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Feasibility study of salt industry and factor influencing the salt production in Pangkep

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Abstract. *This study aimed to investigate the dissemination level of Ulil Filtered Technology (TUF) and geo-membrane technology and factors influencing salt production in Pangkep. Purposive sampling was performed for data collection. Regression analysis was applied for data analysis. Revenue cost analysis (R-C ratio) was performed. Break Event Point analysis (BEP) was applied, and Pay Back Period (PBP) analysis was used. The results showed that salt farmers unfamiliar with TUF and geo-membrane technology ranged from 6.71 to 9.62%, reasonably know (36.53 - 37.76%) and know to use TUF and geo-membrane technology (53.85 - 55.53%). Cost and technology significantly affected salt production, including area and number of labourers. The business feasibility study showed that Revenue Cost Ratio (1.98), Break Event Point (IDR 4,735,276), and Pay Back Period (1.9 years), respectively.*

I. INTRODUCTION

The quality of Indonesian salt and its production are affected by the salt concentration and climate condition. The Local salt product is found to be lacking in calcium and magnesium, particularly NaCl content, which is less than 97%. Nonetheless, Indonesia has been known as a salt producer alongside Australia, India, New Zealand and Germany. Surprisingly, Indonesia still imports 3,989 million salts to meet its daily demands, both Industry and consumption.

On the one hand, National salt production declines gradually from year to year. On the other hand, population growth and industrial development increase steadily. National salt production is estimated at 3.165.600 tons per year. However, it does not meet the demand in terms of quantity and quality. To overcome this, through the Ministry of Marine Affairs and Fisheries, the government has launched a program of National Sufficiency in Salt.

National Standard of Indonesia (SNI) for salt consists of salt consumption and industrial (BRKP, 2001). Both salt industry and consumer demands are 3.878 million tons and increasing about 10% per year. Meanwhile, domestic production only reached 1.2 million tons. Although Indonesia can be the largest producer of salt due to its two seasons only, Indonesia cannot meet its daily consumption of salt.

Pangkep has been identified as one of the local salt producers with Jeneponto and Takalar in south Sulawesi. Their combined salt production only generates approximately 37,000 tonnes per year with a productivity of 3-5 tonnes per ha. Meanwhile, the local demand for salt in South Sulawesi is estimated at 67,000 tons per year. Therefore, salt production technology is urgently required to increase salt production as well as its quality.

Ulil Filter Technology (TUF) can be applied to increase the productivity and quality of local salt. TUF uses filters between the plots, and there are threads in large containers and small shelters to produce clean salt (Yasin *et al.*, 2019). This technology can produce 3-4 tonnes of salt per plot.

TUF production has reached above 80 ton/ha per season, with the current production condition without TUF only reach 50 tonnes per ha per season. Therefore, the application of TUF is suitable to increase salt production in the Pangkep regency.

This study aimed to determine the level of technology adoption (TUF and Geo Membrane) and industrial salt product and factors influencing the production level and feasibility of the local salt industry.

II. MATERIAL AND METHODS

2.1. Study Area

This study was conducted in Bungoro Sub-district, Pangkep Regency, South Sulawesi, Indonesia.

2.2. Data collection

Observation and direct interview using the questionnaire were applied to respondents. Purposive sampling was performed for respondents, following government policy for marine and fisheries, Office for Management of Regional Revenue, Finance and Assets (BAPPEDA), Environment Agency, Office of Public Works-Human Settlements and Spatial Planning, traders, employers and salt farmer. Respondent was also determined by cluster and randomized with 10% precision according to Riduwan and Akdon (2008) with equation as follow:

$$n = N/Nd^2 + 1 \quad \text{..... (1)}$$

Where:

N = Total sample
N = Total population

2.3. Data Analysis

Regression analysis was performed for statistical analysis (Kuncoro, 2003)

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 \ldots + b_aX_a \quad \text{..... (2)}$$

Y = Total Production
X_1 = Initial cost
X_2 = Area
X_3 = Labor
X_4 = Technology
A = Constanta
B = Regression coefficient

The economic index of local community in Bungoro District was observed using equation as follow:

1) Revenue cost ratio

$$\text{RC ratio} = \frac{\text{Total profit}}{\text{Total cost}}$$

2) Break Event Point

$$\text{BEP} = 1 - \frac{\text{Fixed cost}}{\frac{\text{Variable cost}}{\text{Total sales}}}$$

3) Pay Back Period (PBP)

$$\text{PBP} = \frac{\text{Capital Investment}}{\text{Profit}} \times 1 \text{ year}$$

III. RESULTS AND DISCUSSION

3.1. Levels of understanding

The level of understanding of community in Bungoro District related to technology which used for producing salt by Ulil Filter Technology (TUF) and geo-membrane from the total sample as follows:

Table 1. Percentages of understanding level for Ulil Filter Technology (TUF)

Level of understanding			Total
Don't know	Adequate	Know	
9.62	36.53	53.85	100

Table 2. Percentages of understanding level for geo-membrane

Level of understanding			Total
Don't know	Adequate	Know	
6.71	37.76	55.53	100

3.2. Salt Production

Based on analysis factors affects the salt production in Bungoro district, Pangkep regency can be seen in Table 3.

3.3. Feasibility Study

Based on the result of economic analysis of salt management business in Bungoro District, Pangkep Regency can be seen below:

Table 3. The results of multiple regression analysis are related to factors influencing salt production in Pangkep regency

Dependent Variable	Independent Variable	coefficient regression (b)	T value	Probabilities significance
Salt Production (Y)	Constanta	-16,0056	-11,0049	0,00000
	Initial capital (X1)	1,501769	15,61753	0,00000**
	Area (X2)	-0,01961	-0,36339	0,718633ns
	Total labor (X3)	-0,14253	-2,1543	0,038614*
	Dummy Technology (X4)	1,061439	11,62926	0,00000**
F value		126,3218		Prob. Sig. : 0,00000**
R^2		0,9387		

*) Significant level 5%
**) Significant level 10%
Source: data primer, 2017

1) Revenue cost ratio (Gie, 1981)

$$\text{R/C ratio} = \frac{12.832.500}{6.863.517} = 1.87$$

2) Break Event Point (Sigit, 1979)

$$\text{BEP} = \frac{3.490.675}{1 - \frac{3.372.342}{12.332.500}}$$

$$= 4.735.276$$

3) PBP = $\frac{24.363.517,32}{12.832.500,00}$ x 1 year

= 1.9 year

3.4. The level of understanding related to TUF Technology

The community's level of understanding in producing salt with TUF was generally adequate and understood (Table 1). There were only 9.62% of respondents did not know to use the TUF. It indicated that the process of dissemination of TUF was running well. Conversely, table 2 showed that understanding the community in salt farming using geomembrane technology is generally adequate and understood. However, 6.71% only respondents did not understand to apply the TUF. It shows that the process of dissemination of TUF was successful.

The result showed that the community has generally combined the use of TUF and geo-membrane in salt farming. However, uncertain weather conditions and initial capital are the primary problems. Mainly, geo-membrane price is costly (IDR 22.000 per meter).

3.5. Factors influencing salt production

The regression model based on the Cobb-Douglas was applied to production purposes (Hajkova and Hurnik, 2007; Husain and Islam, 2016; Oyenuga and Oyejola, 2017). The Cobb-Douglas production is considered effective in the sound production stage, whose production elasticity is between zeros to one. Furthermore, the estimation results in a regression coefficient indicate the magnitude of elasticity. The magnitude of the elasticity shows the level of returns to scale (Hansen and Knowles 1998). The normality test (Figure 1) from all samples showed that the dots close to the diagonal line indicated that the residual value data is typically distributed.

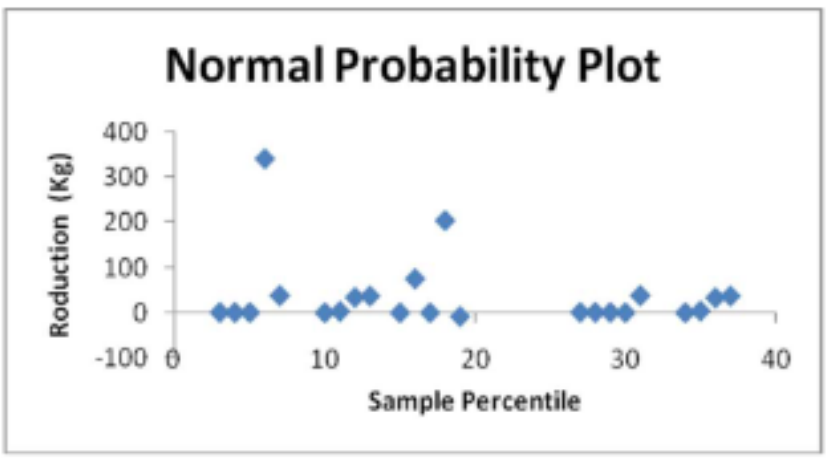

Figure 1. Normality Test

The model is the variable of salt production (kg) as the variable Y (dependent variable), and the variable X1 = working capital (IDR), X2 = land area (ha), X3 = number of labor, X4 = dummy Technology 1 = using TUF and Geomembrane; 0 = not using technology) as the dependent variable.

The summary of regression result using MS Excel 7.0 software is presented in Table 3. Based on Table 3, the salt production regression equation in Pangkep Regency as follows:

Y = -17,0056 + 1,5017X1 - 0,0196X2 – 0,1425X3 + 1,0614X4

The multiple linear regression equation related to regression coefficient value showed that b1 of 0,5017, indicating that the increase of 1 % work capital in salt production leads to increased salt production by 0,5017 %. Besides, b2 of -0.0196 indicated that the increase of farming area by 1 % leads to a decrease in salt production by 0,0196 %. b3 of -0.1425 showed that an increase of labour by 1 % increases salt production by 0.1425 %. b4 of 1.0614 indicated a difference in salt production between the use of TUF and geo-membranes and without technology. These results showed that the average salt productivity from salt farming production was higher using TUF and Geomembrane than those that did not apply TUF and Geo-membrane technology. The constant value 17,0056 showed that this equation model did not analyze four influencing factors' initial production.

3.6. T-test analysis

The t-test result showed that the factors influencing the salt production are: (a) t-test factor for labour factor indicated that the t value was 15,61753, and probability significance 0,000 indicated that labour significantly influenced salt production Pangkep. The increase of labour increases salt production. (b) that value for technological factor was 11.62926 and probability significance 0,000. It suggested that technological factors significantly affect increasing salt production. (c) The t value for land farming was -0,3634. The probability significance of 0,718 indicated no significant effect on salt production. However, at the confidence level of 90% (significant level 0.1), the land factor significantly affects the increase in salt production. This is in line with a probability significance value greater than the natural level (significant levels of 0.01 and 0.05). (d). the t value for labour was -2,1543, and probability significance was 0,038 indicated that the number of labour has a significant effect on salt production. This salt production is following the probability significance of 90%. It shows that the increase in labour leads to a decrease in the level of salt production. (e). The t value for the landlord factor of salt farming was 11,62926, and probability significance 0,0000 indicated a significant difference in salt production between the owner of the land compared to the production of salt obtained from the profit-sharing scheme.

The simultaneous test results showed that the F value was 126,3218 with probability significance 0,0000 indicated that labour, land, labour, land ownership status or salt business had a significant effect on salt production in Pangkep Regency. The factors studied in determining the amount of salt production were 0.9387 (93.87%), while other factors determined the remaining 6.13 %.

3.7. Business analysis

The analysis of the R-C Ratio for-profit was IDR 12.832.500 from 38 samples in Bungoro Pangkep regency. Moreover, the total cost of 38 samples was IDR 6.863.517. Therefore, the analysis of the R-C ratio was 1.87. According to Gie (1981), if R-C Ratio >1, economically feasible to be developed, it can be concluded that the salt industry in Bungoro District is feasible to be developed.

The average of the sample's fixed cost was IDR 3,490,675 with, an average variable cost of IDR 3,372,842, and the average total sales were IDR 12.832.500. It can be concluded that the salt business in BungoroPangkep reaches its break event point at IDR 4.735.276 with a sale price of about IDR 300 per kg (IDR 15.000 per 50 kg). Therefore, salt farming must produce salt IDR 4.735.267 / IDR 300 = 15.784 kg or 15.8 tons (316 packs).

From 38 samples, only three samples experienced a delay in production due to land preparation. Besides, 35 samples can exceed BEP in running their business. Therefore, three samples were considered experiencing financial loss, and 35 samples successfully attained profit.

Fixed costs are the payment of land and building tax (PBB) and profit-sharing by salt farmers who do not own salt land and employee wages. In contrast, variable costs are derived from land preparation costs, purchase equipment, windmill repair, and storage warehouse repair. After calculating the average of the land price, fixed costs, and fixed costs obtained an investment value of IDR 24.363.517,32. The average sales

value in 1 year is IDR 12.832.500. Therefore, the payback period (PBP) was 1.9 years. The result shows that the salt business in Bungoroin Pangkep District reaches a payback period (PBP) of 1.9 years or in 2 salt season cycles. The salt business is not done throughout the year, but only in the dry season every year.

IV. CONCLUSION

The dissemination of technological innovation, both TUF and geo-membrane, on salt farming is adequately understood and familiar by the Pangkep community. Besides, initial capital, land, labour and technologies significantly affect salt production. Furthermore, salt farming is feasible to be developed in the Pangkep regency.

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