The impact of operational and transportation expenses on salt farmers' net sales

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Abstract. Madura Island is one of the biggest salt producers in Indonesia. Some issues faced by small salt farmers include a lack of warehouse management, volatile salt prices, and poor financial management. This study examined the impact of operational and transportation costs on the net sales of smallholder salt farmers. A multiple linear regression analysis was performed to validate the model. A uniform sample of 150 salt farmers in Sumenep Regency was chosen for the research. The results showed that the inventory turnover ratio and transportation costs significantly affected net sales. Meanwhile, net sales were not significantly affected by the average collection period, inventory conversion period, working capital efficiency, return on investment, or debt turnover ratio. Salt farmers are advised to adopt geomembrane technology to increase profits and improve salt quality. They must focus not only on salt standardization to enable large-scale production but also on collaborating with various organizations to integrate farmland.

1 Introduction

Salt, one of Indonesia's national strategic commodities, plays a crucial role as it is a necessity for both society and industry [1]. Smallholder salt farmers produce a significant share of Indonesia's salt. While some farmers have already adopted geomembrane technology for salt production, many still use traditional methods, including solar evaporation. The quality of salt largely depends on how salt farmers handle and treat it during pre-production, production, and post-production, from the salting location to storage hubs. Meanwhile, salt farmers' profits depend heavily on the land area, capital, and labor costs [2]. Due to unfavorable environmental conditions and the need for greater innovation, Indonesia lags in salt production competitiveness, resulting in the country's increased reliance on imports, particularly for industrial use.

The volatility of salt prices and the fact that not all salt farmers have a warehouse to store their salt, while nearby salt producers harvest massive amounts during favorable weather conditions, are among the main issues salt farmers face [3]. Other problems in financial management, including family involvement in business and financial procedures, continue to afflict most farmers' salt business management systems [4], [5], [6]. Furthermore, due to low financial literacy, financial planning and income distribution continue to pose challenges to salt farmers [7].

Salt enterprises in the downstream area face an institutional issue stemming from the prevailing, unregulated, informal lending system between intermediaries and salt farmers, which hinders salt farmers from setting their own salt prices. Therefore, an institutional design involving government intervention is necessary to increase salt farmers' market access [8]. Issues related to government regulations, partnerships, pricing, financing availability, and marketing channels are believed to impact salt farming significantly [9].

Farmers meet economic demands through manual, traditional salt production. In this endeavor, collectors play a crucial role in generating revenue and providing support during challenging times. Meanwhile, landlords offer assistance through salt field rent and profit-sharing schemes. This manner of salt farming arrangement holds cultural value in preserving an ancestral occupation, which must be prioritized even in trying circumstances [10].

Following funding allocation, it is crucial to examine salt farmers' productivity to assess the effectiveness of this strategy [11]. Not only the amount of the funds, but also Indonesia's salt production is significantly impacted by human resources and salt consumption. To boost salt production, the government needs to increase the number and capabilities of human resources in this sector [12]. To improve their abilities, for example, the government should provide more in-depth training and coaching through the Fisheries Office or other relevant authorities [13]. Because farmers rely heavily on intermediaries or wholesalers, there is a growing need for them to improve their knowledge of market prices for salt. Besides, there is a need for farmers to come together under institutions [14], [15], [16]. It is imperative that salt producers enhance packaging quality, expand product marketing, and boost their competitiveness to create opportunities for export.

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Madura is Indonesia's largest salt producer, with extensive potential for the salt industry, particularly in Sumenep Regency. Salt farmers on this island only switch from salt farming to aquaculture during the wet season. As a result, they developed the ability to adapt to harsh weather, even as the climate becomes increasingly unpredictable. However, the volatile meteorological events caused by climate change, such as longer dry seasons, increased precipitation during the dry season, and higher tides, have led to a decline in salt production [17].

Salt farming typically requires significant investment, is highly seasonal, and relies heavily on marine and coastal resources. Unfavorable climate and weather conditions, price mechanisms, and the salt market all pose significant risks to the salt industry [18]. Due to a lack of warehouses, farmers typically leave the salt produced piled up in ponds until a wholesaler purchases it [19], resulting in compromised salt quantity and quality. Weather changes reduce the amount of salt, while air pollution and other contaminants compromise its quality. As a result, the salt's selling price declines.

The income of salt farmers in Madura is determined by the profit-sharing scheme under which they work. The cost of production is typically shared between landlords and salt farmers as sharecroppers in proportions determined by the profit-sharing scheme they have agreed upon. *Paron* (two-part scheme, 1:1 division), *telon* (three-part scheme, 2:1 division), and dan *leman* (five-part scheme, 3:2 division) are the three profit-sharing patterns that landlords and sharecroppers apply in salt production [14].

Previous research used descriptive methods to analyze relationships among technology, human resources, capital structure, price, market access, and increases in salt farmers' income [20], [21], [22]. Still, no research has investigated the relationships among financial indicators, transportation costs, and the profitability of salt farmers. Therefore, research is deemed necessary to develop a model of the relationship between production and transportation costs and farmers' net sales.

This study aimed to determine the capital invested by farmers, examine the inventory systems they use, evaluate the distribution processes they engage in, and analyze their returns on investment (ROI). The research contribution is to provide salt producers with annual performance reports, with the hope that these reports may benefit them. The advantages include supplementary information that aids in decision-making, enhances company performance, and expands knowledge. This study specifically examined the impact of financial performance on salt farmers' earnings.

2 Method

This research employed multiple linear regression [23] to analyze the relationship between financial indicators, transportation costs, and the profitability of salt farmers. The research methodology flowchart is described in Figure 1. The independent variables in this research were sevenfold: average collection period, inventory conversion period, inventory turnover ratio, working capital effectiveness, return on investment, debtor turnover ratio, and total transportation cost. The dependent variable was net sales. These variables are defined in Table 1, and the conceptual model is described in Figure 2.

Table 1. Independent and dependent variables.

Variable	Unit	Symbol
Net sales refer to the total number of sales made in a given year.	IDR	Y
The average collection period is the time a company requires to collect receivables from the sale of goods on credit, where payments can be received in cash or via bank deposits that can be reused.	days	X_1
The inventory conversion period is the average time required to convert raw materials into finished goods and sell them.	days	X_2
Inventory turnover ratio is the ratio of the number of products sold to the total inventory.	%	X_3
Working capital effectiveness ratio is the ratio of current assets to outstanding debt. Examples of assets include land, vehicles, warehouses, and equipment.	%	X_4
Return on investment is the ratio of a company's annual income or profit to the initial or current investment amount.	%	X_5
The debtor turnover ratio is a measure that indicates the proportion of assets financed by debt.	%	X_6
Total transportation cost is the sum of product transport cost, product storage cost, warehouse cost, vehicle cost, and sales administrative cost.	IDR	X_7

The hypotheses proposed in this research are as follows:
H_0: Variable X has no significant influence on variable Y.
H_1: Variable X has a substantial influence on variable Y.

These hypotheses are detailed as follows:
H_0 = Average collection period (X_1) has no significant influence on net sales (Y).
H_1: Average collection period (X1) significantly influences net sales (Y).
H_0 = Inventory conversion period (X_2) has no significant influence on net sales (Y).
H_1: The inventory conversion period (X2) significantly influences net sales (Y).
H_0 = Inventory turnover ratio (X_3) has no significant influence on net sales (Y).
H_1 = Inventory turnover ratio (X_3) has a significant influence on net sales (Y).
H_0 = Working capital effectiveness (X_4) has no significant influence on net sales (Y).
H_1 = Working capital effectiveness (X_4) has a significant influence on net sales (Y).

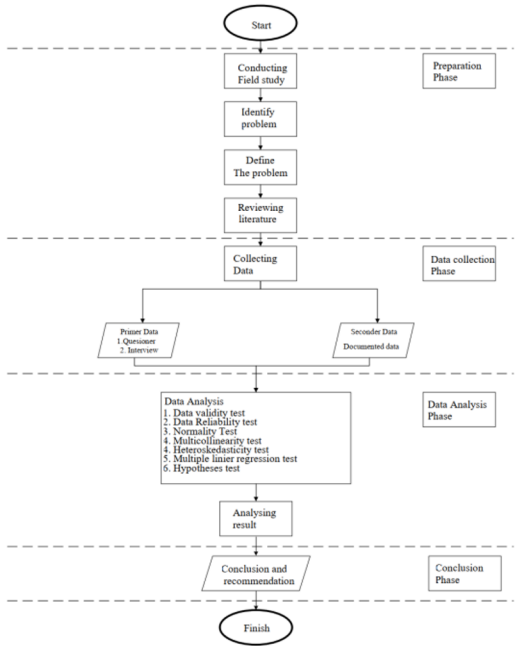

Fig. 1. The research methodology flowchart.

H_0 = Return on investment (X_5) has no significant influence on net sales (Y).
H_1 = Return on investment (X_5) has a significant influence on net sales (Y).
H_0 = Debtor turnover ratio (X_6) has no significant influence on net sales (Y).
H_1 = Debtor turnover ratio (X_6) has a significant influence on net sales (Y).
H_0 = Total transportation cost (X_7) has no significant influence on net sales (Y).
H_1 = Total transportation cost (X_7) has a significant influence on net sales (Y).

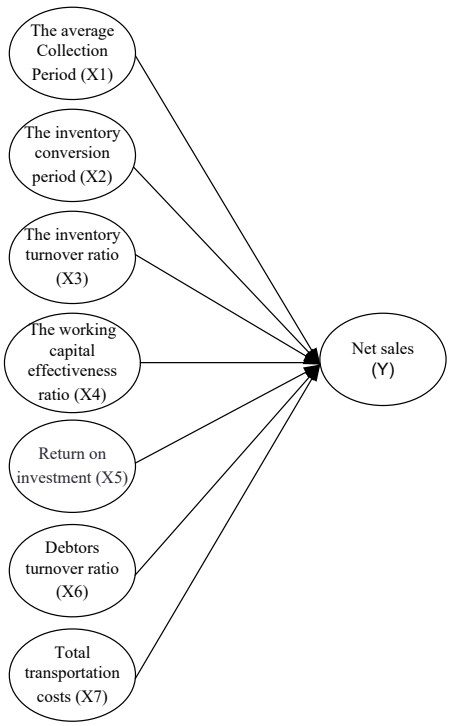

Fig. 2. Conceptual framework for the relationships between financial indicators and the income of salt farmers.

These variables were included in a data collection questionnaire. Additionally, interviews with respondents were conducted. The number of respondents was determined using the Slovin method [24]. This method is used when the characteristics of a population are uncertain. The Slovin sampling formula is as follows:

$$n = N/(1 + (N*e^2)) \quad (1)$$

Where n is the sample size, N is the total population, and e is the error tolerance.

The salt farmer population size was 1650. Therefore, at a 95% confidence level, the sample size n was 1650/(1 + (1650*0.0025)) or 320. Since the respondents' characteristics were homogeneous, 150 responses were collected. The hypotheses in this research were tested using multiple linear regression analysis. The model is expressed in the following equation:

$$Y = \beta_0 + \beta_1 X_i + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + \beta_6 X_{6i} + \beta_7 X_{7i} + e_i \quad (2)$$

Where β_0 is the constant term, β_1 to β_7 are the correlation coefficients of the explanatory variables to the dependent variable, and e_i is the error term.

Before commencing the multiple linear regression analysis, several classical assumption tests were conducted to determine whether the observations in the model satisfied the assumptions. The linear model was considered to be more appropriate to use if the following assumptions were met:

1. Normality

The normality test assesses whether the confounding or residual variables in a regression model follow a normal distribution [25]. In this study, the researcher used the Kolmogorov-Smirnov test to test normality. If the p-value from a normality test is less than 0.05, the data are typically normally distributed. On the other hand, if the ρ value < 0.05, the data are not normally distributed. In this study, the researcher employed the central limit theorem, which states that, for large samples (n > 30), the data tend to follow a normal distribution.

2. Multicollinearity

The multicollinearity test assesses whether the independent variables in a regression model are linearly related. Mathematical analysis of the correlation between independent variables and calculation of the variance inflation factor (VIF) value are used to detect the presence or absence of multicollinearity. Multicollinearity occurs when the correlation coefficient exceeds 0.9 and the VIF exceeds 10. On the other hand, if the correlation is below 90% and the VIF value is smaller than 10, then multicollinearity does not occur. Additionally, multicollinearity is evident when tolerance values are below 0.01 and VIF values are above 10. If the tolerance value is below 0.01 and the VIF value exceeds 10, multicollinearity is present.

3. Heteroscedasticity

The heteroscedasticity test assesses whether the error variances or residuals differ across observations in a regression model. One way to test this is to use a graphical method, such as a scatterplot. If a regular

pattern (wavy, widening, then narrowing) forms, then heteroscedasticity has occurred. However, if there is no clear pattern and the dots spread above and below zero on the Y-axis, then no heteroscedasticity has occurred.

3 Result and discussion

Data validity testing was conducted for each questionnaire variable. If the r-count exceeds the r-table, the variable is declared valid. Conversely, if the r-count is smaller than the r-table, the variable is invalid. In this research, with a degree of freedom (df) of n - k = 150 - 2, a significance level of 5%, and n = 150, the value obtained from the product moment table was 0.130. Table 2 presents the results of validity testing for each variable.

Table 2. Validity test results of the variables.

Variable	r-count	r-table	Description
Y	1.00	0.13	Valid
X_1	0.171	0.13	Valid
X_2	0.282	0.13	Valid
X_3	0.496	0.13	Valid
X_4	0.431	0.13	Valid
X_5	0.499	0.13	Valid
X_6	0.957	0.13	Valid
X_7	0.985	0.13	Valid

A questionnaire is considered reliable if a person's answers remain consistent or stable over time. Cronbach's alpha is used for each research variable to determine the reliability of a question. The results of the test can be considered reliable if Cronbach's alpha > 0.60.

Table 3. Reliability test results.

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0,554	0,359	8

Table 3 shows a Cronbach's alpha of 0.554, which was significant. In other words, each variable was reliable. Therefore, the questionnaire could be used in research.

The purpose of conducting a normality test on a data series is to determine whether the population is normally distributed. If the data are typically distributed, parametric statistical tests can be used. In this research, a normality test was performed using the Kolmogorov-Smirnov test. Table 4 shows that the value of asymp. Sig. (2-tailed) was 0.560, which means it was smaller than 0.05. Therefore, it can be concluded that each variable was normally distributed.

The multicollinearity test determines whether there is a perfect or near-perfect linear relationship among the independent variables in a regression model. A good regression model is one in which multicollinearity, or correlation among independent variables, does not occur. If the VIF value is less than ten and the tolerance value is greater than 0.1, multicollinearity does not happen in the regression model. Based on Table 5, the VIF values for all independent variables were less than 10, indicating that the regression model was free of multicollinearity.

Table 4. Kolmogorov-smirnov normality test results.

One-Sample Kolmogorov-Smirnov		
		zed Residual
N		110
Normal Parameters[a,b]	Mean	0,0000000
	Std. Deviation	2,20299952
Most Extreme Differences	Absolute	0,188
	Positive	0,188
	Negative	-0,122
Test Statistic		0,188
Asymp. Sig. (2-tailed)		.560[c]
a. Test distribution is Normal.		
b. Calculated from data.		
c. Lilliefors Significance Correction.		

The heteroscedasticity test is used to determine whether the variance differs across observations. The Glejser test determines whether heteroscedasticity exists among the independent variables in a regression model. The regression model is free from heteroscedasticity if the independent variables do not have a statistically significant influence on the residuals. Based on Table 5, all independent variables had t-values greater than 0.05, indicating they were free of heteroscedasticity.

Table 5. Multicollinearity test results.

Coefficients								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-569.380	11.080		-51.389	0.345		
	X_1	-0.032	0.075	-0.006	-0.429	0.669	0.951	1.052
	X_2	0.043	0.114	0.006	0.373	0.710	0.897	1.115
	X_3	5.161	0.768	0.017	6.722	0.231	0.785	1.274
	X_4	-0.331	0.331	-0.015	-1.000	0.319	0.900	1.112
	X_5	-0.639	0.487	-0.021	-1.311	0.193	0.759	1.318
	X_6	-1.438	2.710	-0.034	-0.530	0.597	0.247	1.411
	X_7	42.130	2.786	0.964	15.121	0.440	0.249	1.232

In this study, multiple linear regression was used to examine the effect of independent variables on the

dependent variable. The model is expressed in the equation below:

$$Y = 569.380 - 0.032X_1 + 0.043X_2 + 5.161X_3 - 0.331X_4 - 0.639X_5 - 1.438X_6 + 42.719X_7 + e \quad (3)$$

In multiple linear regression, the coefficient of determination is used to assess the model's ability to fit the data accurately. Suppose the coefficient of determination of the multiple linear regression model is 1. In that case, the model fits the data perfectly. On the other hand, if it is close to 0, it is not good at adjusting or matching the data. Based on Table 6, the coefficient of determination (R2) was 0.982 or 98.2%. This indicates that the independent variables accounted for 98.2% of the influence on the dependent variable, while the remaining 1.8% stemmed from variables not explored in this research.

The F-test is a simultaneous test of the regression coefficients' significance. This test aims to determine the influence of all independent variables in a model on the dependent variable.

If the F-count is greater than the F-table, there is a significant influence. In this research, the F-count (797.445) was greater than the F-table (2.43). Therefore, H_1 was accepted, indicating that all independent variables significantly influenced the dependent variable.

Table 7. F-test results.

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25682,896	7	3668,985	797,445	.000[b]
	Residual	469,295	102	4,601		
	Total	26152,191	109			

In multiple linear regression, the t-test is used to test the significance of each regression coefficient. The t-test can determine the influence of each independent variable at the 5% significance level, with degrees of freedom (df) = n – k = 146. H_1 is accepted if t-count > 1.98, and H_1 is rejected if -1.98 ≤ t-count ≤ 1.98.

The test results of this study can further be explained as follows:

1. The influence of average collection period (X_1) on net sales (Y)
   As the t-count for the average collection period (-0.032) was less than the t-table value (-1.98), H_1 was rejected. In other words, the average collection period (X_1) did not significantly influence net sales (Y).
2. The influence of inventory conversion period (X_2) on net sales (Y)
   Because the t-count for the inventory conversion period (0.043) was less than the t-table value (1.98), H_1 was rejected. In other words, the inventory conversion period (X_2) did not significantly influence net sales (Y).
3. The influence of inventory turnover ratio (X_3) on net sales (Y)
   As the t-count of the inventory ratio (5.161) was greater than the t-table (-1.98), H_1 was accepted. In other words, the inventory turnover ratio (X_3) significantly influenced net sales (Y).
4. The influence of working capital effectiveness (X_4) on net sales (Y)
   As the t-count of working capital effectiveness (-0.331) was less than the t-table (-1.98), H_1 was rejected. In other words, working capital effectiveness (X_4) had no significant effect on net sales (Y).
5. Influence of return on investment (X_5) on net sales (Y)
   As the t-count of return on investment (-0.639) was less than the t-table (-1.98), H_1 was rejected. In other words, return on investment (X_5) had no significant influence on net sales (Y).
6. The influence of debtor turnover ratio (X_6) on net sales (Y)
   As the t-count for the debtor turnover ratio (-1.437) was less than the t-table value (-1.98), H1 was rejected. In other words, the debtor turnover ratio (X_6) did not significantly influence net sales (Y).
7. The influence of total transportation cost (X_7) on net sales (Y)
   As the t-count of total transportation cost (42.130) was greater than the t-table (1.98), H1 was accepted. In other words, total transportation cost (X_7) had a significant influence on net sales (Y).

Based on the analysis, the inventory turnover ratio significantly influences the net sales of salt farmers in Sumenep Regency. This means that the higher the inventory turnover ratio, the higher the net sales will be. Transportation also significantly influences net sales. This means that the better the transportation, the higher the net sales will be.

Threats to the salt farming businesses in this area include the erosion of traditional knowledge and practices, a lack of skilled labor, a poor understanding of good agricultural practices, and environmental degradation. These issues can be addressed by preserving traditional knowledge, promoting awareness of cultural values, strengthening ecological conservation, and fostering partnerships among salt farming communities, governmental agencies, and the private sector. In addition, the use of horizontal-axis windmills, revitalization of groups and collaboration, and capital strengthening through the efficient implementation of the PUGAR policy (Empowerment of Smallholder Salt Businesses) are recommended, along with the development of standard procedures for the timely and targeted disbursement of aid [9].

Farmers should always strive to improve their harvests and maintain the quality of the salt, thereby increasing its selling price. They must also learn to use the media effectively as a marketing and promotional tool. However, despite their familiarity with numerous marketing platforms, farmers still rely heavily on Facebook networking and social media marketing strategies as the primary effective e-marketing techniques for businesses [26]. Salt farmers are advised to use geomembrane technology to improve the quality of their salt and increase profitability [27]. Standardizing the salt quality should be a priority for farmers [8]. Finally, land integration efforts among salt

farmers are necessary to reach the minimum production scale of 10 hectares [28].

4 Conclusion

This research examined the relationship between financial performance variables and the net sales of salt farmers in salt production businesses. The analysis showed that the inventory turnover ratio and transportation costs significantly influenced salt farmers' net sales. On the contrary, the average collection period, inventory conversion period, working capital effectiveness, return on investment, and debtor turnover ratio did not have a significant influence on salt farmers' net sales. Salt farmers are advised to use geomembrane technology to increase revenue and improve the quality of their salt. They also need to prioritize standardizing their salt and collaborating with various organizations to facilitate land integration, thereby enabling large-scale production Future research should address the limitations identified in this study by incorporating variables that account for differences in net sales between salt farmers who own warehouses and those who do not. Ownership of warehouses may influence farmers' ability to store salt for longer periods, manage price fluctuations, and negotiate better deals with buyers. Therefore, future studies could employ a comparative analysis to examine how storage capacity affects farmers' income stability and market participation. Additionally, further research is needed to explore the structure and dynamics of transactions between farmers, collectors, and salt factories. Understanding the nature of these relationships, whether contractual agreements, informal arrangements, or market-based interactions, can provide insights into how different transaction models influence farmers' bargaining power and sales outcomes. Mixed-method approaches combining quantitative sales data with qualitative interviews would allow for a more comprehensive understanding of the market mechanisms shaping farmers' livelihoods. By integrating these aspects, future research can help develop more effective policies and interventions to improve the efficiency, equity, and sustainability of salt distribution.

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