

Article

Fish Farmers' Perceptions of the Role of Fisheries Extension Workers in Developing Aquaculture Businesses in Loa Kulu

Baiq Sulisty Rini ¹, Helminuddin ², Fitriyana ^{3*}

^{1,2,3} Mulawarman University, Indonesia; email: fitriyana@fpik.unmul.ac.id

* Corresponding Author : Fitriyana

Abstract: The aim of this research was to analyze the perception of fish farmers towards the role of fisheries extension workers in fostering fish farming businesses in Loa Kulu District, Kutai Kartanegara Regency. This study used the method of analyzing the level of perception of fish farmers; analysis of the profile and characteristics of fish farmers; and Spearman Rank correlation analysis. The results showed that the level of perception of fish farmers towards the role of fisheries extension workers as educators, facilitators, motivators, innovators, advocates, organizers and evaluators was included in the high/good category. The fish farmers in this study consisted of 37 men and 5 women with different characteristics. Internal factors (age, income and land area) and external factors (interaction with extension workers; interaction with traders; availability of market information and availability of aquaculture science and technology) were significantly correlated with the perception of fish farmers towards fisheries extension workers

Keywords: Fisheries Extension Workers, Kutai Kartanegara, Perception Level.

1. Introduction

Fisheries extension is a strategic activity that aims to target the main actors of the fisheries industry in order to improve their competence and welfare [1]. Those who carry out fisheries extension are called extension workers who are limited to a wide range of work [2]. Extension activities are supported by the interests of members who need it in the effort to advance fisheries [3]. For behavior change to occur, extension involves an active process that requires interaction between the extension worker and the person being taught [4][5]. Extension workers play an important role in building community attitudes towards extension activities and farmer group participation. The material presented by an extension worker supports management in improving the welfare of fisheries business actors [2].

Perception is a process used by individuals to know and understand something [6]. Perception is very important to produce community judgment, which will affect business policies and evaluation materials for the future [7]. Community perceptions of the program determine the desire to be involved in a program [8]. Fish farmers' perceptions help farmers understand the facilities and programs provided by extension officers to members of fish farmer groups (POKDAKAN) and assess the performance of fisheries extension officers [9]. The performance of fisheries extension workers shows how well their main tasks can be completed according to standards [9].

Loa Kulu Sub-district is one of 20 sub-districts in Kutai Kartanegara Regency, known as the center of fisheries production which has an area of 1,405.70 km² with a population of 57,048 people. Aquaculture in Loa Kulu Sub-district in 2023 was recorded to produce 14,585.89 tons of fisheries production or 7.98% of the total production in Kutai Kartanegara Regency [10]. Based on data from the relevant fisheries extension program in 2024, it is

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known that fish enlargement activities are the most popular activities by the community in Loa Kulu Subdistrict because there are more farmers who focus on conducting enlargement business activities, namely 55 Pokdakan while groups that focus on hatchery business are 13 Pokdakan with a total of 719 farmers.

Several studies have shown that since the last few years, extension programs have faced problems with an inadequate number of extension workers who cannot reach every region and the quality of extension workers is not optimal [4][11],[12], [13], [14], [15]. This phenomenon also occurs in Kutai Kartanegara Regency where 1 extension worker is assigned to foster 2 sub-districts including Loa Kulu sub-district. Therefore, researchers are interested in analyzing the level of perception of fish farmers towards the role of fisheries extension workers, analyzing the profile and characteristics of fish farmers and analyzing the relationship between internal factors and external factors on the level of perception of fish farmers towards the role of fisheries extension workers in Loa Kulu District, Kutai Kartanegara Regency.

2. Literature Review

Perception is a process used by a person to know and understand something [6]. Perception is the impression or response that a person has after their five senses receive knowledge about something and then combine their own thoughts, feelings, and experiences [16]. [17] stated that the characteristics of the main actors are directly related to perception, namely the level of cosmopolitanism, natural conditions, social interactions, culture and economic conditions of the main actors. [18] stated that social changes that occur in society also change their perceptions and perspectives on nature. [19] stated that a person's socio-economic characteristics such as experience and income will influence perception, in addition to elements such as religion, acceptance of government programs and subsidies, and sales of by-catch also contribute to this perception.

A person's perception can be influenced by internal factors (within a person) and external factors (from outside a person). Internal factors are factors that come from within a person [19]. External factors are factors that come from outside a person such as family environment and community factors [20]. Internal factors are characteristics inherent in a person such as age, education, number of dependents, cultivation experience, income, land area and participation in group activities, while external factors are factors that include relationships with other people such as interactions with extension workers; interactions with traders, availability of market information and the existence of cultivation science and technology [21]. This is supported by other studies by [22] and [23] which show that knowledge is related to a person's perception.

Penelitian lain oleh [24] menemukan bahwa pendidikan sangat penting untuk pembentukan identitas seseorang dan pengembangan kapasitas diri karena berhubungan dengan pengetahuan seseorang. Sedangkan [25] juga menemukan bahwa kurangnya interaksi antara pengelola proyek dan sasaran kegiatan dapat berhubungan dengan rendahnya tingkat persepsi mereka pada suatu kegiatan/proyek. Berdasarkan hal tersebut maka dapat disimpulkan bahwa bentuk interaksi dengan pengelola proyek dan pengetahuan mengenai suatu proyek dapat menjadi faktor eksternal yang berhubungan dengan tingkat persepsi seseorang. Persepsi seseorang terhadap suatu objek akan positif jika sesuai dengan kebutuhannya, tetapi akan negatif jika tidak sesuai dengan kebutuhan orang tersebut [8]. [26] menyatakan bahwa persepsi dapat diukur dengan indikator sikap dan pemahaman. Persepsi masyarakat akan menggambarkan tingkat partisipasi masyarakat [27].

3. Proposed Method

3.1. Research Time and Location

The research location chosen in this research is in Loa Kulu District, Kutai Kartanegara Regency. The duration of the research is for 10 months starting from June 2024 to March 2025.

3.2. Sampling Method

The population in this study were fish farmers who were members of fish farmer groups assisted by fisheries extension workers in Loa Kulu District, Kutai Kartanegara Regency. Sampling was done using the Slovin formula (Bungin, 2005), as follows:

$$n = \frac{N}{1 + N (d)^2}$$

Description:

n = Number of samples

N = Total population

d = Precision Value (determined at 85% or $\alpha = 15\%$)

Arikunto (2016) states that if the population is more than 100, then the allowable margin of error is 10 - 15%. The total population of fish farmers in Loa Kulu District is 719 fish farmers. Based on the results of calculations using the Slovin formula with an error rate of 15%, a minimum sample size of 42 respondents was obtained.

Fish farmer respondents were spread across 10 villages, so sampling in each village was conducted using a *proportionate stratified* random sampling technique. This method is a sampling technique used when the stratum members in the population are not equal. In this way, the characteristics of each stratum are found proportionally (Zuriah, 2006).

Table 1. Fish Farmer Respondent Collection Technique.

No.	Location (Village)	Population (people)	Percentage (%)	Number of Samples (Soul)
1.	Rempanga	206	0.06	12
2.	Jembayan	150	0.06	9
3.	Ponoragan	117	0.06	7
4.	Loa Kulu Kota	104	0.06	6
5.	Source.	50	0.06	3
6.	Deal	23	0.06	1
7.	Jonggon Jaya	20	0.06	1
8.	Lung Anai	23	0.06	1
9.	Payang River	16	0.06	1
10.	Jembayan Tengah	10	0.06	1
Total		719	0.06	42

3.3. Data Analysis Method

Data analysis in this study used descriptive and correlational methods that combine qualitative and quantitative approaches.

3.3.1. Analysis of the Level of Perception of Fish Farmers towards the Role of Fisheries Extension.

Knowing the level of perception of fish farmers towards the role of extension workers, calculations are used: (Total Score)/(Highest Score) X 100%

Data interpretation criteria for farmers' perceptions of the role of fisheries extension workers:

Figure 33.33% - 55,55 % = Less of a Role

Figure 55.56% - 77,77 % = Somewhat Instrumental
 Figure 77.78% - 100% = Very Instrumental

3.3.2. Analysis of Profile and Characteristics of Fish Farmers.

The profile and characteristics of fish farmers were analyzed descriptively quantitatively. The data analysis process was:

3.3.2.1. Organize the data on age (X1.1), education (X1.2), length of business (X1.3), income (X1.4), pond area (X1.5) and number of dependents (X1.6) into frequency distribution data using the Sturges formula (Hasan, 2011):

3.3.2.1.1. Sort data from smallest to largest.

3.3.2.1.2. Determine the range of the data:

Range = largest data - smallest data

3.3.2.1.3. Determine the length of the class interval.

Length of class interval (i) = (range (R)) / (total class (k))

Description:

The number of classes is 3 (poor, fair and good).

3.3.2.2. Further data analysis is carried out quantitatively so that the data collected can be quantified and in the form of counts/numbers (Zuriah, 2006). For data on sub-variables of group activities (X1.7), relationship with extension workers (X2.1), relationship with traders/collectors (X2.2), availability of market information (X2.3), availability of cultivation science and technology (X2.4) and the sub-variable level of fish farmers' perception of the role of extension workers, namely the role of educator (Y1), dissemination facilitator (Y2), motivator (Y3), innovator (Y4), advocate (Y5), organizer (Y6) and monitoring and evaluation (Y7) were analyzed using a Likert scale. The Likert scale model is a form of questionnaire that reveals the attitudes of respondents in the form of answers (questions), each of which has its own score according to the positivity or negativity of the item (Subana and Sudrajat, 2010). The procedure in analyzing the data is: Giving scores to each data consisting of 3 (three) levels, namely less, enough and good. Data tabulation using frequency distribution.

3.3.2.3. The overall data was analyzed by percentages based on the answer categories.

3.3.3. Spearman Rank Correlation Analysis.

The formula used to analyze the Spearman Rank correlation test is the formula (Hasan, 2011):

$$r_s = 1 - \frac{6\sum d^2}{n(n^2 - 1)}$$

Description:

r_s = Spearman Rank correlation coefficient

d = Difference in ranking

n = Number of rank pairs

The degree of relationship is expressed in the correlation coefficient index. The index is between -1 and +1. Negative numbers indicate a negative correlation, meaning inversely proportional. While positive numbers indicate a directly proportional direction or positive correlation, the meaning contained in a positive correlation shows the same direction (Zuriah, 2006). Determining the closeness of the relationship or correlation between these variables, can be seen as follows (Hasan, 2011):

KK = 0 : No correlation

$0 < KK \leq 0.20$: Very low/very weak correlation

$0.20 < KK \leq 0.40$: Low/weak but definite correlation

$0.40 < KK \leq 0.70$: Significant correlation

$0.70 < KK \leq 0.90$: High, strong correlation

$0.90 < KK < 1$: Very high correlation, very strong, reliable

KK = 1 : Perfect correlation

4. Results and Discussion

4.1. Characteristic of Fish Farmers

Respondents in this study were dominated by male fish farmers, namely 37 people or around 88.10% of the total respondents. The small number of female fish farmers is due to the assumption that fish farming activities are more suitable for men than women. This is in line with the research of [28] which states that women dominate the division of labor at home, while men dominate in productive, social, and access to family resources.

Respondents are in the age range between 21 years and 65 years with an average age of 47 years. Age can be categorized into the unproductive category at the age of less than 15 years, productive age at the age of 15-64 years, and the less productive category at the age of more than 64 years [29]. [30] stated that age is an important factor in managing aquaculture businesses because it is related to a person's physical condition, energy, and enthusiasm for work.

Respondents have different educational backgrounds ranging from never attending school to undergraduate education (S1). Most respondents have completed their education at the high school level, namely 19 people or around 45.24% of the total respondents. The quality of work of farmers will be greatly influenced by the role of the government in providing non-formal education, such as counseling, training, and mentoring [30]. Respondents had a length of business between 2 years and 32 years with an average of 11 years. During the fish farming process, work experience is very important because it can build skills to deal with problems in the field [31].

The income of fish farming in Loa Kulu sub-district is in the range of Rp 4,010,924.21/month to Rp 242,389,982.14/month. All fish farmer respondents have an income above the minimum wage of Kutai Kartanegara Regency in 2024 which amounted to Rp 3,536,506.28 and the minimum wage of East Kalimantan Province in 2024 which was determined through East Kalimantan Governor Decree No.100.3.3.2/K.814/2023 which amounted to Rp 3,360,858, -/month. Respondents have a variety of dependents, ranging from having no dependents to 5 people. [29] stated that family size is an important factor in the social circumstances of cultivators, because the number of needs increases with the number of family members. Respondents had a variety of land areas in the range of 6 m² to 30,000 m².

The area of land owned has a significant negative impact on the productivity of aquaculture ponds, this is because the size of the pond is a divisor of the amount of production generated from an aquaculture business [32]. Most respondents, namely 35 people or around 83.33% of the total respondents, were included in a high level of activeness in fish farmer group activities. The number of farmers who are actively involved in fish farmer groups is positively correlated with their level of participation in fisheries extension [21].

4.2. Level of Perception of Fish Farmers towards the Role of Fisheries Extension Officers

4.2.1. Role as an educator

Table 2. The role of fisheries extension officer as educators.

No.	Role as an educator	Average Score	Percentage (%)	Description
1.	Low			
2.	Medium	32,64	90,67	High
3.	High			

The level of perception of fish farmers towards fisheries extension workers as educators is in the high category at 90.67%. Fisheries extension officers always try to share the latest knowledge about aquaculture so that it becomes additional knowledge for fish farmers and can be implemented in order to increase their income. This is in line with the

results of research by [33] which states that fish farmers consider that fisheries extension workers are very helpful in improving their aquaculture skills, which leads to better and more productive results.

4.2.2. Role as Facilitator

Table 3. The role of fisheries extension officer as facilitator.

No.	Role as Facilitator	Average Score	Percentage (%)	Description
1.	Low			
2.	Medium	11,62	96,83	High
3.	High			

Source: Processed Primary Data, 2025.

Table 3 shows that the level of perception of fish farmers towards fisheries extension workers as facilitators is in the high category at 96.83%. This means that fisheries extension workers have played a very important role as facilitators for fish farmers. This is not in line with the research of Ananda et al. (2023) which states that the role of fisheries extension as a facilitator is included in the category of moderate role.

4.2.3. Role as Motivator

Table 4. The Role of Fisheries Extension Officers as Motivators.

No.	Role as Motivator	Average Score	Percentage (%)	Description
1.	Low			
2.	Medium	11,43	95,24	High
3.	High			

Source: Processed Primary Data, 2025.

Table 4 shows that the level of perception of fish farmers towards fisheries extension workers as motivators is in the high category at 95.24%. Fisheries extension officers always provide motivation to fish farmers in the form of stories of experiences of friends who have been more successful to increase the business enthusiasm of fish farmers. This is in line with the research of [34] and Ananda et al. (2023) which stated that most respondents assessed the role of extension workers as motivators in carrying out their duties as optimal or good.

4.2.4. Role as an Innovator

Table 5. The role of fisheries extension officer as Innovators.

No.	Role as Innovators	Average Score	Percentage (%)	Description
1.	Low			
2.	Medium	11,40	95,04	High
3.	High			

Source: Processed Primary Data, 2025.

Table 5 shows that the level of perception of fish farmers towards fisheries extension workers as innovators is in the high category at 95.04%. Fisheries extension officers always encourage fish farmers to continue to improve their production through technological innovations and cultivation techniques. Nurdin and Effendi (2020) added that fisheries extension workers help fisheries groups gain access to fisheries technology and information. [33] in their research showed that extension workers have brought new ideas and changes very well, but they have not been fully perfect in performing and building their role as drivers of innovation.

4.2.5. Role as an Advocator

Table 6. The role of fisheries extension officer as advocators.

No.	Role as Advocators	Average Score	Percentage (%)	Description
1.	Low			
2.	Medium	13,95	93,02	High
3.	High			

Source: Processed Primary Data, 2025.

Table 6 shows that the level of perception of fish farmers towards fisheries extension workers as advocates is in the high category at 93.02%. [33] in their research showed that the role of extension workers is still not too large in providing advice, input, and support. Although extension workers participate in many activities, their function as mentors and providing advice is still not fully carried out. This may be due to their limited time and meetings to assist the groups.

4.2.6. Role as an Organizer

Table 7. The role of fisheries extension officer as organizers.

No.	Role as Organizers	Average Score	Percentage (%)	Description
1.	Low			
2.	Medium	14,57	97,14	High
3.	High			

Source: Processed Primary Data, 2025.

Table 7 shows that the level of perception of fish farmers towards fisheries extension workers as organizers is in the high category at 97.14%. This is in line with the research of Ristanto et al. (2022) which states that fisheries extension workers have worked well as organizers. Hasanah et al. (2022) added that the level of the role of fisheries extension workers as organizers is high because extension workers have succeeded in helping farmers make business plans and marketing plans for their products, and they divide tasks very efficiently for each fish farmer.

4.2.7. Role as Monitor and Evaluator

Table 8. The role of fisheries extension officer as monitor and evaluator.

No.	Role as Monitors and Evaluators	Average Score	Percentage (%)	Description
1.	Low			
2.	Medium	26,26	87,54	High
3.	High			

Source: Processed Primary Data, 2025.

Table 8 shows that the level of perception of fish farmers towards fisheries extension workers as evaluators is in the high category at 87.54%. Fisheries extension officers routinely ask about business progress or obstacles faced by fish farmers as evaluation material for future cultivation efforts. This is in line with the research of [34] which states that extension workers have played a role in conducting supervision and evaluation to assess business progress.

4.3. Factors Associated with the Level of Perception of Fish Farmers towards the Role of Fisheries Extension Officers

4.3.1. The Relationship between Internal Factor Variables (X₁) and Fish Farmers' Perception of the Role of Fisheries Extension (Y).

Table 9. Relationship between Sub Variable X₁ and Sub Variable Y

No.	Sub Variables	Educator r (Y ₁)	Facilitator or (Y ₂)	Motivator r (Y ₃)	Innovator r (Y ₄)	Advocator or (Y ₅)	Organizer (Y ₆)	Evaluator r(Y ₇)
1.	Age (X _{1.1})	-0,151	-0,086	-0,284	-0,193	-0,184	-0,143	-0,316*
2.	Education (X _{1.2})	-0,010	0,020	-0,090	-0,048	-0,048	0,008	0,130
3.	Length of business (X _{1.3})	-0,068	0,200	-0,182	-0,009	0,034	0,106	-0,093
4.	Income (X _{1.4})	0,403**	0,177	0,237	0,302	0,293	0,251	0,307*
5.	Land Area (X _{1.5})	0,267	-0,162	0,362*	0,188	0,150	0,106	0,236
6.	Dependents (X _{1.6})	-0,029	0,003	0,057	-0,171	-0,138	-0,138	-0,118
7.	Participation (X _{1.7})	0,226	0,114	-0,048	0,083	0,085	0,018	0,261

Description:

rs (db=42) with α 0.05 = 0.305

rs (db=42) with α 0.01 = 0.395

* Significant correlation at α = 0.05 level (two-way test).

** Very significant correlation at α = 0.01 level (two-way test).

Source: Processed Primary Data, 2025.

The results of the calculation of the Rank Spearman correlation value show that the correlation of the internal factor sub-variables that have a real correlation at the 95% confidence level as evidenced by the calculated rs value in the sub-variable greater than the rs table ($\alpha=0.05$) of 0.305 is in the age sub-variable to the role as evaluator (0.316); the income sub-variable to the role as educator (0.403) and evaluator (0.307); and the land area sub-variable to the role as motivator (0.362).

Based on Hasan's (2011) criteria for relationship closeness, the correlation value of the age sub-variable to role of extension workers as evaluators of -0.316 is weak but certain and negative. This gives the interpretation that the higher the age of fish farmers, the lower the level of perception of fish farmers towards the role of extension workers as evaluators.

The correlation value of the income sub-variable to the role of extension workers as educators of 0.403 is significant and positive. This gives the interpretation that the higher the income of fish farmers, the higher the level of perception of fish farmers towards the role of extension workers as educators. The correlation value of the income sub-variable to the role of extension workers as evaluators of 0.307 is weak but certain and positive. This gives the interpretation that the higher the income of fish farmers, the higher the level of perception of fish farmers towards the role of extension workers as evaluators.

The correlation value of the sub-variable of land area to the role of extension workers as motivators of 0.362 is weak but certain and positive. This gives the interpretation that the more extensive the land area of fish farmers, the higher the level of perception of fish farmers towards the role of extension workers as motivators.

4.3.2. The Relationship between External Factor Variables (X₂) and the Level of Fish Farmers' Perception of the Role of Fisheries Extension (Y).

Table 10. Relationship between Sub Variable X₂ and Sub Variable Y

No.	Sub Variables	Educator (Y ₁)	Facilitator (Y ₂)	Motivator (Y ₃)	Innovator (Y ₄)	Advocator (Y ₅)	Organizer (Y ₆)	Evaluator (Y ₇)
1.	Interaction with Extension Workers (X _{2.1})	0,187	0,211	0,127	0,237	0,239	0,214	0,364*
2.	Interaction with Traders (X _{2.2})	0,185	0,332*	-0,002	0,268	0,286	0,197	0,313*
3.	Availability of Market Information (X _{2.3})	0,257	0,218	0,179	0,373*	0,358*	0,356*	0,367*
4.	Availability of Cultivation Science and Technology (X _{2.4})	0,165	0,332*	0,272	0,424**	0,425**	0,386*	0,388*

rs (db=40) with α 0.05 = 0.313

rs (db=40) with α 0.01 = 0.405

Description:

* Significant correlation at $\alpha = 0.05$ level (two-way test).

** Very significant correlation at $\alpha = 0.01$ level (two-way test).

Source: Processed Primary Data, 2025

The results of the calculation of the Rank Spearman correlation value show that the correlation of external factor sub variables that have a real correlation at the 95% confidence level as evidenced by the calculated r_s value in the sub variable is greater than the r_s table ($\alpha = 0.05$) which is 0.305 is in the sub variable of interaction with extension workers to the role of evaluator (0.364); the sub variable of interaction with traders to the role as facilitator (0.332) and evaluator (0.313); the sub variable of availability of market information to the role as innovator (0.373), advocator (0.358), organizer (0.356) and evaluator (0.367); and the availability of cultivation science and technology on the role as facilitator (0.332), innovator (0.424), advocator (0.425), organizer (0.386) and evaluator (0.388).

Based on Hasan's (2011) criteria for relationship closeness, the correlation value of the sub-variable of interaction with extension workers on the role as evaluator of 0.364 is weak but certain and negative. This gives the interpretation that the higher the interaction with extension workers, the higher the level of perception of fish farmers towards the role of extension workers as evaluators. The correlation value of the sub-variable of interaction with traders to the role as facilitator (0.332) and evaluator (0.313) is weak but certain and negative. This gives the interpretation that the higher the interaction with traders, the higher the level of perception of fish farmers towards the role of extension workers as facilitators and evaluators.

The correlation between the availability of market information and the roles of innovator (0.373), advocator (0.358), organizer (0.356) and evaluator (0.367) is weak but certain and negative. This implies that the higher the availability of market information, the higher the level of perception of fish farmers towards the role of extension workers as innovators, advocators, organizers and evaluators.

The correlation value of the cultivation science and technology availability sub-variable to the role as facilitator (0.332), organizer (0.386) and evaluator (0.388) is weak but certain and negative. While the sub-variable availability of cultivation science and technology on the role as an innovator (0.424) and advocator (0.425) is significant and positive. This gives an interpretation that the higher the availability of aquaculture science and technology, the higher the level of perception of fish farmers towards the role of extension workers as facilitators, innovators, advocators, organizers and evaluators.

5. Conclusions

Fisheries extension activities are community empowerment activities that involve interaction between fisheries extension workers and fisheries actors, including fish farmers. Effective counseling will occur if there is a good perception of fish farmers towards fisheries extension workers and their activities. Fish farmers in this study consisted of 37 men and 5 women with different characteristics. The level of perception of fish farmers towards the role of fisheries extension workers as educators, facilitators, motivators, innovators, advocates, organizers and evaluators is in the high/good category. Internal factors (age, income and land size) and external factors (interaction with extension workers; interaction with traders; availability of market information and availability of aquaculture science and technology) were significantly correlated with fish farmers' perceptions of fisheries extension workers.

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