



Influence of Private Extension Services on Practices and Perceptions of Shrimp Farmers

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HIGHLIGHTS

- The study focuses on the perception of shrimp farmers regarding private extension services for improving productivity and income.
- Adopting a pluralistic extension model that combines public and private extension services would improve service delivery, affordability, and farmer engagement.
- A high percentage of the determinants influence the perception level of shrimp farmers on private extension services.

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ABSTRACT

The study conducted in 2025 (January to April) to evaluate the perceptions of shrimp farmers regarding private extension services, focusing on quality, accessibility, cost, and impact on farming practices in Tamil Nadu, India. A sample of 150 shrimp farmers was selected using proportionate random sampling from five districts; Nagapattinam, Thanjavur, Thiruvarur, Cuddalore, and Ramanathapuram. Data were collected through a structured interview schedule and was analysed using SPSS software. The findings revealed that shrimp farmers generally held positive views of private extension services, particularly regarding updated market information (51%), addressing the needs of small and marginal shrimp farmers (50%), regular visits by extension agents (45%), and technical expertise (49%). However, challenges like geographical barriers (85%), lack of awareness (76%), and high service costs (59%). Among 17 variables, 10 were found to be significantly associated with shrimp farmers' perception levels. Multiple regression analysis revealed that independent factors accounted for 64.7 per cent of the variation in farmers' perceptions. The study suggests enhancing private extension services by addressing affordability and improving collaboration between the public and private sectors to improve shrimp farming productivity and income.

INTRODUCTION

India is a leading shrimp-producing and exporting nation, with shrimp contributing more than 70 per cent of the country's total aquaculture exports. The industry has grown at a rapid rate

following the introduction of favorable government policies introduction of exotic species such as *Penaeus vannamei* and proactive participation of private stakeholders (MPEDA, 2021). Andhra Pradesh, Tamil Nadu, Odisha and West Bengal are the major states of shrimp aquaculture. Despite, the role of public extension

services such as the Department of Fisheries and research centers such as ICAR-CIBA and ICAR-CMFRI in technology transfer and farmer training their outreach and performance have at times been hampered by limited manpower, infrastructure and operating budgets (CIBA, 2024). Private extension services under such conditions have assumed importance as an alternative and complementary sources of technical guidance for shrimp farmers. Private extension providers in India include: feed and input firms, pharmaceutical firms, hatcheries and nurseries, experts, government officials, processors/exporters offering backward integration. Shrimp farming is a prominent economic activity in Tamil Nadu, India and it makes a substantial contribution to the state economy in employment generation and export earnings. The sector is supported by good coastal conditions, trained human resources and increasing world demand for shrimp. Spontaneous expansion of shrimp farming generated a chain of challenges, primarily disease management, environmental sustainability and compliance with international quality standards. Extension services can address these challenges by educating farmers to become knowledgeable, skilled and technologically advanced to improve productivity and sustainability. Traditionally, public extension services have been the primary source of assistance for farmers (CAA, 2023).

Private extension services have introduced a new paradigm, offering specialization and market-oriented solutions to farmers. Understanding the perception of shrimp farmers on private extension services in terms of the quality of the service, accessibility, cost, and its effect on farming is the foremost objective of the present study. Deepthi et al., (2024b) established a positive farmers' attitude towards private sector extension services and their existence in twelve major regions. It also established fourteen limitations that hinder the utilization of such services, such as accessibility, affordability, and farmers' trust. The study showed that approximately 40.05 per cent of the respondents reported having a high awareness level of private extension services, while 40.55 per cent reported having a moderate level of awareness. These findings show that a high percentage of shrimp farmers utilize private extension service experts to boost their production levels. Moreover, a report by the Central Institute of Brackish Water Aquaculture (CIBA, 2024) showed the importance of extension services in establishing sustainable aquaculture practices. The report showed the importance of effective extension strategies and the role of private extension staff in knowledge transfer to farmers. This study sought to establish how shrimp farmers' perception of various private extension services plays an important role in enhancing shrimp farming practices.

METHODOLOGY

This study was conducted during 2025 (January to April) to assess the level of perception of shrimp farmers regarding private extension services in the state of Tamil Nadu, India. A study sample size of 150 shrimp farmers were selected from the target districts using a proportionate random sampling technique. The total registered shrimp farms in Tamil Nadu was 2220 (CAA, 2022-23). Five districts were selected for the study based on the highest number of registered shrimp farms namely; Nagapattinam (n=50), Thanjavur (n=28), Thiruvarur (n=25), Cuddalore (n=24) and

Ramanathapuram (n=23). The level of perception of shrimp farmers regarding private extension services was taken as the dependent variable. To better understand the impact of various factors on farmer perceptions, the study considered 17 independent variables, grouped into four categories: socio-personal, socio-economic, socio-communicational and socio-psychological. To measure the level of perception, a pre-tested interview schedule was developed with 15 questions. These questions were grouped under three significant service dimensions: Reliability & responsiveness; expertise & knowledge; and productivity & resources. The responses were measured using a 5-point scale: 5 - Strongly agree, 4 - Agree, 3 - Undecided, 2 - Disagree and 1 - Strongly disagree. This allowed for the quantitative assessment of farmers' perceptions across various dimensions of private extension services and identified areas with effective services or scope for improvement. Data collected through interviews were analysed using the SPSS. Descriptive statistical tools such as frequency and percentage analysis were used, along with spearman's correlation and multiple linear regression analysis, to establish the relationship between the shrimp farmers' perception levels and their socio-personal characteristics. This analytical approach ensured statistically significant findings and provided actionable information for enhancing private extension services in the shrimp farming sector. Spearman's correlation measures the strength of ranked variable relationships from -1 to +1 and Multiple linear regression analyzes how multiple factors affect one outcome. Spearman's Rank Correlation Coefficient (ρ):

$$\rho = 1 - \frac{6\sum d_i^2}{n(n^2 - 1)}$$

Where, ρ = Spearman's rank correlation coefficient, d_i = difference between ranks, n = number of observations.

Multiple Linear Regression:

$$y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k + \epsilon$$

Where, Y = dependent variable, β_0 = intercept, $\beta_1 \dots \beta_k$ = coefficients, $X_1 \dots X_k$ = independent variables, ϵ = error term.

RESULTS

Perception level of shrimp farmers towards private extension services

The result on the perception level of shrimp farmers towards private extension services was evaluated through 15 structured statements using a five-point scale and the results were shown in Table 1. The findings revealed a predominantly positive perception across several service dimensions.

Reliability and responsiveness

A majority of farmers felt that private extension personnel visited them regularly, making it the most significant factor in terms of reliability and responsiveness. Following closely, 33 per cent of farmers considered government extension services reliable, showing that a considerable portion found government services dependable, though less frequent compared to private services. Another

Table 1. Perception of shrimp farmers regarding private extension services

Statements	Percentage				
	SA	A	UD	DA	SDA
Reliability and Responsiveness					
Are government extension services more reliable in delivering farm-related support?	3	33	30	31	3
Do you believe private extension services are more responsive than government extension services?	1	36	33	30	0
Do private extension personnel visit farmers on a regular basis?	27	45	4	24	0
Is the time spent by private extension agents during visits sufficient to address your farming needs?	5	42	25	28	0
Expertise and Knowledge					
Do private extension services effectively meet the needs of small and marginal farmers?	7	50	20	22	1
Do you feel that private extension personnel possess the technical expertise required to solve your problems?	5	49	27	18	1
Do these services assist you in making better planning and farm-related decisions?	7	47	17	28	1
Are private extension agencies effective in delivering technical knowledge related to shrimp culture?	19	39	18	24	0
Do private extension agents motivate you to adopt new or modern farming technologies?	17	31	17	35	0
Do private extension services keep you updated with current market information such as prices and demand?	8	51	32	9	0
Productivity and Resources					
Have private extension services helped improve your farm productivity and income?	26	47	19	7	1
Are private extension services affordable for most farmers, including those with limited resources?	9	44	22	25	0
Are inputs such as feed, seed, fertilizers, & machinery made available to you on time by private extension agents?	12	48	8	32	0
Do you receive assistance in accessing financial or credit support from private extension agencies?	10	39	29	22	0
Do private extension services support you in timely management of soil and water health?	19	40	32	8	1

SA- Strongly Agree, A- Agree, UD- Undecided, DA- Disagree, SDA- Strongly Disagree

important factor was the time spent by agents during visits, with 42 per cent of farmers feeling that the time was sufficient to address their needs. This indicated that many farmers believed the visits were adequately comprehensive. However, 36 per cent of farmers agreed that private extension services addressed their needs more effectively than government services, which highlighted the perception that private services were more responsive, but still not as universally agreed upon as regular visits or reliability.

Expertise and knowledge

Private extension services were widely recognized for effectively meeting the needs of small and marginal farmers, with 50 per cent agreeing on this point. Additionally, 49 per cent of farmers believed that private extension agents had the technical expertise required to solve their farming challenges. However, despite these positive evaluations, there was some mixed feedback regarding decision-making assistance. Forty-seven percent agreed that these services helped in planning. A similar divide occurred when evaluating the effectiveness of private extension services in providing shrimp culture-specific knowledge, where 39 per cent agreed. The motivation to adopt new farming technologies was another area of division, with 35 per cent disagreeing that extension agents effectively encouraged adoption. On a positive note, private extension services received high marks (51%) for keeping farmers informed about market trends, such as prices and demand.

Productivity and resources

The impact of private extension services on farm productivity and income was generally viewed positively, with 47 per cent farmers agreeing and 26 per cent strongly agreeing that these services contributed to improvements. However, affordability remained a concern, as 44 per cent agreed that private services were affordable, suggesting that the costs may have been prohibitive for some

farmers, particularly those with limited resources. Timely access to critical farm inputs, such as feed, seed, fertilizers, and machinery, was reported positively by 48 per cent of farmers, highlighting a gap in the provision of essential resources. The support for obtaining financial or credit assistance from private extension agencies was also mixed, with 39 per cent agreeing that help was provided. Finally, while 40 per cent of farmers agreed that private extension services supported the timely management of soil and water health, indicating a need for improvement in environmental management practices.

Association between independent variables and shrimp farmers' perception of private extension services

The results from the study to analyse the association between selected independent variables (X_1-X_{17}) and shrimp farmers perception on private extension services are given below (Table 2). Age and shrimp farming experience had the highest positive correlations, with values of 0.656 and 0.629, respectively ($p < 0.01$). This suggested that older farmers and those with more experience in shrimp farming tended to have a better perception of these services. Contact with extension agencies and mass media exposure also showed strong positive correlations of 0.502 and 0.562, respectively ($p < 0.01$), indicating that regular interaction with extension agents and increased access to media information improved farmers' views of these services.

Farmers with a scientific orientation, risk orientation and economic motivation showed positive correlations of 0.317, 0.446 and 0.494, respectively ($p < 0.05$ and $p < 0.01$), suggesting that farmers with a greater inclination toward research-based practices, openness to risk and a focus on economic gains had more favorable perceptions of private extension services. In contrast, educational level, pond size and annual income showed very weak or no significant correlations (e.g., 0.022, -0.002 and -0.013, respectively),

indicating these factors did not significantly influence farmers' perceptions. Interestingly, farm size had a weak negative correlation of -0.179 ($p < 0.05$), suggesting that larger-scale farmers may have perceived private extension services less favorably, possibly due to established farming systems or reliance on other support mechanisms (Table 2).

Multiple linear regression analysis on the perception of the shrimp farmers on private extension services

The R-square is 0.647 for the perception level, i.e., the independent variables of the model account for almost 64.7 per cent

Table 2. Association between independent variables and shrimp farmers perception on Private Extension Services

Independent variables	Correlation coefficient (r)
Age (x_1)	0.656**
Educational level (x_2)	0.022NS
Shrimp farming experience (x_3)	0.629**
Ownership of farm (x_4)	0.177*
Farm size (x_5)	-0.179*
Pond size (x_6)	-0.002NS
Annual Income (x_7)	-0.013NS
Annual Expenditure (x_8)	0.022NS
Marketing channel (x_9)	-0.115NS
Contact with extension agencies (x_{10})	0.502**
Mass media exposure (x_{11})	0.562**
Utilization of ICT tools (x_{12})	-0.147NS
Need of extension services (x_{13})	-0.444**
Innovativeness (x_{14})	0.011NS
Scientific orientation (x_{15})	0.317*
Risk orientation (x_{16})	0.446**
Economic motivation (x_{17})	0.494**

NS = Non-Significant, ** = Significant at 0.01 level, * = Significant at 0.05 level

of the variation in perception. This is an indication that the model is a good fit to extent, i.e., the model accounts for a high percentage of the determinants of perception level of shrimp farmers on private extension services (Table 3).

The regression results, several variables influenced shrimp farmers' perceptions of private extension services. Age had a significant positive effect, with a coefficient of 0.254 and a p-value of 0.010 ($p < 0.01$), indicating that older farmers held more favorable views of these services. Shrimp farming experience also had a positive relationship, with a coefficient of 0.084 and a p-value of 0.022 ($p < 0.05$), suggesting that more experienced farmers perceived the services more positively. Annual income was another significant factor, with a coefficient of 0.073 and a p-value of 0.046 ($p < 0.05$), meaning wealthier farmers had better perceptions of private extension services. Similarly, contact with extension agencies showed a positive impact, with a coefficient of 0.234 and a p-value of 0.012 ($p < 0.05$), indicating that farmers who interacted more with extension agents had more favorable perceptions. Economic motivation also played a role, with a coefficient of 0.131 and a p-value of 0.046 ($p < 0.05$), suggesting that farmers motivated by financial gains viewed the services more positively. In contrast, educational status, ownership of farm, farm size, and pond size had no significant impact on perceptions, as their p-values were above 0.05. Additionally, variables such as annual expenditure, marketing channel, utilization of ICT tools, need for extension services, innovativeness, scientific orientation, and risk orientation showed no significant effect on farmers' perceptions.

Challenges of shrimp farmers towards private extension service

Figure 1 revealed private extension services played a crucial role in improving shrimp farming by providing expert advice on health management, feeding practices and overall farm productivity.

Table 3. Multiple linear regression analysis on shrimp farmers' perception of private extension services

Variables	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	Reg. Coeff. B	Std. Error	Beta		
Age (x_1)	0.254	0.097	0.355	2.624	0.010
Educational status (x_2)	-0.002	0.017	-0.006	-0.098	0.922
Shrimp farming experience (x_3)	0.084	0.044	0.173	1.908	0.022
Ownership of farm (x_4)	0.054	0.072	0.043	0.751	0.454
Farm size (x_5)	-0.101	0.075	-0.104	-1.346	0.181
Pond size (x_6)	0.130	0.096	0.082	1.353	0.178
Annual income (x_7)	0.073	0.038	0.158	1.931	0.046
Annual expenditure (x_8)	-0.019	0.053	-0.028	-0.358	0.721
Marketing channel (x_9)	0.006	0.048	0.008	0.135	0.893
Contact with extension agencies (x_{10})	0.234	0.146	0.143	1.601	0.012
Mass media exposure (x_{11})	0.082	0.116	0.060	0.710	0.056
Utilization of ICT tools (x_{12})	0.039	0.057	0.041	0.682	0.497
Need of extension services (x_{13})	0.011	0.063	0.015	0.181	0.857
Innovativeness (x_{14})	0.063	0.072	0.059	0.871	0.385
Scientific orientation (x_{15})	0.068	0.057	0.091	1.193	0.235
Risk orientation (x_{16})	0.085	0.048	0.143	1.780	0.077
Economic motivation (x_{17})	0.131	0.065	0.149	2.014	0.046

R square = 0.647, Adjusted R Square= 0.601, Std. Error of the Estimate= 0.339

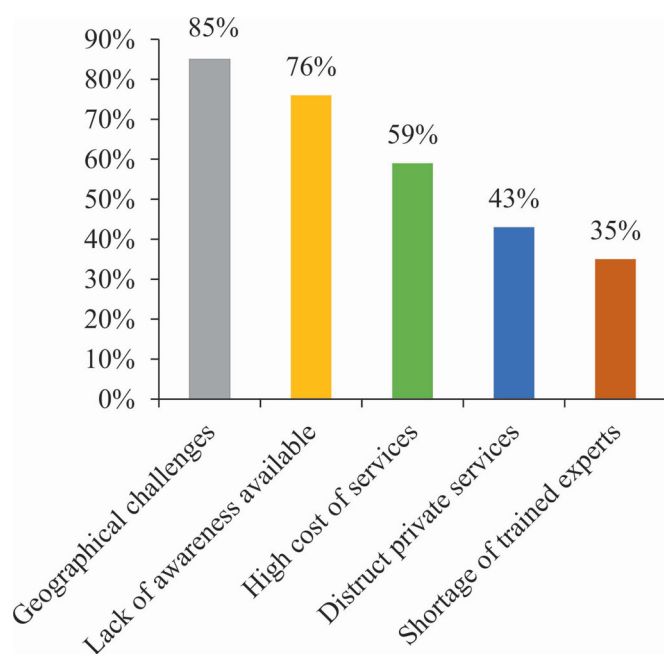


Figure 1. Challenges faced by shrimp farmers with private extension services

However, shrimp farmers faced several significant challenges in accessing these services, which impacted their ability to adopt best practices and enhance their economic outcomes. The most significant barrier was geographical access, with 85 per cent of the 150 respondents reporting that remote farming areas, often with poor infrastructure and high transportation costs, made it difficult for extension services to reach them. This limited access delayed the implementation of improved farming techniques and reduced farm efficiency. Another major challenge was a lack of awareness about available services, which 76 per cent of the 150 respondents highlighted. Many farmers were unaware of the resources that could have helped improve their farming practices due to ineffective communication and outreach by service providers. The high cost of services also posed a challenge, reported by 59 per cent of the 150 respondents. Private extension services often charged for consultancy, training and technology, making it difficult for small-scale farmers to afford these services. Distrust in private services was another issue, with 43 per cent of the 150 respondents indicating they felt these services were profit-driven rather than genuinely focused on farmer welfare. Finally, 35 per cent of the 150 respondents noted a shortage of trained experts with specialized knowledge of shrimp farming, especially in rural areas, limiting the support available for adopting new technologies and practices. Addressing these challenges through improved communication, reduced costs and more access to skilled professionals could have helped empower farmers to improve farming practices, boost productivity and achieve better economic outcomes.

DISCUSSION

The present study analyzes the impact of private extension services on shrimp farming in Tamil Nadu. The findings indicate

that these services have a positive impact on farm productivity and income. Therefore, it can be inferred that promoting private extension services enhances shrimp farming productivity and income in the region. This finding is supported by earlier literature on private extension services in agriculture and aquaculture, which show similar positive outcomes for shrimp farming, although some studies exhibit the similar results (Kavakebi et al., 2023; Kabir & Islam, 2023; Rojas et al., 2020; Deepthi et al., 2024b). Also identifies several factors that influence the performance of private extension services in Tamil Nadu. For instance, the regularity of visits by extension agents positively impacts shrimp farming productivity. This finding aligns with previous research, which suggests that regular visits from extension agents are crucial for providing ongoing support and ensuring the successful adoption of new practices (Mamun-ur-Rashid et al., 2018; Ganpat et al., 2017; Nyairo, 2020; Kumar et al., 2025). Additionally, the timeliness of inputs, such as feed, seed and fertilizers, plays a significant role in improving farm operations. Previous studies emphasize the importance of timely input delivery in boosting agricultural productivity (Global Seafood Alliance, 2023).

Moreover, the study suggests that the technical knowledge provided by private extension agents significantly impacts shrimp farming outcomes. This knowledge indirectly promotes better practices in areas such as disease control, water quality management and feed optimization. In contrast, there is a positive correlation between the level of technical knowledge offered by extension services and the performance of shrimp farming. These findings align with previous research, which highlights the crucial role of technical expertise in improving agricultural practices and productivity (Iakovidis et al., 2023; Farshad & Niknami, 2024; Misra et al., 2025). Affordability remains a significant concern for shrimp farmers, as only 47 per cent of respondents find private extension services affordable, indicating the financial barriers that many farmers face in accessing these services. This issue is consistent with previous research, which highlights the challenges smallholder farmers encounter when services are beyond their financial reach. The affordability issue is particularly concerning for farmers with limited resources who are dependent on accessible and cost-effective support to enhance productivity and income (Bakang et al., 2024). The study finds that while shrimp farmers recognize the impacts of climate change, their adaptive capacity remains limited due to inconsistent and costly extension services. This aligns with earlier findings that emphasize the need for extension services to be more adaptive and tailored to the specific challenges posed by climate change in agricultural practices (Pradhan et al., 2025). Socio-economic factors, such as the experience of farmers and their contact with extension agencies, significantly influence their perceptions and ability to adapt. These findings echo research that shows how crucial socio-economic factors, including farm size, income and access to resources, are in determining the effectiveness of agricultural and shrimp farming services (Sabu et al., 2025; Deepthi et al., 2024a).

CONCLUSION

The study reinforced the importance of private extension services in supporting the shrimp farming industry, particularly in improving productivity and farm income. However, several

challenges persist, especially the affordability, consistency, and delivery of the private extension services, and fulfilling the need for more targeted advice. The findings highlighted the value of a pluralistic extension model that combines both public and private extension systems to maximize outreach and effectiveness of private extension services. Policymakers and extension providers should consider strengthening collaboration between the public and private sectors for improving service delivery mechanisms and addressing farmers' concerns on costs and expenditures. These efforts can lead to more sustainable aquaculture practices and improved farmer well-being in the shrimp farming sector.

DECLARATIONS

Ethics approval and informed consent: Informed consent was sought from the shrimp farmers during the course of the research.

Conflict of interest: The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

The authors declare that during the preparation of this work, thoroughly reviewed, revised, and edited the content as needed. The authors take full responsibility for the final content of this publication.

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