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Analysis of Salt Farming Business Effeciency in Palu City

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Abstract: The objectives of this study were two fold-firstly to find out the influence of production factors-land areas, capitals and work time allocation towards the salt production in Palu city and secondly to find out the efficiency levels of the use of production factors. This study was conducted in Palu city. The research subjects were 50 farmers out of 160 population selected by using a random sampling technique. The research data were collected by using questionnaire, interview and observation. Then, they were analyzed with Cobb Douglas production function, effort efficiency and profit analysis. The results showed that the production factors such as pond sizes, capitals and work time allocation influenced the salt production, the rule of business scale that occurred on the salt farming business has increased based on the scale, none of the use of production factors on the salt farming was efficient and the profits of salt farming in Palu city have still been possible to be improved.

Key words: Efficiency, production factors, salt farming business, Palu city, factors, production

INTRODUCTION

Along with the concept of "economic blu" which arises the paradigm of development based on maritime and fishery resources as an activator of national development, the utilization and management of maritime and fishery resources are done by developing some innovations orientiating on the resource preservation in order to give continual economy, social and environment profits. Business of salt production is a business of both the use and the management of maritime and fishery resources. One of its main production factors is a position of land/pond areas that should be nearby beach which is called as the utilization of coastal areas.

Salt is one of the strategic resources and commodities daily consumed by human beings. The amount of salt that should be consumed is about 9 g/day while the amount of industry consumption is 1,480470 tons/year allocated in the household foods and salting fish industry. Particular industries need 1,904, 719 tons/year allocated on CAP (Choir Alkali Plant) and non CAP industries covering oil skin, leather, textile, soap and many others. For the consumption of national production, community salt and PT Garam Persero produce 1,616,150.5 tons/year (national saltscale, 2015).

Imbalance of the needs of national salt with the production of national salt causes Indonesia import salt from other countries in order to fulfil the national needs, especially, for the industries. The average import from Australia is 1,747,026.677 kg sec from India is 377,405,723 kg sec from New Zealand is 1,829,991.667 kg sec from Thailand and five other countries are 40,543,333 kg sec and the other ones are 1,723,054 kg sec/year. Such condition is apprehensive if there is no effort to increase the production capacity efficiently. The salt farming business in Indonesia includes a micro business that has a land ownership <3 has per farmer, except the land of PT Garam (persero) which has more than 3 has.

Central Sulawesi, especially, Palu city has 60 km sec coastal line along Palu Bay that potencially supports the development program of community-based salt business programmed by the Department of Maritime and Fishery aimed at achieving salt self-sufficience. If the climate is sunny, the amount of salt production in Palu is about 50 tons per month. However, in a transition season the production is only 10 tons/month. Therefore, the effort to increase the salt production in Palu city can be done only by using an intensification way, i.e., maximizing the work time allocation during the sunny days. The salt farming businesses in Palu city have decreased from 20-15 Has caused by the functional shift of land to the construction of housing and public road infrastructure.

As the agents of salt production in Palu city that contributes to the national salt production, the salt farmers in Palu are unable to produce much amount of salt to fulfil the national needs. The effort to increase the production of salt cannot be separated from the use of production factors (inputs) because they affect the result of the production. In the production function, it is formulated that to produce a product, the production factors are automatically needed (Sudarsono, 1992). According to

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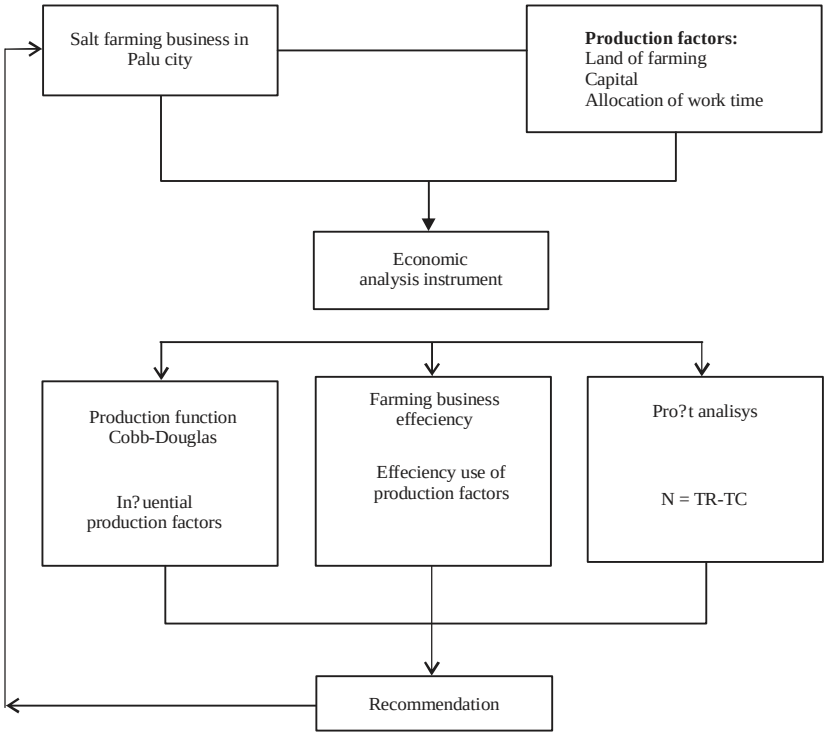

Fig. 1: Conceptual framework

Sukartawi (1989), the addition of production factors can increase yields. However, there are three possibilities occurred in this case Fig. 1.

- Decreasing returns to scale which means that the addition of production factors is more than the addition of production obtained
- Constant returns to scale which means that the addition of production factors is proportional to the production obtained
- Increasing returns to scale which means that the addition of production factors will produce bigger proportion of production

Based on this background, the researchers were interested in conducting research pertaining to how much the influence of the production factors, the business scale rule, the levels of effeciency and profits of salt farming business in Palu city is. The purposes of this study were to find out the influence of some production factors on salt business, the business scale ruleapplied in the salt farming, the efficiency of the use of each production factor and the profits of salt farming business in Palu city. Regarding these research purposes, the followings are the research questions as a guide for us todo the study:

How much is the influence of production factors such as pond are as capitals and of work timeallocation towards the production of salt farming business in Palu city?

Does the salt farming businesses in Palu city apply the business scale rule which shows increasing, decreasing and constant based on the scala rule? Is the use of production factors efficient?

MATERIALS AND METHODS

Conceptual framework: The salt farmers in Palu run their business to get maximum yields in order to improve their income for their prosperity. In order to increase their production and income they use an intensification way, i.e., by adding the work time allocation, especially, in a dry season. The management of salt farming in Palu city is still in a small scale in which the land area owned by each farmer is only about 90 m sec^{-2}, so they face some problems, like the use of production factors which are not effecient yet. Whereas, the effeciency is very important to improvethe salt farmer's production and income.

Based on this condition, we tried to analyze the problems pertaining to how much the influence of production factors, allocation of efficient production factors and income levels of salt farmers in Palu city is. In measuring the influence of production factors towards the salt farming business, the analysis instrument of Cobb-Douglass production functionwas used. The analysis used was anon linear production function commonly used by researchers because of its superior (Soekartiwi, 1989) as follows. The completion of

Cobb-Douglas production function is relatively easy if compared to another production function analysis. The results of estimating the line of production function of Cobb-Douglass will produce regression coefficient that at once shows the scale of elasticity. The scale of elasticity shows the returns to scala at once.

The efficiency and profit levels of salt farming business were also analyzed. The results of the analyses recommended the government to think about the ways of increasing productivity and income of the salt farmers in Palu city. Based on that description a model of conceptual framework is presented.

Research hypothesis: Based on the depicted background, research objectives, research questions and conceptual framework, the hypothesis were formulated as follows:

- The production factors that influence the salt farming business in Palu city were land size, capital and time work allocation
- On salt farming business in Palu city there was a law applied for the increase of product
- The use of some production factors in business of salt farming in Palu city has not been efficient yet
- Most salt farmers in Palu city earned big enough profits

Analysis method: To test the hypothesis, some analysis instruments were used as follows: the first and second hypothesis were tested by using a production function analysis of Cobb-Douglas in order to know the influence of each production factor to get maximum production. In general, there were three production factors, i.e., pond areas, capitals and work time allocation. The model of Cobb-Douglas production function was formulated as follows:

$$Y = b_0\ b^1X_1\ b^2X_2\ \ b^3X_3e^{\mu}$$

Where:
Y : Salt farming business products
X_1 : Pond areas (M^2)
X_2 : Capitals (Rp)
X_3 : Work time allocation (h)
B_ab_i : Used scale (i = 1, 2, 3)
μ : Error term

The model of Cobb-Douglas production function can be modified into a double linier by using logarithm equality, so, the linear formula was as follows:

$$\text{Ln } Y = \text{Ln } b_0 + b_1 \text{ Ln } X_1 + b_2 \text{ Ln } X_2 + b_3 \text{ Ln } X_3 + \mu$$

Where:
Ln Y : Logarithm of salt farming businessproducts
Ln X_1 : Logarithm of pond are as (M)
Ln X_2 : Logarithm of capitals (Rp)
Ln X_3 : Logarithm of work time allocation (h)
b_ob_i : Scale used (i = 1, 2, 3)
μ : Error term

The value of b_i obtained can show the elasticity of input use towards the production, whether it hada positive or negative influence. Meanwhile, the scale of businesseconomic can beknown by adding elasticity coefficient of each production factor, i.e., b_i with the following assessment criteria:

- If b>1 increasing return to scale
- If b = 1 contant return to scale
- If b<1 decreasing return to scale

The third hypothesiswas tested in order to know the effeciency level of the use of production factors onthe salt farming business by using a model of economic effeciency analysis with a ratio approach between the rate of a marginal product and a price of input unit as follows:

$$\text{NPM} = \frac{\text{bi Y} \cdot \text{PY}}{\text{Xi}} \text{PXi}$$

Assessment criteria:

- If NPM/Pxi = 1, the allocation of input useis efficient
- If NPM/Pxi>1, the allocation of input use isinefficient, therefore input X should be added
- If NPM/Pxi<1, the allocation of input useis inefficient, then input X should be reduced

The fourth hypothesis was testedby usinga profit analysis with the following formula:

$$\text{II} = \text{TR-TC}$$

Where:
π : Profits
TR : Total revenue
TC : Total costs

The total revenue was obtained after multiplying the total products with the average price of the products by using the following formula:

$$\text{TR} = \text{Y.Py}$$

Where:
TR : Total revenue
Y : Total products
Py : Average price of products

Total costswere obtained by addingvariable costs and constant costs. The variable costs were counted by showing the multiplication result of production materials used with the prices of production materials. The variable

Table 1: Pond areas managed by participants in Palu city

Salt pond areas (M²sec)	No. of farmers	Percentages
81-200	37	74
200-400	30	20
>400	3	6

Sum primary data after calculated, 2017

costson thesalt farming business in Palu city were the sum of fuel used in one cycle of harvest season. The constant costswere counted from the reduction value of tool, i.e., the reduction value of pump machineswas counted with the following formula:

$$NP = \frac{Nb}{U_e}$$

Where:
NP : Reduction value
Nb : Purchase value
U_e : Economic age

The constant costswere pumps, pipes and maintainance costs of reservoir area from sea water.

RESULTS AND DISCUSSION

Pond areas: Pond areasare one of the factors that influenced the production of salt farming. Despite the pond area, production is also determined by productiviy, climate condition and technology appliedon the production process itself. Generally the pond areas managed by the salt farmers (participants) were various from 81-1000 m²sec with ownership and leasestatus. The land areasmanaged by the salt farmers in Palu city can be seen in the following table.

The data on Table 1 showed that 74% farmers managed 81-200 m²sec of pond areas, 20% farmers managed 200-400 m²sec of pond areas and the rest of 6% farmers managed >400 m²sec of pond areas. Based on theclassification, the farmersin palu managing the ponds under 200 m²sec were the most. This finding revealed that the management of salt farming in Palu was still in a small scale and used traditional management.

Capitals: In addition topond areas, capitalsare one of the production factors influencingthe level of production and the success of salt farming. It can also save the number of labours by using technology (labour saving capital). The use of capitals in salt farming business in Palu city was classified into constant and inconstant capitals. The constant capitals were as the first independent variable while the inconstant capitals were as the second variable covering the cost of fuel for water pump machine. The pump machine itself was not included as the independent variable because it was a constant capital of the government aid. The use of inconstant capitalsutilized by the salt farmers in Palu can be seen on Table 2. Table 2 showed that the farmers possessing 81-200 m²sec of ponds used Rp. 127,000 of capitals, those managing 200-400 m²sec of ponds used Rp. 180,000 of capitals and those having more than 400 m²sec of ponds used Rp. 320,000 of capitals. These capitals were used for once production for 3-4 days during the supporting climate.

Tabel 2: The average use of capitals in salt farming business in Palu city

Farm land width (M^2)	No. of farmers	Capital (Rp)
81-200	37	127.000
200-400	10	180.000
▸400	3	320.000

Primary data, 2017

Table 3: The average use of work time allocation in once production process on salt farming in Palu city

Activity	Work allocation (h/day)	Percentage
Preparation	3	16
Water pumping	4	21
Drying	3	16
Harvesting	5	26
Marketing	4	21
Total	19	100

Primary data, 2017

Work time allocation: Either agriculture or farming business needs labors. In analyzing the labor force, the use of labours is stated with the work time allocation. The work time allocation used is the amount of effective labors employed. The intended labors were men, women, children, cattle and machines. On the salt farming business in Palu city, the farmers generally empowered male workers from their relatives, so they can save the production costs. Some activities needing laborswere preparation, water pumping, drying, harvesting and marketing. The proportions of work time allocation were different between one activity and others. The following table showed the average use of work time allocation in once production process.

The activity of the salt farming management in Palu city dominating the work time allocation wass harvesting, especially, when the crystallizing salt and worrying about the rain. The preparation and drying needed only 3 h/day. These activities did not need more attention as long as the climate supported them (sunny day). Finally, water pumping and marketing only needed 4 h of the work time allocation.

Production levels: Production process begun from the preparation to the harvest time took 3-6 days. The production level syielded by the participants in Palu city can be seen in the following table.

Table 4 and 5 showed that 37 participants possessing 81-200 m²sec of pond areas produced 254 sacks of salt, 10 participants having 200-400 m²sec of pond areas produced 220 sacks and 3 participants having more than 400 m²sc of pond areas produced 105 sacks. This condition indicated that the mostsalt production was produced by the farmers who possessedpond areas between 81-200 m²sec.

Table 4: Production of salt farmers in Palu city

Pond area (m^2)	No. of farmers (person)	Salt farming product (sack)
81-200	37	354
200-400	10	220
>400	3	105
Total	50	679

Primary data, 201

Table 5: Estimation of production function model of Cobb-Douglas towerds salt

Free variable	Regression coefficient	t-counted	t-table α = 0.01	t-table α = 0.05	t-table α = 0.10
Land width	2.490	7.141	2.37	1.66	129
Capital	2.691	0.28 tsec			
Work allocation	0.086	0.086 tsec			
Constanta	206.077				

Analyzed data, 2017; sample = 60; determination coefficient (R) = 0.804; Adjusted R = 0. 791; F Counted = 62.827; F tabel α = 0.01 (3;46) = 2.81; F table α = 0.05 (3;46) = 4.24; Level of significant 99 % (α = 0.01) = ***; Level of significant 95 % (α = 0.05) = **; Level of significant 90 % (α = 0.10) = *; Not significant = ns

Analysis of production function and economic effeciency of salt farming business: The dependent variable in the production function of Cobb-Douglas was the salt production while the independent variables were the pond areas, capitals and work time allocation. The prediction results of production function model of Cobb-Douglas towards the salt farming business were as follows:

$$Y = 206.077.\ X_1^{\ 2,490}\ X_2^{\ -2,691}\ X_3^{\ 0.086}$$

$$\text{Ln } Y = 5.328 + 2.490 \text{ Ln } X_1 - 2.6091 \text{ Ln } X_2 - 0.086 \text{ Ln } X_3$$

The estimation of production function model of Cobb-Douglas was presented in the following table: the table showed that the determination coefficient (R) was 0.804. It revealed that there was high correlation between salt production and production factors (X_1) which meant that 80.4% of salt farming production were indeed influenced by the three production factors while the rest 19.6% were affected by other variable excluded from the research variables. To find out the influence of each independent variable towardsthe salt production with t-test, the resultswere described below.

Pond areas: Thet-counted of this variable was bigger than the t-table 7.14 which meant that the variable of pond areas statistically influenced the levels of salt productionat level of significant (α = 0.10). In other words, the wider the pond areas, the more the table of salt production as a result, the more salt crystals formed.

Capitals: The t-counted 0.28 of this variable was smaller than the t-table 1.29 which meant that the capitalsdid not really influence the salt production at level of significant α = 0.10). It was understand able because the use of capitals wasrelatively similiar for the salt farmers with different width of pond areas. During the production process, the financial capitals were only used to buy fuel for pump machine while the pump machine was a constant capital because of the government aid.

Work time allocation: The t-counted 0.086 of this variable was smaller than the t-table 1.29 meaning that the work time allocation did not really influence the levels of salt production at level of significant (α = 0.1). It was indicated that even though the width of pond areas increased, the work time allocation did not increase however, the production increased. Because the labors of salt farming business in Palu city were labors from relative members, the production cost became cheaper.

The next step was to test the whole analysis result of the independent variables (X_i) to wards the dependent variable (Y) by using F-test. The variant analysis showed that the independent variables (X_i) strongly influenced the dependent variable (Y). It was shown with the value of F-counted 62.827 which was higher than F-table, either at level of significant 5% 4.24 or 1% 2.81. The value of business scales was obtained from the sum of the whole regression coefficient ($\sum_{bi}$) of each variable.

Business economic scales:

$$\sum_{bi} = b_1 + b_2 + b_3$$

$$\sum_{bi} = 2.490 + 2.691 + 0.086 = 5.267$$

$$\sum_{bi} = 5.267 \text{ "increasin greturns to scale}$$

The sum of regression coefficient was 5.267 which meant that the production scales of salt farming was in increasing return to scale. The percentage of output increasewas bigger than the percentage of input increase. In shorts, the increasing inputs into100% will increase the production more than 100%. Therefore, in taking a desicion, the salt farmers should add the use of input (production factors) because of the additional value got ten more from the inputs added than the cost added, except for the unefficient production factors. The economic effeciency was reached when the maximal profit was achieved. It can be achieved if the marginal

Table 6: The analysis of the effeciency of production function in salt farming business in Palu city

Independent variable	Regression coefficient	Marginal product value	Pxi	RMP/Pxi
Pond areas	2.490	59,174.85	83,000	0.71295
Capitals	2.691	26,275	100,000	0.00026
Work time allocation	0.086	107,567.895	73,000	1.47353

Marginal Product Value (MPV) = $_{Pmi.Py}$; Average price of salt production = Rp. 350,000; Average production of salt/one harvest cycle = 13.58 sacks or 679 kgs

Table 7: Condition of average revenue, expenses and profits of salt farming with the pond areas operated <200 M²sec in Palu ciy, 2016

A. Revenue	Variables
Salt production: 9.56 sacks (478 kgs)×@ Rp 7,000	= Rp. 3,346,000
B. Constant costs	
Reduction of water pump machine	Rp.100,000
	Rp.83,000+
Land lease	Rp.183,000
C. Variable costs	
Fuel	Rp.127,000
Others	Rp.150,000+
	Rp.225,000
D. Total Costs (B+C)	= Rp. 408,000
E. Profits (A-D)	= Rp. 2,908,000

Primary data after being analyzed, 2016

Table 8: Condition of averagerevenuee, expenses and profits of salt farming with the pond areas operated ranging from 200-4000 M²s in Palu city, 2016

A. Revenue	Variables
Salt production: 22 sacks (1100 kgs)×@ Rp 7,000	= Rp. 7,700,000
B. Constant costs	
Reduction of water pump machine	Rp. 100,000
Land lease	Rp. 83,000+
	Rp. 183,000
C. Variable costs	
Fuel	Rp. 180,000
Others	Rp. 160,000+
	Rp. 240,000
D. Total Costs (B+C)	= Rp. 423,000
E. Profits (A-D)	= Rp.7,277,000

Primary data after being analyzed, 2017

Table 9: Condition of average revenuee, expenses and profits of salt farming with the pond areas operated ranging >4000 M²sec in Palu city, 2016

A. Revenue	Variables
Salt production: 35 sacks (1.750 kgs)×@ Rp 7,000	= Rp. 12,250,700
B. Constant costs:	
Reduction of water pump machine	Rp. 100,000
Land lease	Rp. 83,000+
	Rp. 183,000
C. Variable costs:	
Fuel	Rp. 320,000
Others	Rp. 240,000+
	Rp. 560,000
D. Total Cost (B+C)	= Rp. 43,000
E. Profit (A-D)	= Rp. 11,507,700

Primary data after being analyzed, 2017

product values of the use of each production factor were equal to the price. The marginal product values obtained from the production function of salt farming in Palu city can be seen on the following table.

Table 6-9 indicated that none of the use of production factors of salt farming business in Palu city was effecient bacause of not obtaining the value of MPV/Px = 1. It showed that the economic effeciency was still difficult to achieveon the salt farming business in Palu city.

Revenue and profits of salt farmingbusiness in Palu city: The revenue of the salt farming business in Palu city were obtained from the amount of salt production during once harvest cycle multiplied by the average prices prevailing during the study. The profit, on the other hand, was the result of subtraction between revenue and expenses in one harvest cycle. The average revenue, profits and expenses in details, based on the pond areas operated, can be seen in the following table:

Table 7, 8, and 9 showed that the average profits earned by the salt farmers in one harvest cycle during 3-7 days in the sunny days were Rp.2,908,000 for <200 m²sec of pond areas, Rp. 7,727,000 for 200-400 m²sec of pond areas and Rp. 11,507,000 for >400 m²sec. The profits earned from the operation of >400 m²sec of pond areaswere higher than the operation of 200-400 m²sec. It can be indicated that operating wider pond areas will get higher profits.

The result of the study found that the management of salt farming in Palu city is not efficient, especially, the use of production factors, therefore, salt farmers should focus on the production factors that dominantly influence the salt production and further study about the improvement of salt farming efficiency that will be proportional with the income of salt farmers should be done.

CONCLUSION

Simultaneously the production factors, i.e., pond areas, capitals and labors significantly influences the salt production in Palu city. Partially the use of pond areassignificantly influenced but capitals and laborsdid not significantly influenced the salt production. The reason is that the addition of pond areas operated does not add the expenses and labors because the management of the salt farming business is still in a small (traditional).

The salt farming business in Palu city applies the rule of increasing return to scale which means that the addition of inputwill increase the products into the higher yields. However, none of the use of production factors achieves the efficient condition because no marginal product value divided by production factor price is equal to 1.

Since, the management of salt farming business in Palu city is not efficient yet, particularly on the way of using the production factors, we recommend the salt farmers to pay more attention to the production factors dominantly influence the salt production. For the related institutions, they need to do coaching, training and research in order to increase the production and quality of human resources of salt farmers.

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