THE IMPACT OF SILVOFISHERY CONDITIONS IN THE MANGROVE ECOSYSTEM ON THE SOCIO-ECONOMIC CONDITIONS OF THE COMMUNITY IN LUBUK KERTANG VILLAGE

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Abstract

This research aims to determine the influence of silvofishery in the mangrove ecosystem on the socio-economic conditions of the community in Lubuk Kertang Village. The population was 1124 families, the sampling technique used slovin to obtain 100 people as research samples, the data analysis technique used path analysis with the SEM-PLS 4.0 measurement tool. The results of this research are that there is an influence between livelihoods and socio-economic conditions because the original sample value is 0.611 and p-values are 0.000 < 0.05, there is an influence between income and socio-economic conditions because the original sample value is 0.354 and p-values are equal to 0.000 < 0.05. Then there is no influence between education and socio-economic conditions with the original sample value of 0.041 and p-values 0.743 > 0.05. Livelihoods have no effect on socio-economic conditions mediated by silvofishery in the Lubuk Kertang Community, this is because the p-value is 0.182 > 0.05. In this research, income has no effect on socio-economic conditions mediated by silvofishery in the Lubuk Kertang Community, this is because the p-value is 0.214 > 0.05. Then education influences socio-economic conditions mediated by silvofishery in the Lubuk Kertang Community, this is because the p-value is 0.016 < 0.05.

Keywords: *Silvofishery, Society, Socio-Economics.*

1. INTRODUCTION

Research by the North Sumatra Environmental Agency (BLH) stated that 90 percent of the mangrove forests in this province were quite badly damaged. The causes include, among other things, the conversion of mangrove forests into oil palm plantations, fish and shrimp ponds and so on. Conversion of functions into oil palm plantations, reaching more than 12 thousand hectares, and fish ponds covering more than 10 thousand hectares. This is because mangrove forests change function and are damaged in coastal areas. From this research, quite large damage occurred in Serdang Bedagai Regency, Batubara Regency, Tanjung Balai City, Sibolga City and Nias Regency. The average damage to mangroves due to conversion to oil palm plantations, construction of ponds and illegal logging is 1,000-4,000 hectares (Basyuni et al., 2018).

Mangrove forests have a strong influence on the socio-economic conditions of society because they are a source of livelihood for coastal communities, the majority of whom work as fishermen. Ecologically, mangrove forests can function as a habitat for marine biota, a protective buffer for coastal areas, protection from various threats of sedimentation, abrasion, sea water intrusion, and as a spawning place for fish that live in the open sea (Asbi & Rauf, 2019).

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One rehabilitation method that allows the community to play an active role in improving the community's ecology and socio-economics is the application of silvofishery technology. Silvofishery is a traditional technology aquaculture system that combines fisheries with mangrove planting, which is followed by the concept of introducing a management system by minimizing input and reducing the impact on the environment (Yunus & Parawansa, 2020). Therefore, the silvofishery concept needs to be developed as a form of fisheries cultivation. sustainable with low input (Musa et al., 2020).

Lubuk Kertang Village is one of the areas in the mangrove area of Langkat Regency. The Mangrove Forest in the Lubuk Kertang area has been quite successful in the eyes of the world, because Lubuk Kertang is one of the areas where mangrove conservation is considered successful, where the success of this mangrove began in 2014, the coastal communities and traditional fishermen of Lubuk Kertang were assisted by several non-governmental organizations encourage proposals for Community Forest (HKm)-based forest land management to the Ministry of Environment and Forestry. The activists included KNTI Langkat, WALHI, KIARA and LBH Medan. Until finally, in March 2017 their proposal was accepted. The Lubuk Kertang residents group obtained a HKm permit covering an area of 410 hectares. Of the 700 hectares of mangrove forest area that has been successfully restored.

The results of the silvofishery program developed in Lubuk Kertang Village in 2019 had a cooperative turnover of IDR 1.2 billion. The cooperative also has cultivation ponds, work equipment and other assets. For example, in a 2.5 hectare pond with Silvofishery around the mangrove ecosystem, for one harvest of crabs, shrimp and fish, they can earn IDR 300 million per harvest. This is very different when the mangrove forest has not been restored and Paluh is closed. Fishermen's fishing activities are minimal, they only get IDR 500 thousand per each high and low tide, fishing fishermen can get a catch of up to IDR 5 million per ebb and flow. Likewise, fish trap fishermen who used to be practically unable to work are now able to produce IDR 1 million per tide (Basyuni et al., 2020).

Table 1.

Comparison of Mangrove Area with Number of Fish Catches in Langkat Regency (2011-2020)

| Year	Damaged Mangrove Area /ha	Number of fish caught/ton
2011	8982	21920
2012	8975	29063
2013	8969	22741
2014	8957	31696
2015	8944	22753
2016	8855	23112
2017	8766	31115
2018	8677	29559
2019	8611	33137
2020	8558	35511

Source: Langkatkab.bps.go.id

Table 1 shows that over the last 10 years, the condition of the Langkat mangrove area has experienced degradation. In the last 10 years, it can be seen that the relationship between mangrove damage and the number of fish catches in Langkat Regency is inversely proportional, meaning from the table it can be seen that the wider the area of mangrove damage, the smaller

the number. fish catch. The Lubuk Kertang mangrove forest can ideally be a home for fauna that is characteristic of mangroves such as crabs, shrimp and fish. With good management the mangrove forest can become a buffer area for the socio-economic system of the surrounding community, therefore the conversion of mangrove land to oil palm land causes loss of fauna with high economic value, plus the production of fish and shrimp in the sea is greatly influenced by the production of litter as a food source and spawning ground produced by mangrove forests, so that damage to mangroves will result in a decline in marine biota which has economic value (Winastuti, et al. 2019).

2. RESEARCH METHODS

This research took place at Mangrove Ecotourism located in Lubuk Kertang Village, West Brandan District, Langkat Regency. The type of research used in this research is quantitative research, the population in this research is all residents of Lubuk Kertang village, totaling 1124 families, the sampling technique used in this research is the purposive sampling method, using slovin sampling so that 100 people are obtained as research samples. , the data analysis technique used in this research is path analysis with the SEM-PLS 4.0 measuring tool.

By using SmartPLS 4.0 Software to test each hypothesis. To see whether there is a relationship between two variables. According to (Purwanto, 2019) there are several steps that will be achieved in PLS analysis, namely: (1) Designing a structural model (inner model); (2) Measurement of the designing model (outer model); (3) Constructing a path diagram; (4) Convert path diagrams to systems of equations; (5) Estimation of path coefficients and weights; (5) Evaluation of suitability; (6) Hypothesis testing (Resampling bootstrap), a conceptual overview of the research will be presented in the picture below
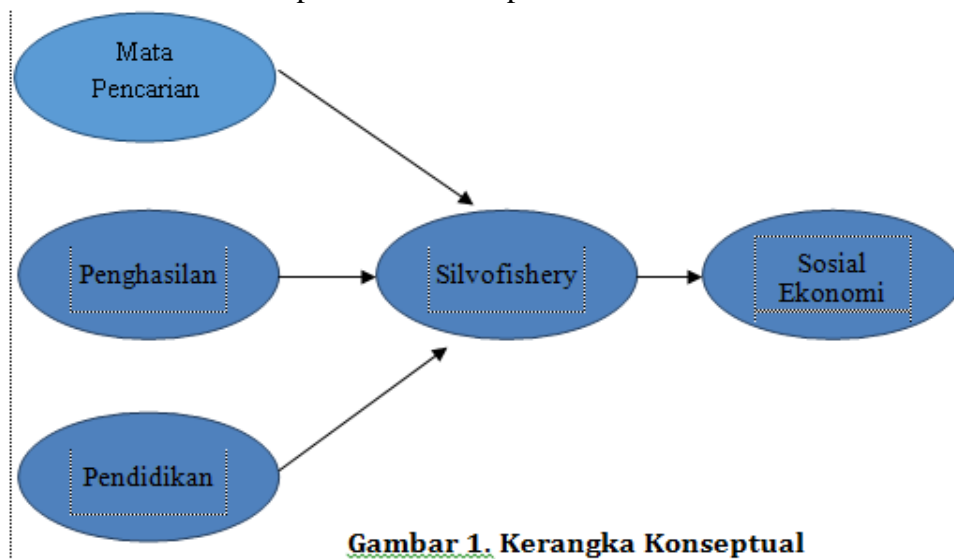
Gambar 1. Kerangka Konseptual

Based on the background of the problem and expert opinions, the hypotheses in this research are:

1. The existence of Silvofishery is able to improve socio-economic status conditions seen from improving people's livelihoods

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2. The existence of Silvofishery can improve socio-economic status conditions seen from increasing income and increasing community wealth

3. The existence of Silvofishery can improve socio-economic status conditions seen from the increasing level of community education

4. Silvofishery directly helps the community in improving the socio-economic conditions of the people of Lubuk Kertang through silvofishery.

3. RESULTS AND DISCUSSION

1. Measurement Model Analysis (Outer Model)

The measurement model analysis (outer model) uses 2 tests, including; (1) Construct validity and reliability and (2) Discriminant validity.

a Construct reliability and validity

Construct validity and reliability are tests to measure the reliability of a construct. The reliability of construct scores must be high enough. The composite reliability criterion is > 0.6 (Juliandi, 2018)

Table 2. Composite Reliability

	Composite Reliability
X1	0.393
X2	0.885
X3	0.737
Y	0.718
Z	0.770

Source: 2023 SEM-PLS data

The conclusion of composite reliability testing is as follows:

1) The livelihood variable (X1) is unreliable, because the composite reliability value is $0.393 < 0.6$

2) The Income variable (X2) is reliable, because the composite reliability value is $0.885 > 0.6$

3) The Education Level variable (X3) is reliable, because the composite reliability value is $0.737 > 0.6$

4) The socio-economic condition variable (Y) is reliable, because the composite reliability value is $0.718 > 0.6$

5) The Silvofishery variable (Z) is reliable, because the composite reliability value is $0.770 > 0.6$.

b Discriminant Validity

Discriminant validity of the measurement model with reflected indicators can be seen from the cross loading value of the measurement with the construct. If the correlation between the measurement constructs is greater than the other constructs, it shows that the latent constructs have better measurements in their block than the measurements in other blocks (Ghozali, 2014). The following are the output results from the discriminant validity test using SmartPLS 4.0:

Table 3. Discriminant validity (Cross Loadings)

Variable	X1	X12	X3	Y	Z
X11	0.197				

Variable	X1	X12	X3	Y	Z
X12	0.354				
X13	0.672				
X14	0.829				
X21		0.857			
X22		0.798			
X23		0.923			
X24		0.823			
X31			0.867		
X32			0.613		
X33			0.900		
Y1				0.626	
Y2				0.599	
Y3				0.428	
Y4				0.172	
Z1					0.500
Z2					0.495
Z3					0.545
Z4					0.636

Source: 2023 SEM-PLS data

Based on the table above, it can be seen that the loading factor value for each indicator of each latent variable has a greater value when compared to the indicator values of other latent variables. For example, the comparison of loading factor values for socio-economic conditions is greater than the loading factor values for other constructs. According to the results above, it can be seen that all latent variables have good discriminant validity. So it can be concluded that the discriminant validity test has been fulfilled, and can be declared valid.

Apart from using the loading factor value, a method that can be used to assess discriminant validity is by comparing the square root value of the average variance extracted for each construct with the correlation between one construct and other constructs in the model. If a model has an AVE root for each construct that is greater than the correlation between the construct and other constructs, then it is said that the model has good discriminant validity. To see the square root value of AVE, you can see the Fornell Lacker Criterium table, as follows.

Table 4. Discriminant Validity (Fornell Lacker Criterium)

Variable	X1	X12	X3	Y	Z
X1	0.571				
X2	0.661	0.852			
X3	0.507	0.806	0.804		
Y	0.543	0.578	0.436	0.769	
Z	0.536	0.548	0.546	0.710	0.685

Source: 2023 SEM-PLS data

Based on table 4, it can be seen that the square root value of AVE in variables X1 (0.571), X2 (0.852), It can be concluded that all constructs in the model that have been estimated have quite good discriminant validity values.

2.   Structural Model Analysis (Inner Model)

Structural model analysis uses 3 tests, including: (1) R-square; (2) f-square; (3) Mediation effects: (a) Direct effects; (b) Indirect effects; and (c) Total effects.

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a R-Square

    R-Square is a measure of the proportion of variation in the value of a variable that is influenced (endogenous) that can be explained by the variable that influences it (exogenous). This is useful for predicting whether the model is good/bad (Juliandi, 2018). The criteria for R-Square are: (1) if the value (adjusted) = 0.75 → the model is substantial (strong); (2) if the value (adjusted) = 0.50 → the model is moderate; (3) if the value (adjusted) = 0.25 → the model is weak (bad) (Juliandi, 2018).

Table 6. R-Square

	R-Square	*R-Square Adjusted*
Y	0.589	0.572
Z	0.382	0.362

Source: 2023 SEM-PLS data

    (1) R-Square Adjusted Model = 0.572, meaning that the ability of variables X1 (Livelihood), X2 (Income) and Meanwhile, the R-Square Adjusted Model = 0.362, meaning that the ability of variables X1 (Livelihood), X2 (Income) and

b F Square

    The F-Square measurement or effect size is a measure used to assess the relative impact of an influencing (exogenous) variable on the influenced (endogenous) variable. Measurement (f-square) is also called effect change, meaning that the change in value when certain exogenous variables are removed from the model, can be used to evaluate whether the omitted variables have a substantive impact on the endogenous construct (Juliandi, 2018).

    The F-Square criteria according to (Juliandi, 2018) are as follows: (1) If the value = 0.02 → Small effect of exogenous variables on endogenous; (2) If value = 0.15 → Medium/moderate effect of exogenous variables on endogenous; and (3) If value = 0.35 → Large effect of exogenous variables on endogenous variables.

Table 7. F-Square

	X1	X2	X3	Z	Y
X1	-	-	-	0.073	0.034
X2	-	-	-	0.084	0.019
X3	-	-	-	0.002	0.109
Z	-	-	-	-	0.486
Y	-	-	-	-	-

    The conclusion of the F-Square value can be seen in table 7. is as follows: Variables X1 (Livelihood), X2 (Income) and towards endogenous, then for variables X1 (Livelihood), X2 (Income) and

3. Mediation Effects

    The structural model analysis of Mediation effects uses 3 tests, including: (a) Direct effects; (b) Indirect effects; and (c) Total effects.

a Direct effects

    The purpose of direct effect analysis is useful for testing the hypothesis of the direct influence of an influencing (exogenous) variable on the influenced (endogenous) variable (Juliandi, 2018). The criteria for testing the direct effect hypothesis are as shown in the section below.

    First, the path coefficient: (a) If the path coefficient value is positive, then the influence of a variable on other variables is in the same direction, if the value of a variable increases/rises,

then the value of the other variable also increases/rises; and (b) If the path coefficient value is negative, then the influence of a variable on another variable is in the opposite direction, if the value of a variable increases/rises, then the value of the other variable will decrease/low. Second, probability/significance values (P-Values):

1)   If the P-Values < 0.05, then it is significant; And
2)   If the P-Values > 0.05, then it is not significant (Juliandi, 2018).

Table 8. Direct effects

	Original samples	*Sample Mean*	*Standard Deviation*	*T Statistics*	*P-Values*
X1→ Z	0.283	0.284	0.117	2,428	0.015
X1→Y	0.163	0.172	0.117	1,399	0.162
X2→ Z	0.442	0.431	0.191	2,320	0.020
X2→Y	-0.178	-0.186	0.177	1,003	0.316
X3→ Z	-0.063	-0.035	0.214	0.297	0.766
X3→ Y	0.358	0.356	0.123	2,914	0.004
Z→Y	0.568	0.571	0.093	6.124	0,000

Source: 2023 SEM-PLS data

The path coefficient in Table 8 shows that all path coefficient values are positive (seen in the original sample), including:

1. The influence between Livelihood and Silvofishery is 0.283 and p-values are 0.015 indicating a positive and significant relationship

2. The influence between livelihoods and socio-economic conditions is 0.163 and p-values are 0.162 indicating a positive and not significant relationship

3. The influence between Income and Silvofishery is 0.442 and p-values are 0.020 indicating a positive and significant relationship

4. The influence between income and socio-economic conditions is 0.178 and p-values are 0.316 indicating a positive and not significant relationship

5. The influence between education and Silvofishery is 0.063 and p-values 0.766 indicating a positive but not significant relationship

6. The influence between education and socio-economic conditions is 0.358 and p-values 0.004 indicate a positive and significant relationship

7. The influence between silvofishery and socio-economic conditions is 0.568 and p-values 0.000 indicate a positive and significant relationship

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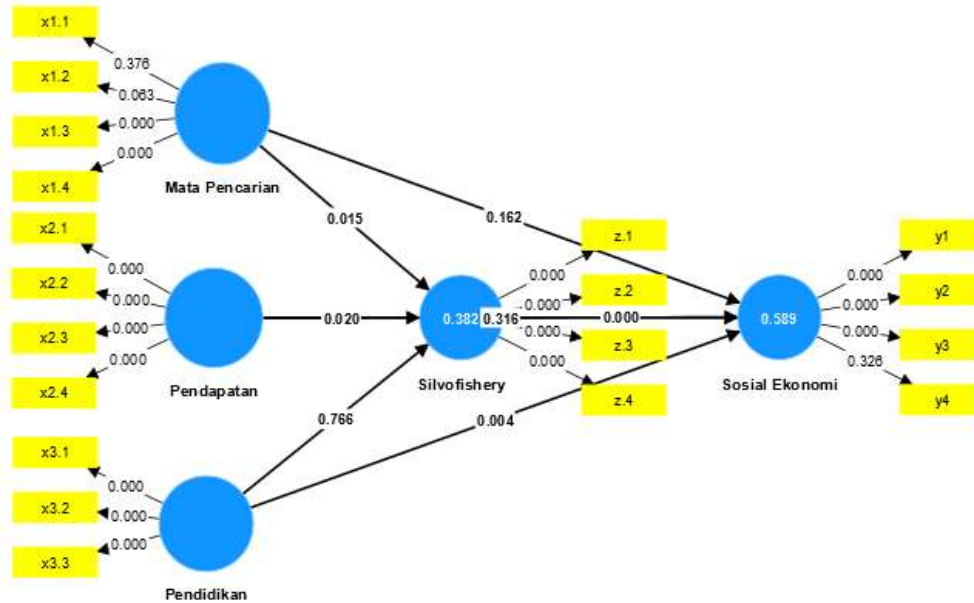*Hafiz Marasoki, Syahbudin Hasibuan, Eri Yusni*

Figure 2. Inner Research Model

Graphically, a summary of the results of the direct effect above can be seen in Figure 2.

b   Indirect Effects

The purpose of indirect effect analysis is useful for testing the hypothesis of the indirect influence of an influencing variable (exogenous) on the influenced variable (endogenous) which is mediated/mediated by an intervening variable (mediator variable) (Juliandi, 2018). The criteria for determining indirect effects (Juliandi, 2018) are: (1) if the P-Values value is <0.05, then it is significant, meaning that the variable mediates the influence of exogenous variables on the variable. In other words, the effect is indirect and (2) if the P-Values value is > 0.05, then it is not significant, meaning that the mediator variable does not mediate the influence of an exogenous variable on a variable. In other words, the effect is direct.

Table 9. Specific indirect effects

	Original Sample	Sample Mean	Standard Deviation	P values
X1→Z→Y	0.251	0.250	0.125	0.044
X2→Z→Y	0.161	0.162	0.072	0.026
X3→Z→Y	-0.036	-0.026	0.126	0.774

Source: 2023 SEM-PLS data

From the table above, conclusions can be drawn
1. In this research, livelihoods influence socio-economic conditions mediated by silvofishery in the Lubuk Kertang Community, this is because the P-Value is 0.044 < 0.05.
2. In this research, income influences socio-economic conditions mediated by silvofishery in the Lubuk Kertang community, this is because the P-value is 0.026 < 0.05.
3. In this research, education has no effect on socio-economic conditions mediated by silvofishery in the Lubuk Kertang Community, this is because the P-Value is 0.0774 > 0.05.

Understanding

1.   The Influence of Livelihoods on Socio-Economic Conditions

Social means everything related to society, while economics is a science related to the principles of production, distribution, use of goods and wealth. Social and Economics seem like two different things and branches of science, but they are actually closely related. One of them, if economic needs are not met, there will be social impacts in our society. In this case, social economics is everything related to economic actions in fulfilling income such as clothing, food and shelter (Lestariningsih et al., 2021). In this study there is no influence between livelihoods and socio-economic conditions because the original sample value is 0.163 and the p-value is 0.162, indicating a positive and insignificant relationship, and rejects the hypothesis that there is an influence of livelihoods on socio-economic conditions in the Lubuk Kertang Community. , so that people's high livelihoods will not necessarily mean that people will improve their social status.

2.   The Effect of Income on Socioeconomic Conditions

According to Soerjono Soekanto, socio-economics is a person's position in society in relation to other people in terms of their social environment, achievements, and rights and obligations in relation to resources. According to Soekanto, the main components of socio-economic position include measures of wealth, measures of power, measures of honor, measures of knowledge. Economic conditions play an important role in a child's education. According to Gerungan, the role of economic conditions in children's education plays a very important position. With an adequate economy, the material environment faced by children in their families is clear (Rachman & Mardiana, 2018). In this study, there is no influence between income and socio-economic conditions because the original sample value of 0.178 and p-values of 0.316 indicate a positive and insignificant relationship, and this research rejects the hypothesis that there is an influence of income on socio-economic conditions in the Lubuk Kertang community. People's high income does not give rise to the public's perception that they have a stable financial condition so that it will increase their social status.

3.   The Influence of Education on Socio-Economic Conditions

It is known that the aim of national education is to make the nation's life more intelligent and to develop Indonesia's human resources as a whole. In order to achieve these national education goals, education is implemented through various channels, both formal and non-formal education. In the formal education pathway itself, there are several levels of school education consisting of preschool education, primary education, secondary education and higher education. In this research, there is an influence between education and socio-economic conditions of 0.358 and p-values of 0.004 indicating a positive and significant relationship, and this research accepts the hypothesis that there is an influence of education on socio-economic conditions in the Lubuk Kertang community. This shows that people who have adequate education can improve their social status.

4.   The Influence of Livelihoods on Socio-Economic Conditions through Silvofishery

The word silvofishery comes from the words silvo and fishery so that silvofishery can be defined simply as a business or activity carried out on land that combines forestry and fishing activities. In principle, the aim of combining fisheries and forestry activities is to realize

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conservation goals, namely efforts to manage mangrove ecosystems that synergize conservation and utilization. The concept of silvofishery management in mangrove ecosystems refers to the goals of sustainable development, namely ecologically sustainable and economically optimal and profitable (Basyuni et al., 2019). In this research, livelihoods influence socio-economic conditions mediated by silvofishery in the Lubuk Kertang Community, this is because the P-Value value is $0.044 < 0.05$, and this research accepts the hypothesis that there is an influence of livelihoods on socio-economic conditions through silvofishery in the Lubuk Kertang Community , meaning that if the condition of the silvofishery is not maintained, the community cannot improve their economic condition in other ways which still depend on mangrove land.

5.   The Effect of Income on Socio-Economic Conditions through Silvofishery

Silvofishery, also known as wanamina, is an activity carried out simultaneously between preserving the mangrove ecosystem and fishing business on the same land. The implementation of the silvofishery system is a form of mangrove ecosystem management that combines ecology and economics. The consideration is that the success of this system will have an impact on restoring the condition of the mangrove ecosystem, which has experienced much degradation due to increasing aquaculture activities (Rumengan et al., 2019). In this research, income influences socio-economic conditions mediated by silvofishery in the Lubuk Kertang Community, this is because the P-Value value is $0.026 < 0.05$ and this research accepts the hypothesis that there is an influence of income on socio-economic conditions through silvofishery in the Lubuk Kertang Community. These results show that the existence of silvofishery will have a direct impact on the economic conditions of the community.

6.   The Influence of Education on Socio-Economic Conditions through Silvofishery

The silvofishery concept was developed as a form of sustainable aquaculture with low input. This approach between conservation and utilization of mangrove areas makes it possible to maintain the existence of mangroves which ecologically have relatively high productivity with economic benefits from fish cultivation activities. In this research, education has no effect on socio-economic conditions mediated by silvofishery in the Lubuk Kertang Community, this is because the P-Value value is $0.774 > 0.05$ and this research rejects the hypothesis that there is an influence of Education on socio-economic conditions through silvofishery in the Lubuk Kertang Community. This shows that not only people with adequate education are able to use silvofishery to raise their social status.

4. CONCLUSION

1. There is an influence between Livelihoods and Silvofishery which is 0.283 and p-values of 0.015 indicate a positive and significant relationship.
2. There is no influence between Livelihoods and socio-economic conditions is 0.163 and p-values are 0.162 indicating a positive and not significant relationship
3. There is an influence between Income and Silvofishery which is 0.442 and p-values 0.020 indicating a positive and significant relationship
4. There is no influence between income and socio-economic conditions, it is 0.178 and the p-value is 0.316, indicating a positive and not significant relationship.

5. There is no influence between education and silvofishery is 0.063 and the p-values are 0.766 indicating a positive and not significant relationship
6. There is an influence between education and socio-economic conditions which is 0.358 and p-values 0.004 indicating a positive and significant relationship
7. There is an influence between silvofishery and socio-economic conditions which is 0.568 and p-values 0.000 indicate a positive and significant relationship
8. In this research, livelihoods influence socio-economic conditions mediated by silvofishery in the Lubuk Kertang Community, this is because the P-Value value is 0.044 < 0.05.
9. In this research, income influences socio-economic conditions mediated by silvofishery in the Lubuk Kertang Community, this is because the P-Value value is 0.026 < 0.05.
10. In this research, education has no effect on socio-economic conditions mediated by silvofishery in the Lubuk Kertang Community, this is because the P-Value is 0.774 > 0.05.

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THE IMPACT OF SILVOFISHERY CONDITIONS IN THE MANGROVE ECOSYSTEM ON THE SOCIO-ECONOMIC CONDITIONS OF THE COMMUNITY IN LUBUK KERTANG VILLAGE

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