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LAND RENT VALUE OF BLOOD SHELL PONDS (*Anadara granosa*) IN BANGKO DISTRICT ROKAN HILIR REGENCY RIAU PROVINCE

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ABSTRACT

The land rent value is one of the critical indicators in determining the profitability of blood cockle (*Anadara granosa*) cultivation and the efficiency of pond land utilization. This study aims to calculate the land rent value of blood cockle ponds and analyze the factors influencing land rent value in Bangko District, Rokan Hilir Regency, Riau Province. This study used a survey method with a census respondent selection technique involving 43 blood cockle farmers. Data were collected through interviews, observations, questionnaires, and literature studies. Data was analyzed using the rental value calculation method and multiple linear regression analysis. The results showed that the average land rent value of blood cockle ponds in Bangko District was IDR 49.777,968/ha, and the main factors that affect the rent value of blood mussel pond land are pond productivity and the distance of the pond location to the market center. This study concludes that the higher the productivity, the higher the land rent value, while the further the distance, the lower the land rent value.

Keywords: Rent Value, Blood shell, Pond

1. INTRODUCTION

Rokan Hilir Regency, located on the east coast of Sumatra Island, has abundant natural resource potential, especially in the fisheries and marine cultivation. Fisheries production was recorded at 52,072.00 marine capture fisheries and 2,884.00 are inland public water fisheries[1]. In addition to marine fisheries, this Regency produces blood cockles (*Anadara granosa*) from both catches and cultivation. This is proven by the fact that Rokan Hilir Regency is the largest producer of blood cockles in Riau Province; one of the potential areas is Bangko District. Although the potential for blood-shell ponds in Bangko District is huge, inefficient land management can cause losses for farmers and damage the environment[2].

Therefore, it is essential to optimize pond land management by paying attention to land rent, which indicates the economic benefits of land use based on fertility, location, and accessibility. Analysis of this land rent value can help increase efficiency and productivity in blood cockle cultivation[3]. Based on this, the author is interested in conducting this research to determine the land rent value of bloodshell ponds and how the land rent value influences the utilization of bloodshell pond cultivation.

2. RESEARCH METHOD

Time and Place

This research was conducted in May 2024 in Bangko District, Rokan Hilir Regency, Riau Province. The method used in this study is a quantitative survey. Respondents were determined using census or total sampling techniques. In this study, the respondents were 43 blood cockle farmers in the Bangko District. Data was collected through observation, interviews, and literature studies, using primary and secondary data as sources of information needed for this study.

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Data analysis

Ricardian land rent is the concept used to calculate the value of land rent. This concept illustrates that the value of productivity, price, production costs, and transportation costs[4] determines land rent value.

$$\boldsymbol{\pi} = Y\ (\boldsymbol{P} - \boldsymbol{tx} - \boldsymbol{C}/\boldsymbol{Y})$$

Description

P = Land rent for blood cockles (IDR/ha)
P = Blood cockle price (IDR/kg)
Y = Blood cockle productivity (kg/ha)
C = Total cost of blood cockle production (IDR/kg)
T = Transportation costs for blood cockles (IDR /kg/km)
X = Distance from Pond to market center (km)

Productivity

$$Y = \boldsymbol{q}/l$$

Description

Y = Blood cockle productivity (kg/ha)
q = Total blood cockle production (kg)
l = Land area (ha)

Production Cost

$$TC = FC+VC$$

Description

TC = Total cost (IDR /Month)
FC = Fixed cost (Rp IDR Month)
VC = Variable cost (non-fixed costs) (IDR /Month).

Multiple linear regression was used to analyze the factors influencing the land rent value of bloodshed ponds. Multiple linear regression is a statistical analysis method used to understand the relationship between one dependent variable and two or more independent variables[5].

$$Y = ß0 + ß1\ X1 + ß2\ X2 + e$$

Description

Y = Land Rent (dependent)
X1 = Distance (independent)
X2 = Productivity (independent)
ß0 = Constant (intercept)
ß = The regression coefficient of each independent variable
e = error term

F Test

The f-test shows whether all independent (free) variables in the model jointly influence the dependent (bound) variable.

T-test

The t-test shows how far the influence of one explanatory/independent variable can be explained individually in explaining the dependent variable.

Coefficient of Determination

The coefficient of determination (R2) measures how much the model can explain the dependent variable. A larger adjusted R2 value closer to 1 means that the independent variable (X) can provide almost all the information needed to predict the variation of the dependent variable (Y). Conversely, a smaller adjusted R2 value means that the influence of the independent variable (X) is small on the dependent variable (Y).

3. RESULT AND DISCUSSION

Fishpond Land

Pond land in Bangko District generally has a substrate suitable for blood cockle cultivation, especially near rivers or beaches with sand and mud. Most of the farmers in this area are traditional farmers who manage ponds in a hereditary and conservative manner. The average land used for blood cockle ponds in Bangko District is around 14 ha, with easy access to water sources from rivers or the sea. Research by Yulinda et al.[6] shows that the potential land for blood cockle development in Rokan Hilir Regency reaches 12,434 ha, but only 10% has been utilized. This aligns with research by Kurniawan et al.[7] in Tanjung Punai Hamlet, West Bangka Regency, which revealed that the local community manages blood shell ponds on the muddy coast around the mangrove forest. Although maintenance does not require significant costs, high

regional and national market demand is the main driving factor.

Cultivation Activity Equipment

Adequate equipment is one key to success in blood cockle cultivation activities. This equipment supports every stage of the cultivation process, from site preparation and maintenance to harvesting. The equipment used varies depending on the cultivation method, environmental conditions, and business scale. One of the facilities used in cultivation activities is supporting equipment, as shown in Table 1.

Table 1. Equipment in blood shell pond cultivation activities

No	Type	Function	Shelf life
1	Boat	Transportation	10 years
2	Wood	Retainer	1 year
3	Garut	Harvesting & moving of shellfish	3 months
4	Net	Protecting shellfish	3 years
5	Filling basket	Shell Place	6 Month

Table 1 shows that in the blood cockle cultivation effort in Bangko District, various types of equipment are needed that have an essential role from land preparation to harvest. Boats are a means of transportation, and wood is used as a boundary material between ponds, regulating the boundaries of the cultivation area and preventing the mixing of shellfish between pond plots. Garut is a traditional tool often used in the blood cockle cultivation process. It has a dual function: moving and harvesting. In the maintenance stage, garut moves mussels so they do not pile up, which can cause death. In the harvesting process, the gut plays a role in effectively collecting mussels from the bottom of the Pond without damaging the surrounding ecosystem. The filler basket is used to hold mussels after they are harvested.

Blood Cockle Seeds

Blood cockle seeds in Bangko District are obtained from the Daun River, Panipahan Darat. Blood cockle seeds consist of two sizes, namely green bean-sized seeds (5 mm in diameter) and corn-sized seeds (10 mm in diameter). Green bean-sized blood cockle seeds (5 mm in diameter) are purchased per can for IDR 320,000 to IDR 400,000, while corn-sized seeds (10 mm in diameter) are purchased for IDR 120,000 to IDR 170,000. Based on research, the average price of blood cockle seeds in Bangko District is IDR 309,302/kg, indicating that the seed component is one of the main factors in the production cost structure. The high cost of purchasing seeds reflects a significant dependence on the quality and quantity of seeds, thus directly affecting the level of cultivation success and the potential profit that farmers can obtain.

Labor

Labor is an essential element in every economic sector, including cultivation. The labor used by cultivators in running this blood shell cultivation business is divided into two categories: permanent and non-permanent labor. Permanent labor is tasked with protecting blood shells from theft. The wages for permanent laborers range from IDR 1,500,000 to 2,000,000/person monthly. Furthermore, non-permanent labor is employed during harvest; the labor during harvest ranges from 3-6 people per Pond unit, while the wages are IDR 2000 /kg.

Investment Capital

Fixed Capital

Fixed capital is not affected by the production process and will not be used up in one production process; it can be used repeatedly over a long period. The fixed capital in this aquaculture business unit consists of boats, arrowroot, wood, and filling baskets. Fixed capital for blood shell cultivation can be seen in Table 2.

Table 2. Fixed capital for blood cockle cultivation in Bangko District

Cost components	Average fixed capital (IDR/year)
Boat	42,651,163
Garut	1,880,233
Wood	377,163
Filling Basket	688,372
Net	3,626,744
Amount	49,223,675

Based on Table 2, the average fixed capital spent by blood cockle farmers in Bangko District is IDR 49,223,675, with the most significant investment in boats reaching IDR 42,651,163. In addition, fixed capital for arrowroot, wood, filler baskets, and nets each have smaller values, namely IDR 1,880,233, IDR 377,163, IDR 688,372, and IDR 3,626,744. The large amount of fixed capital required shows that the success of blood cockle cultivation depends on the availability of adequate facilities and infrastructure. Compared to Asih[8], In Panipahan Village, the fixed capital of farmers in Bangko District is greater because they use boats, while in Panipahan, they still use canoes.

Working capital

Working capital is the cost of purchasing capital goods that are spent in one production cycle and the turnaround process in a short period. Table 3 shows working capital in blood-shell aquaculture.

Table 3. Working capital for blood cockle cultivation in Bangko District

Cost Components	Average working capital (IDR/Year)
Shellfish Seeds	42,697,674
Transportation	14,860,465
Shellfish guard wages	10,465,116
Harvest Wages	231,148,837
Maintenance Costs	487,209
Consumption	18,000,000
Amount	317,659,301

Based on Table 3, the average working capital in blood cockle cultivation business in Bangko District is IDR 317,659,301, which includes various costs such as cockle seeds of IDR 42,697,674, transportation of IDR 14,860,465, shellfish guard wages of IDR 10,465,116, harvest wages of IDR 231,148,837, maintenance costs of IDR 487,209, and consumption costs of IDR 18,000,000 during the cultivation period. Comparison with Asih[8] in Kepenghuluan Panipahan shows that working capital in Bangko District is greater, mainly due to costs for permanent labor, consumption, and transportation crossing to the Pond, which are not found in Kepenghuluan Panipahan. This difference indicates that geographical factors, labor systems, and different operational needs can affect the amount of working capital in blood cockle cultivation in each region.

Total Investment

Fixed capital includes assets used in business activities, such as equipment and infrastructure needed for cultivation, while working capital is used to support daily operations, such as purchasing raw materials and paying for labor. Based on calculations, the average total investment cost required for this business is IDR 366,882,976.

Production Activities (Maintenance, Harvesting of Blood Cockle Cultivation)

Blood cockle cultivation in Bangko District begins with land preparation; after the land is prepared, the farmer spreads the seeds that have been prepared previously. Blood cockles take about 4 to 6 months to reach the optimal harvest size, around 2-5 cm. The first harvest is usually carried out after 4 months, but not all cockles reach the desired size, so the sorting process is carried out 2 to 3 times in one cultivation cycle. Farmers usually employ workers with wages of around IDR to assist in harvesting and sorting. 2,000/kg of harvested cockles.

Production Result

In blood cockle cultivation in Bangko District, production refers to seed management until it reaches a size ready for

harvest and marketing. With an average land area of 14 Ha, farmers produce an average of 115,574 kg of cockles, with a productivity of 8,510 kg/Ha. The highest yield reached 350,000 kg, which was influenced by good environmental conditions, optimal management, and supportive weather, while the lowest yield reached 8,500 kg. Comparison with research in Labuhan Deli and Sukal Hamlet, West Bangka Regency, shows that factors such as pond area, number of seeds, and farmers' socio-economic factors, including education and experience, also affect production levels. Therefore, increasing blood cockle production requires good technical management and adequate socio-economic support to ensure the sustainability of cultivation and maximum economic benefits for coastal communities.

Marketing of Production Results

Marketing in blood cockle cultivation includes a series of activities to introduce, promote, and distribute the harvest to consumers or target markets. Blood cockles in Bangko District have reached local and international markets, with selling prices in the local market ranging from IDR 8,500 to IDR 11,000 per kg. In contrast, exports to Malaysia reach IDR 20,000/kg via cargo plane. Asih[8] shows that the selling price of blood cockles in the local market is around IDR 8,500 per kilogram, while Medan can reach IDR 25,000 per kilogram. Marketing of blood cockles in West Bangka Regency is also quite smooth, with prices at the farmer level of around IDR 6,000/kg, which is driven by high market demand. This high demand encourages the development of blood cockle cultivation, which can improve the coastal communities' economy.

Land Rent Value Analysis

According to Ricardo[9], the economic value of land is determined by the difference in productivity between it and other land of poorer quality or further away, which leads to higher production costs. Productivity itself is the amount of production per unit area, which is an indicator of land fertility. The higher the productivity level of land compared to other lands, the more fertile the land is, and the resulting production surplus is called land rent.

Land Productivity

Based on the research, the average total land area used by blood shell farmers in the Bangko Sub-district reached 14 ha, with a total blood shell production of 115,574 kg, so the average land productivity reached 8,510 kg/ha. The success of bloodshell farming depends mainly on the quality of the land, water, and seed. Land with a good substrate favors optimal growth, while proper water quality, including salinity and dissolved oxygen levels, is an essential factor in mussel survival. The selection of superior seeds with good resistance to environmental conditions also significantly accelerates growth and reduces mortality.

Production Cost

According to Susilowati[10], production costs in cultivation businesses are expenses that cover all production inputs, both physical and non-physical, used to increase production results, such as the use of superior seeds, cultivation technology, and efficient management. Production costs are divided into two categories: fixed and variable.

Fixed Costs

Fixed cost is a type whose value does not change, regardless of the amount of goods or products produced[11]. The fixed costs of blood shell cultivation can be seen in Table 4.

Table 4. Fixed costs blood cockle cultivation business in Bangko District

Cost components	Average fixed cost (IDR/Year)
Depreciation expense	5,034,183
Maintenance costs	487,209
Fixed labor wages	10,465,116
Amount	15,986,508

Based on Table 4, the average fixed costs incurred by farmers blood cockles in Bangko District reached IDR 15,986,508, consisting of depreciation costs from various capital such as arrowroot, nets, filler baskets, boats, and wood, with a total average depreciation cost of IDR 5,034,183. In addition, farmers also spent maintenance costs of IDR 487,209 and fixed labor costs to maintain blood cockles for 3 months, totaling IDR 10,465,116. Compared to Asih[8] research in Panipahan Village, fixed costs in the area were much smaller, ranging from IDR 1,080,000 to 3,795,000, because farmers in Panipahan only calculated depreciation costs and did not calculate maintenance costs or using huts.

Variable Costs

According to Darmawan & Nugroho[12], Variable costs are the total costs incurred to obtain production factors whose quantities can be changed. The variable costs of blood shell cultivation can be seen in Table 5.

Table 5. Variable costs of blood shell farming in Bangko Subdistrict

Cost Component	Average non-fixed cost (IDR/ Year)
shellfish seeds	42.697.674
Consumption	18.000.000
Harvest labour wages	231.148.837
Transport	14.860.465
Amount	306.706.976

Based on Table 5, the total variable cost in the blood cockle cultivation business reaches IDR 306,706,976 per year, with the most significant cost component coming from harvest labor wages of IDR 231,148,837, which covers around 75.4% of the total cost. This shows that the harvest process requires intensive labor, including shellfish collection and sorting. The cost of shellfish seeds, which reaches IDR 42,697,674 per year, or around 13.9% of the total cost, is crucial to ensure optimal survival and growth. In addition, the cost of consumption and transportation contributed 5.9% and 4.8%, respectively. Research by Saputra et al.[13] in Sukal Hamlet, West Bangka Regency, showed that despite focusing more on income, the average total income from blood cockle cultivation on 0.58 hectares of land was IDR 20,642,336 per production cycle, providing an overview of the scale of the business and potential revenue from blood cockle cultivation.

Total cost

The total cost is the total amount of expenses incurred in cultivating blood cockles until harvest. The total cost of blood shell cultivation can be seen in Table 6.

Table 6. Total cost of blood cockle cultivation business in Bangko District

No	Cost components	Average (IDR/Year)
1	Fixed costs	15,986,508
2	Variable costs	306,706,976
	Total cost	322,693,484

Table 6 shows that the average total cost of blood cockle cultivation in Bangko District amounts to IDR 322,693,484. The fixed costs in this study are IDR 15,986,508, while the variable costs are IDR 306,706,976. The initial capital influences the fixed costs incurred by blood cockle farmers in long-term investment in equipment and production facilities.

Transportation costs

According to Djojodipuro[14], the cost of transportation input is incurred by a businessman to move one unit of weight of goods one unit of distance. In the analysis of land rent value, the distance factor of the location of the pond land is considered to affect the transportation costs that must be incurred, which will affect the amount of land rent value from the use of the land. Based on the research results, the average distance of 18 km (2 hours) shows how far the production results must be transported from the pond to the market, with a transportation cost of IDR 930,000, this is

the total cost incurred to transport all production results. The average production is 115,574 kg, which indicates the total harvest or product produced.

Land Rent Based on Fertility and Distance of Pond Location to Market Center

Land rent analysis of blood clam ponds based on Ricardian land rent is built based on land fertility factors and production distance to the market, as seen in Table 7.

Table 7. Land rent value based on fertility and distance factors

No	Information	Unit	Amount
1	Productivity	kg/Ha	8,510
2	Production cost	IDR/Ha/	322,693,484
3	Average price of clams	IDR/kg	9,000
4	Transportation costs	IDR/kg/km	0.44
5	Distance to Market	km	18
6	Land Rent	IDR/Ha	49,777,968

Based on Table 8, productivity is quite large compared to other costs. Blood cockle cultivation in this study reached 8,510 kg/ha/year, which is higher than the study by Saputra et al.[13], which recorded a productivity of 7,920 kg/ha/year. Environmental factors, cultivation management, and the quality of the seeds used can influence this. The total production cost in this business reached IDR 322,693,484/ha/year, lower than the production cost reported by Ningsih[15] (2013) of IDR 387,980,667/ ha/year, which shows better cost efficiency. The land rent cost in this cultivation business is IDR 49,777,968 per hectare per year, which is still lower than the land rent costs reported by Ningsih[15] of IDR 52,383,084/ha/year. This cost difference can be caused by variations in production input prices, cultivation methods applied, and different geographical and economic factors in each region.

Factors Affecting Land Rent Value

The factors influencing the land rent value of blood mussel ponds in Bangko District are fertility factors and the distance of the pond location to the market or sales location. Fertility is determined from the value of land productivity in units of kg/ha, as shown in Table 8.

Table 8. T-Test results

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	6.938836	3.920645	1,76982	0.08438
Distance (km)	-0.60065	0.185287	-3.24171	0.002398
Productivity	1.379319	0.392024	3.518459	0.001098

The results of the substitution value from the multiple regression analysis on the regression model equation are:

$$\hat{Y} = 6.938836 - 0.60065X1 + 1.379319X2$$

The regression results show a significant relationship between distance and productivity on the dependent variables analyzed. Distance to the market has a coefficient of -0.60065 with a P-value of 0.002398, which indicates a significant adverse effect on the land rent value, where the further the cultivation location is from the market, the lower the land rent value. This result is in line with the research of Saputra et al.[13], which states that distance to the market hurts the profits of fisheries businesses because of the cost of higher transportation and difficulty in accessing potential markets. On the other hand, the productivity variable has a coefficient of 1.379319 with a P-value of 0.001098, which indicates a significant positive effect on the dependent variable. The higher the productivity of the cultivation business, the higher the land rent value. This result is consistent with Ningsih[15], which states that increasing productivity contributes directly to increasing income and profits in fisheries.

F Test

The F test is a stage used to explain the influence of independent variables simultaneously (comprehensively) on the dependent variable, as seen in Table 9

Table 9. F Test results in ANOVA

	Df	*SS*	*MS*	*F*	*Significance F*
Regression	2	0.544897	0.272449	32.66939	3.89E-09
Residual	40	0.333583	0.00834		
Total	42	0.87848			

The F-statistic value of 32.66939 with a Significance F of 3.89E-09 indicates that the overall regression model is significant, which means that the independent variables included in the model have a real influence on the dependent variable. The Sum of Squares (SS) value for the regression is 0.544897, greater than the residual of 0.333583, indicating that this model can explain the variation in the data quite well. The results of this regression suggest that the model used successfully explains the relationship between the factors that influence blood cockle cultivation efforts. These results also support the hypothesis that the independent variables in the model contribute significantly to the variation in the dependent variable. Compared to previous studies, the findings in this study align with the results of Ningsih[15], who found an F value of 27.45 with a significance level of p <0.05, which also shows a significant relationship between production costs and productivity. Likewise, Saputra et al.[13] research recorded an F value of 30.21 with a Significance of F <0.01, confirming a strong relationship between the variables studied.

Coefficient of Determination

The coefficient of determination (R^2) shows how much the regression model can explain changes or variations in the data we are analyzing. In simpler terms, R^2 tells us how much variation in the dependent variable (y) can be explained by the regression model's independent variables (x), as seen in Table 10.

Table 10. Results of the determination coefficient test

Multiple R	0.787574
R Square	0.620273
Adjusted R Square	0.601286
Standard Error	0.091321
Observations	43

The R Square (R^2) value of 0.620273 indicates that around 62.03% of the variation in the dependent variable can be explained by the independent variables in the model, which means that this regression model is quite effective in explaining changes in the dependent variable. However, other factors outside the model still explain around 37.97% of the variation. The Adjusted R Square value of 0.601286, which is slightly lower than R^2, indicates that even though the number of variables in the model is considered, the model's ability to explain the dependent variable remains stable and high. In addition, the Standard Error value of 0.091321 indicates a low level of estimation error, indicating good model accuracy in predicting the dependent variable. With 43 observations, this model has sufficient data to produce accurate estimates. These results align with the findings of Saputra et al.[13], who recorded an R Square value of 0.64, and Ningsih[15], who obtained an R Square value of 0.64. of 0.58, which also indicates a strong relationship between the variables in the model.

4. CONCLUSION

The results of the study related to the land rent value of blood cockle ponds in Bangko District, Rokan Hilir Regency, Riau Province, can be concluded that the average

land rent value obtained by blood cockle farmers in Bangko District is IDR.49,777,968 and factors that influence the land rent value in this study are distance and productivity, where distance has a significant adverse effect on the dependent variable (land rent). At the same time, productivity has a considerable positive impact on land rent.

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