

Factors Influencing

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Factors influencing the production of *eucheuma cottonii* seaweed processing industry in South Sulawesi

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Abstract. This study aims to find out factors the influence the production of *Eucheuma cottonii* seaweed processing industry in South Sulawesi. The results of the study show that the results of seaweed processing from the three companies in South Sulawesi is in decreasing return to scale, which means that the increase of output has a smaller proportion compared to the addition of inputs, the three companies are in a favorable position.

1. Introduction

The increase in seaweed production is still quite optimistic to be achieved considering the high technical carrying capacity and potential of the development area that is still widely open to be utilized. However, until now the seaweed aquaculture cycle still leaves a fairly complex problem, among others, the quality assurance of the production of DES (Dried *Eucheuma* Seaweed) at the farmer level which in general still does not meet export standards, as well as volatile price stability where 2 (two) this actor is a scourge for the sustainability of the seaweed industry in Indonesia [1].

The development of seaweed commodities in the future is expected to be more prospective along with the increasing level of awareness of the world community to consume hygienic and healthy foods. One of them is food made from seaweed. The high world demand for the needs of the seaweed industry is to meet industrial needs, both for the food and beverage industry, pharmaceutical industry and others.

Indonesia in fulfilling the needs of Charrageenan products has not been maximized in meeting domestic needs so that it requires Indonesia to import Charrageenan from other countries. Because Charrageenan production in the domestic seaweed processing industry has not been able to reach the production targets needed in the country. So Indonesia for now is only able to export Charrageenan a little



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because it is still dominated by exports of dried seaweed. Although it is known that if the processing of *E. cottonii* seaweed into Charrageenan is achieved 20 to 30 times more then there will be an increase in added value. Where when sold in the form of raw materials the price is 0.3 US dollars per kilogram. But in the form of SRC (semi reined chrrageenan) for 6 US dollars / kg and to 10 US dollars / kg in finished form as Chrrageenan powder [2].

One potential seaweed development center in Indonesia is South Sulawesi. In addition to the agricultural production of the food sector which still dominates, seaweed cultivation is also one of the leading commodities in the fisheries revitalization program in South Sulawesi. The development of seaweed cultivation in South Sulawesi provides a promising prospect. The type of economically valuable commercial seaweed cultivated in South Sulawesi is *Eucheuma cottonii* [3].

South Sulawesi has the opportunity to develop the seaweed industry with the consideration that South Sulawesi has the potential and completeness of the seaweed industry both from upstream (production sector) and downstream (processing plants). The demand for processed seaweed is still not able to be fulfilled due to various limitations [4]. South Sulawesi as one of the centers for the development of seaweed, especially *Eucheuma cottonii*, has a high chance of becoming a major producer of seaweed in Indonesia and even in the world, because of the enormous potential of its resources. Development of seaweed in South Sulawesi as a regional superior product such as Charrageenan. South Sulawesi produces Charrageenan ± 14,000 tons / year, as evidenced by the continuous increase in production volume every year.

The development of seaweed products in South Sulawesi is in the Maros, Takalar, Palopo, Bone, Makassar regions. In South Sulawesi Province there are 3 large-scale seaweed processing industries that produce seaweed into finished products. The forms of industrial products are Charrageenan Chip and Semi Refined Charrageenan. Where the three processing industries are in the Makassar, Takalar and Maros regions. Seaweed processing industries in these three regions are able to export seaweed in the form of Charrageenan, but there are still problems that the processing industry faces in producing finished products, namely those problems such as the lack of quality of raw materials, changing prices of raw materials, and availability of raw materials (KKP, 2018). Another problem that hampers the development of seaweed commodities is that small-scale seaweed cultivation is generally spread out so that transportation costs per unit are high. markets that tend to oligospony [3].

2. Methods

This research was conducted in three processing industries in South Sulawesi, namely Makassar City, precisely in KIMA (Makassar Industrial Area) at PT. Wahyu Putra Bimasakti, PT. Giwang Citra Laut Takalar, PT. Bantimurung Indah Maros. Population and sample in this study are processing companies found at PT. Wahyu Putra Bimasakti Makassar, PT. Giwang Citra Laut Takalar, PT. Bantimurung Indah Maros. In the types and sources of data where the type of descriptive research in which data is collected, analyzed and described using qualitative and quantitative approaches. The data sources used are primary data, secondary data, namely data from interviews and data from related agencies.

Data processing is used in the analysis of factors that influence production. The functional relationship between the production factors stated in the Coob Douglas function model can be formulated as follows:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + e \quad (1)$$

Transformed into a linear logarithmic function, the production function model can be formulated in the equation:

$$\ln Y = \ln \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \mu \ln e \quad (2)$$

Where :

Y	=	production(Tons)
a	=	constants
X ₁	=	labor
X ₂	=	law material (Tons)
X ₃	=	law material prices (Rp)
B	=	elasticity
E	=	error term

After the regression coefficient is obtained, the F test is performed to find out the relationship between the independent variable (Xi) together on the dependent variable (Y). T test to find out the relationship of each variable is not free.

3. Results and discussion

3.1. PT.Wahyu Putra Bimasakti (Makassar)

The results of the production of PT.Wahyu Putra Bimasakti for the past 5 years have not reached the required target where the target is 270 tons / month on average. However, the company is only able to produce an average of 117 tons / month. This is due to several factors that influence it, namely labor, the amount of raw materials, and the price of raw materials. Then the problem needs to be overcome by regression analysis. Where can be seen as follows:

3.1.1. Test F - Ho: $\beta_1, \beta_2, \beta_3 = 0$, the number of raw materials, raw material prices, and labor simultaneously have no effect on production.

Ha: at least one of $\beta_i \neq 0$, then the number of raw materials, raw material prices, and labor simultaneously affect production.

- Determine the Level of Significance (significant level) of 5% with a Level of Confidence (confidence level) of 95%.

- Ho is rejected if $F_{hitung} > F_{table}$

Ho is accepted if $F_{hitung} \leq F_{table}$

ANOVA ^a						
	Model	Sum of squares	Df	Mean square	F	Sig.
1	Regression	15186,500	3	5062,167	100,937	,000 ^b
	Residual	2808,500	56	50,152		
	Total	17995,000	59			

a. Dependent Variable: y

b. Predictors: (Constant), x₃, x₁, x₂

Source: Data Processed 2019

Based on the data above the F_{hitung} value of 100.937 is greater than F table of 2.77. From the data above the sum of squares regression of 15186,648 can be obtained from $\sum (Y - \hat{Y})^2$, that is the difference between the original Y with Y the average squared and the sum of square residual of 2808,352 obtained from $\sum (Y - \hat{Y})^2$, i.e. the difference between Y estimates with original Y. The mean of Square is obtained from the sum of square divided by df.

Then the F_{hitung} value of 100.937 is greater than F_{table} of 2.77. What is seen from the level of probability shows that the probability value of 0,000 is smaller than the significant level of 0.05 (α), it can

be concluded that H_0 is rejected, which means the number of raw materials, raw material prices, and labor simultaneously affect production.

3.1.2. Uji T

Model	Coefficients ^a			T	Sig.
	Unstandardized coefficients		Standardized coefficients		
	B	Std. Error	Beta		
1 (Constant)	-913,022	54,796		-16,662	,000
x1	16,621	4,787	,244	3,472	,001
x2	27,553	8,070	,272	3,414	,001
x3	49,996	8,920	,517	5,605	,000

a. Dependent Variable: y

Source: Data Processed 2019

The value of t_{hitung} for labor is $3.472 > t$ table of 1.671. With a probability of $0.001 < 0.05$, H_0 is rejected. The t_{hitung} for the number of raw materials is $3.414 > t$ table of 1.671. With a probability of $0.001 < 0.05$, H_0 is rejected. The value of t_{hitung} for the price of raw materials is $5.605 > t$ table of 1.671. With a probability of $0.000 < 0.05$, H_0 is rejected. Because all three probability variables are < 0.05 , then all have a significant effect on production.

Then analyze the influence of Labor, Raw Materials, and Price of Raw Materials on the Production of *Euchema cottonii* Processing of Seaweed Industry in PT.Wahyu Putra Bimasakti Makassar, Cobb douglass linear regression analysis was carried out using SPSS version 24. As for this regression the variables bound (dependent variable) is Production (Y), while the independent variable (independent variable) is Labor (X1), Amount of Raw Material (X2), and Raw Material Price (X3).

The results of the above analysis are obtained in the first analysis which analyzes "factors that influence the production of seaweed processing industry. The results of the first analysis at PT.Wahyu Putra Bimasakti (Makassar), namely the magnitude of the elasticity of each independent variable can be seen from the magnitude of the rank coefficient on each independent variable. Labor elasticity is 0.002, raw material elasticity is 0.003, elasticity of raw material prices is 0.005 while the amount of Return to scale can be calculated by summing the rank coefficients of each independent variable, that is:

$$Y = 6,817 + X_1^{0,002} + X_2^{0,003} + X_3^{0,005} \text{ then obtained } (0,002 + 0,003 + 0,005 = 0,01).$$

3.2. PT.Giwang Citra Laut (Takalar)

The production of PT. Giwang Citra Laut (Takalar) for the past 5 years has not yet reached the required target, where the average monthly target is 136 tons / month. However, the company is only able to produce an average of 95 tons / month. This is due to several factors that influence it, namely labor, the amount of raw materials, and the price of raw materials. Then the problem needs to be overcome by regression analysis. Where can be seen as follows:

3.2.1. Test F - $H_0: \beta_1, \beta_2, \beta_3 = 0$, the number of raw materials, raw material prices, and labor simultaneously have no effect on production.

H_a : at least one of $\beta_i \neq 0$, then the number of raw materials, raw material prices, and labor simultaneously affect production.

- Determine the Level of Significance (significant level) of 5% with a Level of Confidence (confidence level) of 95%.

- Ho is rejected if $F_{hitung} > F_{table}$

Ho is accepted if $F_{hitung} \leq F_{table}$

ANOVA ^a						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	16934,135	3	5644,712	297,968	,000 ^b
	Residual	1060,865	56	18,944		
7	Total	17995,000	59			

a. Dependent Variable: Y

b. Predictors: (Constant), X3, X1, X2

Source: Data Processed 2019

Based on the data above the F_{hitung} value of 297.968 is greater than F_{tabel} of 2.77. From the data above, the sum of squares regression of 16934.135 can be obtained from $\sum (Y - \bar{Y})^2$, which is the difference between the original Y with Y the average squared and the sum of square residuals of 1060,865 obtained from $\sum (Y' - Y)^2$, that is the difference between the estimated Y and the original Y. The mean of Square is obtained from the sum of square divided by df.

Then the F_{hitung} of 297.968 is greater than F_{tabel} of 2.77. What is seen from the level of probability shows that the probability value of 0,000 is smaller than the significant level of 0.05 (α), it can be concluded that Ho is rejected, which means the number of raw materials, raw material prices, and labor simultaneously affect production.

3.2.2. Uji T

Coefficients ^a					
Model	Unstandardized coefficients		Standardized coefficients	T	Sig.
	B	Std. Error	Beta		
1 (Constant)	-1,061,186	37,678		-28,165	,000
x1	-8,250E-6	,000	-,012	-,357	,722
x2	,002	,000	,256	6,403	,000
x3	,010	,000	,802	19,946	,000

a. Dependent Variable: y

The t_{hitung} for Labor is 6.403 > t_{tabel} is 1.671. With a probability of 0.00 < 0.05, Ho is rejected. The value of t_{hitung} for the number of raw materials is 19,946 > t_{tabel} of 1,671. With a probability of 0,000 < 0,05, Ho is rejected. The value of t_{hitung} for the price of raw materials is 0.357 > t_{tabel} of 1.671. With a probability of 0.722 > 0.05, Ho is accepted. Because in probability labor variables > than 0.05, only raw material variables and raw material prices have a significant effect on production.

Then analyze the influence of Labor, Raw Material Amount, and Raw Material Prices on the Production of Euchema cottonii Seaweed Processing in PT.Giwang Citra Laut (Takalar), then Cobb douglass linear regression analysis was carried out using SPSS version 24. As for this regression which is the dependent variable (dependent variable) is Production (Y), while the independent variable (independent variable) is Labor (X1), Amount of Raw Material (X2), and Raw Material Price (X3).

PT.Giwang Citra Laut (Takalar) that is the magnitude of the elasticity of each independent variable can be seen from the magnitude of the rank coefficient on each independent variable. The labor elasticity is 0.001, the elasticity of raw materials is 0.003, the elasticity of raw material prices is 0.005 while the

amount of Return to scale can be calculated by summing the rank coefficients of each independent variable, that is:

$$Y = 13.8749 + X_1^{0,001} + X_2^{0,003} + X_3^{0,008} \text{ then obtained } (0,002 + 0,003 + 0,008 = 0,013).$$

3.3. PT. Bantimurung Indah

The production of PT. Bantimurung Indah (Maros) for the past 5 years has not yet reached the required target, where the average monthly target is 264 tons / month. However, the company is only able to produce an average of 162 tons / month. This is due to several factors that influence it, namely labor, the amount of raw materials, and the price of raw materials. Then the problem needs to be overcome by regression analysis. Where can be seen as follows:

3.3.1. Test F - Ho: $\beta_1, \beta_2, \beta_3 = 0$, the number of raw materials, raw material prices, and labor simultaneously have no effect on production.

Ha: at least one of $\beta_i \neq 0$, then the number of raw materials, raw material prices, and labor simultaneously affect production.

- Determine the Level of Significance (significant level) of 5% with a Level of Confidence (confidence level) of 95%.

- Ho is rejected if $F_{hitung} > F_{tabel}$

Ho is accepted if $F_{hitung} \leq F_{tabel}$

Anova ^a						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	17,101,843	3	5,700,614	357,422	,000 ^b
	Residual	893,157	56	15,949		
7	Total	17,995,000	59			

a. Dependent Variable: Y

b. Predictors: (Constant), X3, X1, X2

Source: Data Processed 2019

Based on the data above the F_{hitung} value of 357.422 is greater than F_{tabel} of 2.77. From the data above, the sum of squares regression of 17101,843 can be obtained from $\sum (Y - \bar{Y})^2$, which is the difference between the original Y with \bar{Y} the average squared and the sum of square residuals of 893,157 obtained from $\sum (Y' - Y)^2$, which is the difference between the estimated Y and the original Y. The mean of Square is obtained from the sum of square divided by df.

Then the F_{hitung} of 357.422 is greater than F_{tabel} of 2.77. What is seen from the level of probability shows that the probability value of 0,000 is smaller than the significant level of 0.05 (α), it can be concluded that Ho is rejected, which means the number of raw materials, raw material prices, and labor simultaneously affect production.

3.3.2. Uji T

Model	Coefficients ^a				T	Sig.
	Unstandardized coefficients		Standardized coefficients			
	B	Std. Error	Beta			
1	(Constant)	-415,939	46,883		-8,872	,000
	x1	-4,732	3,770	-,045	-1,255	,215
	x2	24,839	1,186	,787	20,943	,000
	x3	29,938	4,010	,302	7,466	,000

a. Dependent Variable: y

The t_{hitung} for Labor is 20.943 > t_{tabel} is 1.671. With a probability of 0.00 < 0.05, H_0 is rejected. The value of t_{hitung} for the number of raw materials is 7.466 > t_{tabel} of 1.671. With a probability of 0.000 < 0,05, H_0 is rejected. The value of t_{hitung} for the price of raw materials is 1.255 < t_{tabel} of 1.671. With a probability of 0.215 > 0.05, H_0 is accepted. Because in probability labor variables > than 0.05, only raw material variables and raw material prices have a significant effect on production.

Analyzing the influence of Labor, Raw Materials, and Price of Raw Materials on the Production of *Euchema Cottonii* Processing of Seaweed Industry in PT. Bantimurung Indah (Maros), Cobb douglass linear regression analysis was conducted using the SPSS version 24 program. the dependent variable (dependent variable) is Production (Y), while the independent variable (independent variable) is Labor (X1), Amount of Raw Material (X2), and Raw Material Price (X3).

PT.Bantimurung Indah, namely the elasticity of each independent variable can be seen from the magnitude of the rank coefficient on each independent variable. Labor elasticity is 0.005, raw material elasticity is 0.008, elasticity of raw material prices is 0.003 while the amount of Return to scale can be calculated by summing the rank coefficients of each independent variable, that is:

$$Y = 12.9383 + X_1^{0,005} + X_2^{0,008} + X_3^{0,003} \text{ then obtained } (0,005 + 0,008 + 0,003 = 0,016).$$

Of the three companies showed that the company is in a decreasing return to scale condition, which means that the increase in output has a small proportion than the addition of inputs.

In the Donny [5] study entitled analysis of production and income of seaweed in the village of Bulagi two regency districts, prouidi islands. The researcher wanted to see to find out the effect of the length of the stretch, seeds, labor, age of harvest and business experience on seaweed production and how much the income of seaweed farming in Bulagi Dua Village, Bulagi District, Banggai Kepulauan Regency.

In this determination the use of inputs in seaweed farming is used in Cobb-Douglas model production function approach, where the level of dry seaweed production (Y) is the dependent variable, while the production input is an independent variable (X) in the analysis model, namely stretch length (X1), Seedlings (X2), Labor (X3), Harvest age (X4), and Business Experiences (X5).

In this study, the effect of independent variables (together) on the dependent variable simultaneously used the -F test (overall-test). The results of the F test calculation can be seen in showing that simultaneously (together) the stretch length (X1), Seedlings (X2), Labor (X3), Harvest age (X4), and Business Experience (X5) have a significant effect on production dried seaweed. Furthermore, the influence of each independent variable (X) on the dependent variable (Y) partially (separately) can be used t test (t-student).

The results of this regression analysis show that if the seeds owned by seaweed farmers increase, the production of seaweed will also increase. Indonesia known as a nation which has many areas which are

potential to develop seaweed [6]. Addition of seeds will increase the population of seaweed plants, with the increase in the number of seaweed populations, so there will be many seaweed products that they produce.

4. Conclusions

In this study it was concluded that from the results of the regression analysis of the three seaweed processing companies in South Sulawesi the results were that the company was in a decreasing return to scale condition, which meant that the increase in output had a smaller proportion than the addition of inputs. It is hoped that the industrial and government communities will cooperate in utilizing natural resources that exist and benefit all parties in order to reduce imports of seaweed products.

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