THE IMPACT OF FISH FARMERS' GROUP PARTICIPATION ON THE CATFISH SECTOR INCOME IN PRINGSEWU DISTRICT

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Abstract

Background: Challenges farmers face such as low bargaining power, difficulty accessing information regarding farming and marketing of production can be overcome if catfish farmers are active in fish farmers' groups. Fish farming groups were formed to increase their members' farming income, through implementing fisheries businesses supported by infrastructure assistance from the Government.
Purpose: This research aims to analyze the role of fish farmers groups towards members, analyze catfish on farm income, and analyze differences in income based on participation in farming groups.
Design/methodology/approach: This study used a non-probability sampling method to sample 100 catfish farmers which is divided into 51 members and 49 non-members of the fish farming group. The method used is quantitative analysis using Endogenous Switching Regression (ESR) model analysis.
Findings/Result: The results of the research show that the fish farmers group has a sufficient role as a place for teaching and learning, a place for cooperation and production units, and the rho (ρ) value in the ESR model estimation shows that participation in farmers group has a positive impact on the income of members of catfish farming, namely that members' on farm income is greater than the income of random sample individuals and the income of non-members of the fish farmers group.
Conclusion: Role and participation in fish farming groups have a positive impact on members' on farm income, namely members' income is greater than non-members, and members' on farm income can increase.
Originality/value (State of the art): This research uses exogenous and endogenous variables which together in the ESR method can influence participation decisions in fish farming groups. Research by Mutiara et al. (2023) used a questionnaire to analyze the role of cultivation groups qualitatively, while in the research, apart from using a questionnaire with a Likert scale, empirical evidence was also carried out using the ESR model.

Keywords: Analytical Hierarchy Process, corporate sustainability indicators, sustainability practices, performance measurements, PT. Sido Muncul Tbk

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INTRODUCTION

Problems such as low bargaining power, difficulty in obtaining market information, developments in technological innovation, and uneven marketing of production products, especially in non-catfish-producing areas, are challenges for small-scale catfish farmers. This challenge can be somewhat overlooked by catfish farmers due to the high demand for catfish, so farmers continue to carry out the farming. Apart from the high demand which affects production, the ease of farming catfish compared to other freshwater fish and the empowerment of farmers are considerations to continue producing. The issue of challenges and catfish production is by research Anashrullah and Yusuf (2021) which explains that obstacles in catfish agribusiness accompanied by farmer empowerment will increase loyalty in catfish farming. Catfish is produced by all districts in Lampung Province and reached production of 34,430 tons in 2021. Pringsewu Regency is in third place as the highest producer of catfish after Central Lampung Regency and South Lampung Regency with a production level of 15.39 percent of total production in 2021 (BPS, 2023). Production that is quite high is not in line with the population, resulting in low demand for catfish in Pringsewu Regency and the production must be marketed outside the area

Studies regarding the collective actions of farmers are increasingly developing, however studies in the Indonesian context, especially regarding the influence of fish farming group participation and its role in the sustainability of aquaculture businesses, still require further exploration. The grouping of fish farmers originates from Minister Regulation of Maritime and Fisheries No. 41/PERMEN-KP/2015 which defines the fish farming group as a collection of main actors in the field of aquaculture whose livelihoods are in the field of fish farming (Permen, 2015). Apart from the Minister's decision regarding the formation of fish farming groups, what must be continued and developed is the management of institutional aspects so that these institutions can continue to produce positive roles for their members. The Indonesian government's attention to farm institutions must be aligned with public awareness regarding the sustainability of farm businesses with good processes and results, especially for the farming community itself. In reality, there are still many people who think that fish farming groups do not increase farm productivity or provide economic benefits. This assumption has an impact on activities within the fish farmers' group which do not run well, so that in the end the fish farmers' group does not play any role as a farming institution.

This research explores the role and impact of participation in fish farming groups on farming income. Implementation of the role of fish farming groups following the mission of formation in Law No. 7 of 2016 will increase farm income, especially in the production and marketing aspects. This is because these two things are related to the costs of production factors and the selling price of production results. This research not only looks at the variable costs of production factors and participation in fish farming groups as stated in the research of Nashrullah et al. (2023), but also analyzes factors outside of the farm that can influence participation decisions and farm income as a whole. indirect. These exogenous factors are variables that are not directly observed but can influence participation decisions in fish farming groups

Participation in fish farming groups is an effective strategy for small farmers to access agribusiness supporting institutions, especially with the development of product quality standards and systems for procuring production factors and fulfilling demand for production results (Mutiara et al. 2023). Several studies have emphasized the role of fish farming groups in increasing the adoption of innovation and technology in farming practices and analyzed the role of fish farming groups in fish farming income (Puspita and Sunartomo, 2019; Sekarwangi and Herdiana, 2021). Research by Prihatini et al. (2022) and Nashrullah et al. (2023) show that there is a positive influence from fish farming groups in increasing the income of fish farming members of fish farmers group, and research by Pramuda et al. (2022) shows that the role of fish farming groups has not had a significant positive effect on fish farmers group members in increasing income. Differences in the results of this research may occur due to the nature of the fish farming group in each problem and the use of analytical methods. Based on previous research which states that adoption of a program can have a positive effect on the dependent variable if the modifying variable has principles that are appropriate to the circumstances of adoption. This research examines the impact of an institutional role simultaneously with cost variables on income, namely the influence of the farm cost variables and farmer characteristics which together influence participation in farming groups, but do not directly influence catfish farming income.

Empowerment of farmers is also stated in Government Regulations so that farmers can increase their income from farming catfish. One part of empowering farmers is the formation of fish farming groups, with the hope that through carrying out their roles in accordance with the mission of formation, they can increase the farming income of members of fish farmers' groups. Apart from being beneficial for each individual member of the group, the formation of a fish farming group can also provide collective benefits for the group, such as profits from the fish food business. The role of fish farming groups as a place for teaching and learning, a place for collaboration, and a joint production unit, if implemented according to the indicators, will provide these benefits. The role and benefits of fish farming groups are in accordance with the research Arbi and Alamsyah (2020), Ariyani and Adnan (2021) which states that guidance by related institutions as a group will facilitate the dissemination of information regarding knowledge and technological developments.

Considering the importance of fish farming groups in providing better access to input and output markets, this research tries to provide empirical evidence regarding how catfish farming income is based on participation in fish farming groups, as well as the role and impact of participation in fish farming groups on members' farming group income.

METHODS

The research was conducted in the Pagelaran Subdistrict, Pringsewu District, Lampung Province. The research focused on catfish farmers in the research area and sampling began in early October to the end of December 2023 using purposive sampling. The sample size was determined by following Yusuf (2017) research that used the Lemeshow formula, where the minimum sample size was obtained by looking at the confidence score, maximum estimate, and error rate. In this study, 100 samples were used, divided into 51 respondents who were members and 49 respondents who were non-members of the fish farmers group. The distribution was obtained from findings in the field.

The data used in this research is primary data, which was collected through interviews using a questionnaire containing written questions regarding this research. Apart from that, research supporting data regarding the performance of fish farmers and farming groups was obtained from the Pringsewu District Fisheries Service and the Central Statistics Agency.

Data collection was carried out through interviews using a questionnaire with closed questions regarding the farming process from preparation of production factors to marketing of catfish. Then proceed with questions on a scale of 1-5 to determine the role category of the fish farming group based on the indicators for each variable. However, before asking about catfish agribusiness, an interview was conducted regarding the characteristics of the farmer first. This was done to determine the profile distribution of respondents.

Income Measurement

Quantitative descriptive analysis using Ms. Excel and STATA 16 software. Quantitative descriptive analysis is used to analyze catfish farming income starting from analysis of the farming cost structure. The cost structure looks at explanatory variables in the form of Rupiah costs such as seeds, feed, medicines, labor, land tax, depreciation of farming equipment, transportation, and other costs. After processing the cost structure, cash costs, non-cash costs, and total costs will be obtained, and these three types of costs will be used to calculate catfish farming income.

Apart from costs, it also calculates the revenue obtained from the product of the average price of catfish and the average production quantity. Revenue itself consists of cash receipts and non-cash receipts, depending on the type of costs used. Meanwhile, income from catfish farm is obtained from the difference between revenue and costs incurred during the production process. (Soekartawi, 1995). The income that will be calculated in this research consists of net farm income, net farm earnings, return to total capital, return to farm equity capital, and return to family labor. The three types of rewards are influenced by the farmers's capital and interest on borrowed capital, that is, each on-farm receipt can return a certain amount of the resources used. This is to see the success of catfish farming in returning a number of resources, so that it can present the use of these resources.

Qualitative Measurement of Farmers' Group Role

The role of the farming group will be analyzed using a 1-5 Likert scale as an indicator assessment for each categorical variable, where one means very no role,

two means no role, three means quite a role, four means a role, and five means a very role. Three categorical variables that represent the role of farming groups are teaching and learning places, collaboration places, and production unit units. Teaching and learning places have six indicators, collaboration places have three indicators, and production units have four indicators. Measurements related to the fish farmers' group role score were carried out by examining the intervals for each part of the fish farmers' group role. The value will be obtained by first finding the highest value, lowest value, and class interval of the fish farmers' group role scores. Therefore, the interval percentage values and indicator score interval values are obtained in Table 1.

The teaching and learning place variable has six indicators, namely (1) preparing learning needs, (2) fostering discipline and motivation, (3) carrying out learning about catfish farming, (4) providing members with opportunities to express their aspirations, (5) determining mutual agreement related to problem-solving, and (6) holding regular meetings to discuss proposals or problems. The corporation forum variable has three indicators, namely (1) creating a sense of trust between members of the farming group, (2) carrying out deliberations for joint agreements, and (3) group members complying with collective agreements regarding solving problems and proposals. The production unit variable has four indicators, namely (1) providing financial loans to members by farming groups, (2) managing administration properly, (3) providing or purchasing production factors collectively, and (4) selling production results collectively.

Endogenous Switching Regression (ESR)

The endogenous switching regression (ESR) model is used to analyze the impact of fish farmers' group participation on catfish farming income, by forming two types of equations, namely the selection equation and the yield equation (Adela and Aurbacher, 2018). The selection equation is divided into two groups or what is usually called a binary model, due to the assumption that the group participating in the fish farmers group has a value of 1 (D1) and the non-participating group has a value of 0 (D0) (Akpalu and Normanyo, 2014). This value arises because theoretically, pokda participants will obtain higher utility than non-participants. Therefore, the selection equation for participation decisions can be modeled as follows:

$$D^* = Z_i\alpha + \mu_i$$

Meanwhile, the equation of results separately based on participation and non-participation in fish farmers group is as follows:

$$Y_1 = X_1\beta_1 + \sigma_{\varepsilon 1\mu}\lambda_1 + u_1 \quad \text{if } D = 1$$
$$Y_0 = X_0\beta_0 + \sigma_{\varepsilon 1\mu}\lambda_0 + u_2 \quad \text{if } D = 0$$

Information: D* = participation decision (1 = member, 0 = non-member), Z = participation decision modifying variable (Z1 = extension, Z2 = household members, Z3 = farmer age, and Z4 = gender), α = coefficient of value Z, μ = error, Yj= catfish farming income (j = 1,0), X= independent variable catfish farming income in rupiah (X_1 = catfish food, X_2 = vitamin, X_3 = labor, X_4 = other costs, X_5 = catfish production, dan X_6 = catfish price), βj = coefficient of value Xj, $\sigma_{\varepsilon 1\mu}$ = sample selection error value ($\sigma_{\varepsilon 1\mu} > 0$, $\sigma_{\varepsilon 1\mu} < 0$).

The full information maximum likelihood estimation (FIMLE) method is efficient for the ESR model, because it simultaneously estimates the selection and on farm income equations to produce consistent estimates (Fitawek and Hendriks, 2021). The estimates of dan are statistically significant indicating that there is sample selection bias. The sign of the estimated covariance term has an economic interpretation. Theoretically, $\sigma_{\varepsilon 1\mu} > 0$ dan $\sigma_{\varepsilon 1\mu} < 0$ indicate positive selection for both groups (members and non-members) (Liu et al. 2021).

Table 1. Intervals of indicator scores based on fish farmers' group role categories

Categories	Indicator score interval			Percentage intervals (%)
	Learning Teaching	Cooperation forum	Unit production	
Very influential	1285.5 – 1530.3	643 – 765.4	857.2 – 1020.4	80.01 – 100.00
Influential	1040.6 – 1285.4	520.5 – 642.9	693.9 – 857.1	60.01 – 80.00
Quite influential	795.8 – 1040.5	398 – 520.4	530.6 – 693.8	40.01 – 60.00
No influential	550.9 – 795.7	275.5 – 397.9	367.3 – 530.5	20.01 – 40.00
Very insignificant	306 – 550.8	153 – 275.4	204 – 367.2	0.00 – 20.00

Analysis of differences in catfish farming income based on participation in fish farmers group using the results of the ESR treatment effect model by looking at the difference in the value of fish farmers group member catfish farming income and non-member catfish farming income. The treatment effect (TE) value is considered to be a significant difference if the P-value is at the real level of 1%, 5%, or 10% (Ogunleye et al. 2021). The TE value is supported by the results of the independent sample t-test with the assumption of Sig. 2-tailed is less than 0,1 (10% real level), so there is a difference in income between fish farmers group member and non-member catfish farmers (Herlina et al 2023). The framework for ESR method is depicted in Figure 1.

The framework of this research is depicted in Figure 2. The challenges of low bargaining power, market uncertainty, and the need for guidance from related institutions, combined with high demand for catfish have caused catfish farms to continue despite the challenges. The assumption is that these challenges can be resolved by participating and optimizing the role of fish farming groups so that fish farming groups have a role and have a positive impact on group members.

Hypothesis

Therefore, the hypothesis in this research is that the role and impact of participation in farming groups will increase on farm income of group members, so that members' on farm income will be different or greater than that of random sample individuals and non-members of fish farmers' groups. Income will be measured using on farm revenues and costs in the form of net income to rewards for resources. The role of the farming group will be measured using a Likert scale assessment of 1-5 within the indicator interval range for each variable. Meanwhile, the impact of participation in farmers' groups is measured and described based on the results of the ESR model estimation.

RESULTS

Characteristics of respondent

The characteristics of farmers in this study aim to determine the relationship between farmers demographics and factors that influence the decision-making process for fish farmers' group participation. The majority of catfish farmers in this study were aged 34-49 years, male, had a high school education, had 14-18 years of farming experience, and had a pond area of 45-65 m^2 with the status of their own land. These characteristics are in line with the results of research by (Safitri et al. 2023) that the majority of farmer respondents were male with farming experience of more than 10 years and their own land. These characteristics indicate that catfish farmers at the research location can make wise decisions about participating in the farmers' group based on the activities and tasks of the farming group because they are of productive age, have a good educational background, and are quite experienced in fish farming, but are constrained on the efficiency of pond land use.

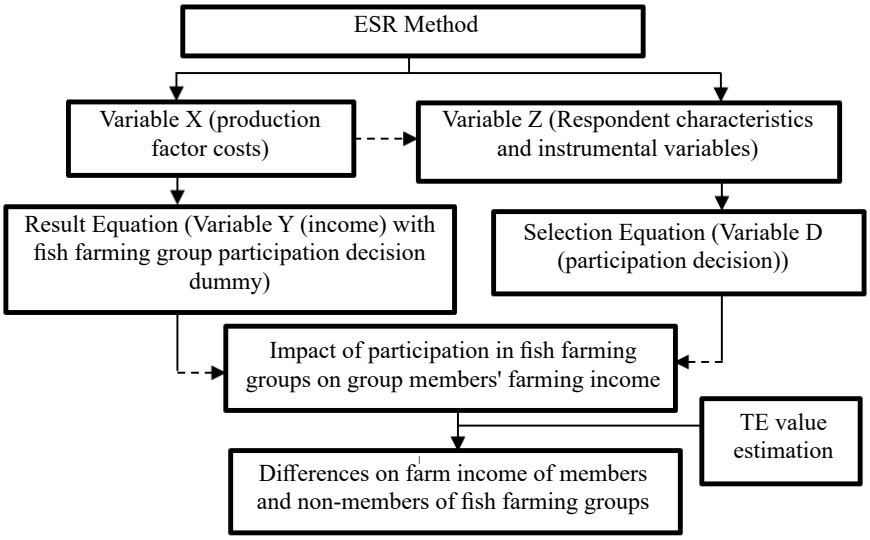

Figure 1. ESR method framework

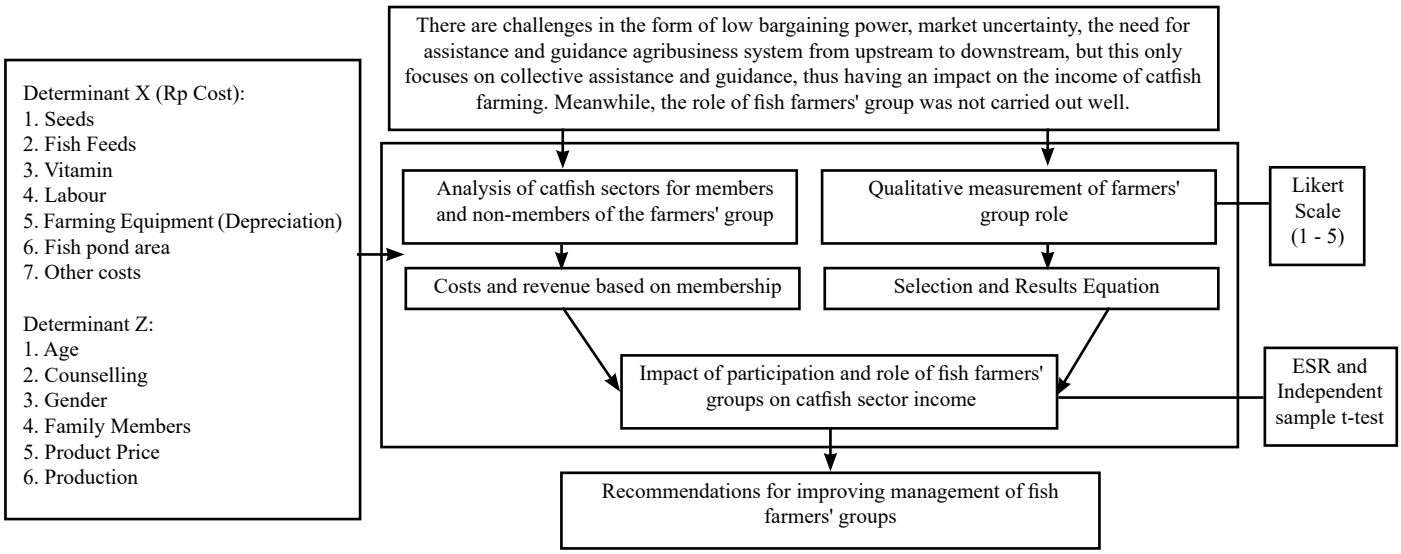

Figure 2. Research framework

Catfish Sector Income

Farming costs are the total costs incurred by respondent farmers while carrying out farming activities. These costs are divided into cash costs and non-cash costs. The costs of farming catfish for fish farmers group members and non-members can be seen in Table 2. The largest cash costs for both member and non-member farmers group income are feed costs, with a percentage of 56,74 percent and 58,03 percent. This shows that the large amount of farming funds allocated is used to purchase fish feed because fish feed is the main supporting factor for production results. The types of feed used in catfish farming vary and are based on the growth period of the fish. The type of feed given during the growth period from 0 to 1,5 months of age is floating food with a protein content of 32 percent, while during the rearing period from 1,5 to 3,5 months of age, it is floating food with a protein content of 30 percent. This difference in feed type occurs to slightly reduce feed costs during the production process, because the price of 32 percent protein feed is more expensive than 30 percent protein, while the frequency of feeding during the growing period is higher than during the growth period.

While the largest non-cash costs are family labor costs with a percentage of 9,23 percent and 11,16 percent. This shows that farmers and household members still take part in the farming process, but usually in routine activities, such as feeding, checking pond water, condition of ponds and catfish, as well as monitoring the harvest process. Table 2 shows that the value of non-cash costs for farming non-members of the farmers' group is greater than farming members, because the time allocation for family labor is higher, so that farmers will save costs for labor outside the family. These results are in line with research by Ilahi et al. (2019) that the highest non cash costs are family labor costs, because family workers are still actively involved in farming.

Apart from analyzing the costs incurred by catfish farmers, income analysis was also carried out with several types of income based on changing factors (Purba et al. 2022). The average income for farming catfish can be seen in Table 3. Table 3 shows that as a whole category, the farming of fish farmers' group member is superior to the farming of non-members. Net farm income shows that the value obtained can return more than a number of resources used during the farming process, resulting in a profit of IDR4,071,219 for farming of farmers' group members and IDR2,203,395 for farming of non-members of the fish farmers' group. The return on total capital and the farmers's capital for farming members of the farmers' group is the same, because the farmers do not borrow capital and only focuses on the costs of labor during the production process, so that the net income from farming can provide a return for the use of labor of 17. 30 percent. Meanwhile, the return on total capital and capital of farmers in non-member farmers' groups has a different value, because there are several farmers

who make capital loans to fish collectors, so that the net income from farming can only provide a return on the use of total capital of 6.74 percent and on capital farmers by 10.82 percent.

Rewards for labor in the family for farming members and non-members of the fish farmers' group have the same value as the net farm income, because there is no interest on capital loans, so that pure farming net income is obtained without having to return a certain amount of funds to pay off the loan interest. Based on the results of the income analysis in Table 3 and the description of the discussion, the results of this analysis can be used as a reference for fish farmers and fish farming groups to evaluate production costs so that their use can be more optimal, so that even though they get the same price for catfish, catfish farmers can increase their income in every harvest season. This is in line with research by Ilahi et al. (2019) and Rozaini and Silaban (2023) which explains that farming income will increase even though product prices tend to be stable if the use of production factors is more optimized in accordance with standard operating procedures (SOP). However, in this study no analysis was carried out regarding the suitability of using production factors based on SOPs, so it is necessary to research this matter so that the costs incurred by farmers can be optimized or minimized.

Table 2. The cost structure of catfish farm for m^2

Component	Fish farmers group member		Non-member fish farmer group	
	Mean (IDR)	%	Mean (IDR)	%
Cast Cost				
Catfish seeds	2,171,364.86	11.14	2,314,769.26	12.74
Fish feeds	11,060,352.47	56.74	10,548,201.36	58.03
Fertilizers	144,049.22	0.74	122,635.25	0.67
Vitamin	144,174.84	0.74	129,628.40	0.71
Labor	3,461,053.92	17.75	2,414,464.29	13.28
Transportation	50,000.00	0.26	50,000.00	0.28
Others	357,941.18	1.84	315,918.37	1.74
Land tax	30,000.00	0.15	30,000.00	0.17
Total Cash Costs	17,418,936.49	89.35	15,925,616.93	87.62
Non Cash Cost				
Depreciation of Equipment	276,877.71	1.42	221,089.22	1.22
Family Labor	1,798,382.35	9.23	2,029,107.14	11.16
Total Non Cash Cost	2,075,260.06	10.65	2,250,196.36	12.38
Total Cost	19,494,196.55	100.00	18,175,813.29	100.00

Table 3. Average income of catfish farming for m^2

Description	Member respondent farmers	Non-member respondent farmers
Total Income	23,565,415.72	20,379,208.92
Total Cost	19,494,196.55	18,175,813.29
Net Farm Income	4,071,219.16	2,203,395.62
Net Farm Earnings	4,071,219.16	2,203,395.62
Return to Total Capital	17.30	6.74
Return to Farm Equity Capital	17.30	10.82
Return to Family Labour	4,071,219.16	2,203,395.62

Fish Farmers' Group Duties Towards Members

Table 4 shows the total score and percentage of each variable. The total score was obtained from the sum of the Likert scale values given by 51 fish farmers' group members in each category of the three variables. The first role of the fish farmers group is as a teaching and learning variable for members which aims to improve knowledge, skills, and behavior so that farm can grow and develop independently, thereby increasing income (Permen, 2015).

This variable has a medium score value. The variable score of the role of the fish farmers group towards members as a forum for teaching and learning is 918, in the range 795,8 – 1.040,5, which is a moderately important category. This is also supported by the average percentage value of 60,00 percent which is in the quite influential category. The values and percentage scores in Table 4 show that the farming group is only adequate in carrying out its duties as a teaching and learning place for group members, because group members feel that the fish farming group is able to determine mutual agreements but rarely holds meetings.

The second role of the fish farmers group for members is as a forum for cooperation. A group becomes a place to strengthen cooperation both between fellow farmers in the fish farmers group and with other parties (Ministerial Regulation, 2015). This variable has a medium score value, namely 453. The variable score for the role of fish farming groups towards members as a cooperation forum is in the range 398 – 520.4 as well as a percentage score of 59.22 percent which is in the moderately important category.

The value and percentage score in Table 4 shows that the farming group is only sufficient in carrying out its duties as a place of collaboration for group members because group members feel that the farming group needs to increase the sense of trust for cooperation between members and comply with the results of mutual agreements, so if these three variable indicators are increased, it is hoped that it will increase the contribution of members to the farming group as well as members on farm income.

The third role of the fish farmers group for members is as a production unit. According to Law Number 7 of 106, Government Regulation Number 50 of 2015, and Minister of Maritime Affairs and Fisheries Regulation 41 of 2015, farming business carried out by group members must be viewed as a single business that can be developed to achieve economies of scale. This variable has a medium score value, namely 570 wich is in the range 530,6–693,8 and a score percentage pf 55,88 percent is a moderately important category.

The value and percentage score in Table 4 shows that the farming group is only sufficient in carrying out its duties as a production unit for group members because group members feel that the farming group is not yet able to provide financial assistance such as cooperatives and collective marketing of production results for members of the farming group. Therefore, if these two variable indicators are improved, it is hoped that it will increase member activity in the fish farming group program as well as members' on-farm income. However, despite this, the implementation of the other two indicators has been considered good by members, because several farmers who are members of the farming group are able to produce feed independently, accompanied by good administrative management.

The explanation of the assessment of the role of fish farmers' groups towards members shows that farmers' groups only have a small role as a place for teaching and learning, a place for cooperation and production units for their members. Then, if you look at the average value of the three variables, a value of 58.38 percent is obtained, which means that the fish farming group still needs to improve the implementation of its duties, such as several indicators that form production unit variables, especially providers of financial loans and collective marketing of production results.

Table 4. Distribution of total scores and percentages of fish farmers' group role variables

Variable	Score	Percentage (%)
Teaching and learning forum (6 indicators)	918	60.00
Cooperation forum (3 indicators)	453	59.22
Production unit (4 indicators)	570	55.88
Mean	647	58.38

The results of this study agree with research conducted by Aulia et al. (2022) which states that business groups can make a significant contribution to business success, but still need to improve in several parts and maintain compliance with the duties of the business group.

Impact of Fish Farmers' Group Participation

The impact of catfish farmers' participation in the fish farmers group on income can be seen from the results of a simultaneous analysis between the independent variables in the yield equation and the independent variables in the selection equation. The independent variables in both types of equations jointly influence income with the coefficient values they have (Siddiqua et al. 2021). The estimation results can be seen in Table 5.

Table 5 shows that only the rho covariance (ρ) of the fish farmers group members' choice equation is statistically significant, although it is negative (Fitawek and Hendriks, 2021). A negative value of rho (ρ) 1 in the fish farmers group members' choice equation and significantly different from zero means that farmers who choose to participate in fish farmers group obtain income that is greater than the income of random sample individual farmers (Amponsah et al. 2023). The negative value of rho 1 and the positive value of rho 2 explain that unobserved factors influence participation decisions and income from catfish farming, thus confirming that the ESR model is the appropriate model to use in this analysis.

In the estimation results of the farming income model for members of the fish farming group, it can be seen that the variables of fish feed costs, vitamin costs, labor costs, and other costs such as water and electricity have a significant negative effect. This means that the lower the cost variable, the member's on farm income will increase. This is in line with research by Rozaini and Silaban (2023) which states that simultaneously production factors in the form of production costs have an inverse relationship with farming income. Production variables have a significant positive effect on income and these results are in line with research by Suhartini et al. (2021) which states that a high amount of production will increase income, because the higher the product price multiplied by the amount of production, the income of the farming business will increase. Meanwhile, for non-member farming income, only vitamin costs, labor costs and catfish production affect on farm income of non-group members. This shows that the variable costs of vitamins and labor have an inverse relationship with on farm income of non-group members, that is, the lower these two costs are, the higher the income will be. Meanwhile, the influence of production variables shows that optimizing input costs and production results will increase the income of non-group members. However, in this case, the farming income of non-members is not greater than that of members of the fis farmers' group.

Table 5. Results of ESR estimation of the impact of fish farmers' group participation

Variable	Income		
	Selection	Member	Non-Member
Constanta	-917.116	51.529	314.97*
Fish Feed Cost	-0.801	-1.321***	-0.195
Vitamin Cost	0.284	-0.958***	-1.333***
Labor Cost	-0.529	-0.598***	-0.524**
Other Cost	0.987	-0.879**	0.426
Catfish Production	0.963	3.688***	2.907***
Catfish Price	93.9	-0.882	-30.642
Counseling (ppl)	0.196***		
Household Members	0.051		
Age	-0.007		
Gender	0.318		
rho (ρ)		-0.919**	0.518
Log likelihood			-30.599

Note: Significant in degree * P-value<0,1, **P-value<0,05, and ***P-value<0,01

Apart from the cost variable which has a direct influence on farm income, the extension variable as an instrumental variable also influences the decision to participate in fish farmers' groups. The estimation results show that simultaneously cost variables and instrumental variables influence the decision to participate in fish farming groups, namely that the higher the frequency of counseling received by farmers, the more likely it is to attract farmers' interest in participating in farming groups. This is in line with the research of Abdulai and Huffman (2014), which explains that instrumental variables with the main modifying variables will simultaneously influence decisions about a program, such as technology adoption, participation in institutions and other programs, but do not have a direct effect on the main dependent variable.

Apart from analyzing the impact of participation, the ESR model is also used to analyze income differences through the treatment effect (Udimal et al. 2020). This analysis was carried out by estimating the endogenous treatment effect which made income and net farm earnings dependent variables while making variables X and Z in the previous ESR model independent variables (Zegeye et al. 2022). The results of the ESR treatment-effect model estimation can be seen in Table 6. Table 6 shows that fish farmers group participation has a significant positive impact on catfish farming income and the value of net farm earnings, as seen from the percentage change value. This finding is in line with the research Arbi dan Alamsyah (2020) which states that participation in fish farmers' groups and actively participating in fish farmers' group activities increases farming income.

The increase in income based on the impact of fish farmers group participation can be seen from the percentage change in Table 6. Income increased by 23,09 percent, while for the net farm income category there was an increase of 43.09 percent. The impact of fish farmers group participation does not only reach farming income, but can also be felt in household income if the farmer does businesses outside of farm. This finding is in line with research by Van Vu et al. (2020) which states that farmer groups can increase household income through collaboration between members and also with other parties.

These estimation results are also supported by the independent sample T-test, which states that there is a difference on farm income between member and non-member farmers of fish farmers group. The test results obtained a sig (2-tailed) value of 0.065 which is smaller than 0,1 or a real level of 10 percent, so it can be concluded that there is a significant difference between average farming income of fish farmers group members compared to non-member on farm income. The results are in line with research by Herlina et al. (2023), Purba et al. (2019), and Januarti et al. (2018) that there are differences in income between the two groups based on the research area, with the result that the income value of adopting an option will result in higher income than those who do not adopt it.

Managerial Implications

The policy implications of this research focus on implementing the duties of fish farming groups as farming institutions that can increase income and the welfare of their members. Empirical results show that joining a fish farming group can increase members' income. However, on the other hand, the fish farming group in this study needs to improve the implementation of its role, especially in indicators related to production units. This production unit variable is closely related to income, so if activities such as providing input and selling output are collectively carried out, it is hoped that income will further increase.

This could be a consideration for the Government to hold an extension program and independent training of feed by farmers institutions, so that the biggest costs in the form of feed costs can be minimized because if input provision is carried out collectively, farmers can get lower input prices compared to private provision. Apart from that, the Government can also facilitate farming institutions that have submitted proposals regarding business formation and business partnerships. The results of this research only focus on the influence of participation and the role of fish farming groups on farm income, and do not explore farmer empowerment programs which can directly influence the implementation of fish farmers' group tasks and on farm income.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Based on the empirical results, it can be concluded that participation in fish farming groups causes members' income to be higher than non-members of farming groups with the same cost structure which is dominated by feed costs. Meanwhile, fish farming groups still need to improve the implementation of their tasks as production units, such as purchase production factors and sell production results collectively.

Recommendations

Suggestions that can be given from the results of this research are that farmers can be more active in programs established by social institutions and the government, so that they are able to keep up with technological developments and increase income. Apart from that, social institutions can be more active in forming programs or activities that can attract farmer participation. One of the programs proposed by the Government for fish farming groups is the independent feed program, because with this program, it is hoped that it can attract farmers participation, minimize production costs, and ultimately increase income.

Apart from that, fish farming groups can take an active part in marketing their production collectively, in order to obtain a higher selling price compared to individual marketing. The government can facilitate programs carried out by fish farming groups, such as providing information on agricultural technology developments, improving the efficiency of independent feed programs, and granting technology for fish feed making machines.

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