RQ7	Extension workers supply promised materials at the right time	0.743			
EQ19	Extension workers provide individual attention to each client				
F₃			1.043	11.589	0.409
TQ ₂	Extension workers are well-dressed and have a neat appearance	0.757			
RSQ ₁₄	Knowledge gained from the extension program will not be outdated within a few days	0.716			

Note: C* = Cronbach's α , Factor loadings below 0.40 are not shown in this table

The actual survey instrument was composed of 20 statements classified into five factors. However, the factor analysis output retained nine statements divided into three factors. The first set of factors comprises three statements from responsiveness and one from the empathy dimension. The second set of factors encompasses one question from each dimension of tangibles, reliability and empathy. The third set of factors that can explain 11.58% of the variance in

perceived service quality of aquaculture service is composed of one question each from tangibles and responsiveness.

Effect of Perceived Service Quality on Client Satisfaction

The effect of perceived service quality dimensions on clients' overall satisfaction was ascertained using a logistic regression model. The logistic regression model

was statistically significant, $\lambda^2(5,230) = 139.68$, $p < 0.001$. The Cox–Snell pseudo- R^2 was 0.455 indicating that the fitted logistic regression model provided a substantial improvement in explaining the variation in the outcome compared with the intercept-only model and the model can correctly classified 81.7% of the cases. The findings of regression in Table 5 further describe that responsiveness (OR = 5.29, 95%CI [2.4, 11.6]) has the

highest contribution to client satisfaction, followed by reliability (OR=4.25, 95%CI [2.2,8]) and empathy (OR=1.83, 95%CI [1.1, 2.8]). Tangibles and assurance were not associated with client satisfaction. Hammoud et al. (2018), in their research focusing on the impact of E-Banking service quality on customer satisfaction, also found reliability and responsiveness as significant determinants of service quality.

Table 5. Logistic regression results showing the effect of service quality dimensions on client satisfaction

Model	B	SE	Wald	Sig.	Exp(B)	95% CI	
Constant	-19.293	2.992	41.587	<0.001	0.00		
Tangibles	-0.468	0.310	2.273	0.132	0.626	0.341	1.151
Reliability	1.448	0.323	20.035	<0.001	4.255	2.257	8.021
Responsiveness	1.667	0.403	17.066	<0.001	5.294	2.401	11.674
Assurance	0.375	0.366	1.046	0.306	1.454	0.709	2.981
Empathy	0.605	0.227	7.116	<0.01	1.831	1.174	2.855

Observations(n) = 230

Hosmer Lemeshow statistic (P-value) = 6.698 (0.569)

Mean VIF (Max) = 1.40 (1.572)

Discussion

This study has examined the quality of public fisheries extension services in a selected sub-district in a selected coastal area of Bangladesh. The findings revealed that the perceived service quality in the assurance dimension was high, followed by the responsiveness and tangible dimensions. The service quality was low in the reliability and empathy dimension. In Bangladesh, the public service staff abides by strict rules and regulations, so the clients feel safe dealing with them. On the contrary, most extension workers are less concerned about caring and individualized attention to the client which may reflect limitations in individualized client care and service capacity.

The study revealed that responsiveness strongly associated with client satisfaction, similar to the other studies conducted on agricultural information services (Mamun-ur-Rashid et al., 2018; James et al., 2012). Responsiveness focuses on the intention of the extension agents to assist clients and provide prompt support. In Bangladesh, a significant section of the farmers remains out of formal aquaculture extension services due to the poor capacity of government extension service providers (Ahmed et al., 2018). Hence, individual care is necessary to enhance satisfaction among the farmers. Moreover, fish are living aquatic animals very susceptible to changing environments. Therefore, clients need quick and timely information. It is also necessary for the extension agents to inform the clients when the service is going to be delivered, to deliver the service promptly and on time and to demonstrate their overall willingness to help clients. The clients valued the reliability dimension,

which is the service provider's ability to deliver the service precisely and reliably. This finding is in line with other studies (Mamun-ur-Rashid et al., 2018; James et

al., 2012), which identified reliability as a crucial factor contributing to client satisfaction. Improvement of reliability requires the extension service providers to maintain the meeting schedule, develop skills in doing extension work, accurately keep farmers' records, and gain the dependability of the clients. Empathy has also emerged as one of the crucial service quality dimensions influencing client satisfaction. Supporting our findings, other studies (Shaba, 2020; James et al., 2012) endeavoring to assess the quality of agricultural information service also found empathy as a significant predictor of client satisfaction. The empathy dimension represents taking care of individual clients. More precisely, extension service needs to focus on individual clients, arrange extension programs considering the time and location convenience of the clients and the agents must be interested in solving clients' needs. Agricultural extension literature stresses that extension agents who understand farmers' unique circumstances, actively listen to their concerns, and tailor recommendations to local needs are more likely to build trust, enhance client satisfaction, and accelerate technology adoption (Anderson & Feder, 2007; Davis & Sulaiman, 2014).

This research also found that the SERVPERF model can be used to measure the quality of fisheries extension services. However, reconsidering more dimensions is necessary to develop a more parsimonious service quality assessment tool. As the fish production system

is a complex nexus, the dimensions of the extension service are too many. So, the SERVPERF model can be reorganized for measuring the extension service quality of aquaculture extension services. A study focusing the influence of service quality on farmer satisfaction in Indonesian Artificial Insemination programs suggested adding context-specific dimensions like service accessibility, cultural appropriateness, and environmental sustainability with SERVQUAL dimensions (Nugroho et al., 2026). Similarly, research endeavoring to assess patient satisfaction with rural Indian healthcare also recommends adding context-specific dimensions to the SERVPERF model (Chawngzikpuui and Lalromawia, 2024).

The policy recommendation from this research indicates that the quality improvement strategy of the fisheries extension service should focus on the ability to deliver promised service precisely and reliably. The policy must also find pathways to take individualized care, strengthen extension agents' intention to assist clients and provide prompt service.

This study contributes to the existing literature in several ways. For instance, this research is one of the few studies focusing on the quality of fisheries extension service in Bangladesh, which is crucial for improving the quality of government fisheries extension services. Last but not least, this research applied the SERVPERF model in the context of aquaculture extension service, which might assist in further developing a service quality assessment tool in measuring the quality of aquaculture extension services in Bangladesh and other countries. In addition to these contributions, this research encompasses several limitations. First, this research has limited geographical coverage and considered a limited number of respondents, which calls for caution in the generalization of the findings. The service quality dimensions considered in this study are limited to the SERVPERF model, which might not be sufficient to capture all the dimensions of service quality in the case of fisheries extension service that focuses on a wide range of communication and learning activities, coordinating stakeholders from various fields, promoting agricultural productivity, ensuring food security, improving livelihoods and promoting agriculture as an engine for pro-poor economic growth (Glendenning et al., 2010).

Conclusion

The present study investigated the quality of aquaculture extension service in a selected sub-district of Bangladesh. This research is one of the few studies focused on the aquaculture extension service, a vital

tool for expanding aquaculture technologies among rural fish farmers to ensure food security. The study's findings show that the aquaculture extension service performs satisfactorily in assurance, responsiveness and tangibles dimension and is relatively low in reliability and empathy. Among the dimensions of SERVPERF, reliability, responsiveness and empathy played a significant role in determining the client's overall satisfaction with the aquaculture extension service. This study further found that a modified SERVPERF model is a reliable tool for measuring the service quality of aquaculture extension services. This research fully recognizes that the aquaculture extension service deals with diverse nationwide clients, and the complex nature of extension service calls for quality assessment considering additional dimensions with the SERVPERF model. Therefore, further multilocation research is necessary, considering diversified clients and additional service quality dimensions. The findings suggest that agricultural extension service providers must emphasize clients' individual needs and convenience, strengthen extension agents' competencies to deliver timely, responsive services, and foster their commitment to assisting clients, thereby improving the overall quality of aquaculture extension services. The policy must identify avenues to provide precise, reliable, and need-based service to each client in a timely manner.

Author Contributions

S.H.: Design, data collection and manuscript writing. N.S.: Data collection, analysis and manuscript writing. A.R.C.: Design and data collection. M.M.U.R.: Design, supervision, data analysis and manuscript writing and editing. All authors read and approved the final manuscript.

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