Factors that influence the increase of *Eucheuma cottonii* Seaweed farmers' income in Bantaeng, South Sulawesi

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Abstract.
Seaweed is one of the marine production that authentically potential to be increased its production in quantity and quality. In economic side, it is not only for country's foreign exchange earnings but also for a source of income to the seaweed farmers. The aims of research were to elaborate the influencing use of seed, number of labor, and farming experience on seaweed production in Bantaeng Regency and to analyze the influencing production to the farmers' income. The research was conducted in Bantaeng Regency and the data were obtained through observation and structured interview. The samples were selected purposively consisting of 94 seaweed farmers using cobb-douglas and simple linear regression analysis. The results of the research indicated that; (a) regression coefficient variable in use of seed had influence to the increased of seaweed production but regression coefficient variable number of labor didn't has influencing to increased seaweed production. For regression coefficient variable of farming experience also had influence to the increased seaweed production.Cobb-Douglas analysis indicated that production function in factors use of seed, number of labor and farming experience had significantly affected to the seaweed production. In simple linier regression analysis, regression coefficient of seaweed production variable explained if seaweed production increases, farmers' income would be increase too.

***Keywords** : Seaweed, Cobb-Douglas, Production, Farmers' Income.*

INTRODUCTION

Seaweed as a marine resource has great potential to be developed in improving the income of coastal villagers in this case seaweed farmers. In addition, seaweed industrialization plays a strategic role as integrated activity in cultivation management, seed availability, socio-economic, post-harvest processing, capital dan marketing (Daryanto, 1997)

There are wide range of using seaweed. Seaweed are used as human foods (alginate drinks, jelly candy, seaweed drinks, gelatine), medicine substance, animal feed, plant and soil fertilizer. Seaweed derivative products are also used for textiles, paper, paint, cosmetics, laboratory materials, toothpaste, ice cream and many more (Daryanto, 2007). Based on these benefits, seaweed has a potential for overseas market (Pusdata Kemendag, 2012).

Indonesia as one of the seaweed main producer has been able to fill about 60 – 70 % of the seaweed world market. Seaweed becomes a high-value product which continue improving its development. There was 1.190.000 hectares of Indonesian seaweed

potential development and recently only 222.180 hectares or about 20 % of total area that has been used (Anggadireja, 2007).

South Sulawesi becomes one of seaweed main producer in Indonesia. The extensice land of this province has supported seaweed development. Seaweed production in South Sulawesi has reached 670.740 tons as wet product or equal to 63.074 tons as dry product in percentage it is predicted about 36.5%. In addition, increasing seaweed production is possible to maximize because South Sulawesi has large marine area as resource land and then seaweed has gradually simple in technology using and post-harvest processing as well as only needs less capital in cultivating (Harifuddin, 2011).

The development of *Echeuma cottonii* seaweed in Bantaeng Regency becomes an important concept of local government in order to increase living standard and income of coastal villagers or seaweed farmers. Seaweed began to be cultivated by farmers in Bantaeng since year of 2000 until now (Department of Marine and Fisheries of Bantaeng, 2011).

Bantaeng Regency as one of many regencies in South Sulawesi has developed the cultivation of seaweed species *E. cottonii*. Bantaeng is located on the coastal edge of Flores to the mountains of Lompobattang with altitude of 1.000 meters and coastline length of ± 21.5 kilometers. Seaweed cultivation location is located on the coast of 100 to 3.000 meters with depth of 1 to 20 meters (Department of Marine and Fishery of Bantaeng, 2014).

Production is a process that produces goods and services by using two or more goods or services. That statement gives an understanding that to produce a certain commodity needed two or more factors of production. Soekartawi (2001) states that the factor of production management becomes important in terms of efficiency. High production will not be achieved if factors of production failed to manage.

Contributing factors to ability and development of production are determined by; (1) land production factors, (2) the number of labor, (3) capital production factors, (4) intelligence and skill factors, (5) Used in production, and (6) local climate and season (Soekartawi, 1995). The quantity and quality of agricultural product depends on the given input state. So that, between input and output there is a close relationship (Kartasaputra, 1989).

The number of seaweed production in Bantaeng Regency fluctuated from year to year in which dry production was reaching 6,834.33 tons per year. The occurrence of fluctuations in seaweed production was caused by several factors such as limited production facilities, the use of seed, a relatively short maintenance time, not maximal drying or in other words, the knowledge of farmers on seaweed was still very limited and land use was still not maximized. Therefore,this study aims to analyze factors that influence the increase of *Eucheuma cottonii* seaweed farmers's Income in Bantaeng, South Sulawesi.

METHODS

The research was conducted from September 2014 to May 2015, in Bantaeng Regency, South Sulawesi Province. This location was chosen purposively with the consideration that the area was the development area for cultivating seaweed species *E. cottonii*.The first and the second problem of the research used population of seaweed farmers which scattered in Bisappu, Bantaeng and Pajukukang District as central production of *E.cottonii.* Number of seaweed farmers as the total population in the study were 1.632 people. The number of samples was determined by using Slovin formula,

thus the number of samplesused in this research were 94 seaweed farmers. Sampling research used simple random sampling technique that was taken randomly.According to the aims, this research was including explanatory research. The research aims to analyze the relationship between one variable with other variables or how a variable affects to other variables. Variable of research is formulated by using quantitative method which was supported by qualitative descriptive analysis. The data were conducted by interviewwith using questionnaire. The first formula was used to analyze use of seed, number of labor and farming experience on seaweed production using *Cobb Douglas analysis with formula:*

$$Log\ Y = Log\ a + Log\ b_1X_1 + Log\ b_2X_2 + Log\ b_3X_3 + Log\ b_4X_4 + e \quad (1)$$

Where :Y = Seaweed production (kilogram)
X_1 = Use of Seed (kilogram)
X_2 = Number of Labor (person)
X_3 = Farming Experience (year)
a = Constanta
b1…b3. = Coefficient of Regression
e = *Error Term*

the second formula is used to analyze the effect of seaweed production on farmers' income by using simple linier regression with formula :

$$Y = b_1X_1 + e \quad (2)$$

Where: Y = Seaweed Farmers' Income (IDR)
X = Seaweed Production (kilogram)

RESULTS AND DISCUSSION

Analysis of Seawood production function

Understanding the relationship of causal factors in the production of seaweed in the production function of cobb-douglas among use of seed (X1), number of labor (X2) and farming experience (X3) towards the production of seaweed was obtained the following results in the Table 1:

Table 1. Estimation of Seawood production function

Independent Variable	Dependent Variable	Coeffisien of Regression Beta	Coeffisien of Correlation (r)	T_{count}	Sig.	A
Constanta	Y	-0,149				
X_1		1,087	0,851	15,379	0,000	significant
X_2		-0,032	-0,101	-0,961	0,339	unsignificant
X_3		0,028	0,222	2,161	0,002	significant
Multiple R = 0,877; R_{Square} = 0,770; F_{Sign} = 0,000; F_{Count} = 100,370						

Note : Significant at α = 0,05.

Table 1 showed the results of analysis of variables production function X_1 (use of seed), X_2 (number of labor) and X_3 (farming experience) to variable Y (seaweed production). Use of seed (X_1) at 5% significance level at T table was equivalent with1.990, because the value of T count smaller than T table (15,379> 1,990) and significance value 0,000 higher than 0,05. It can be concluded that the use of seed individually influencedseaweed production. Number of labor (X_2) at the level of

significance 5% T table value was equivalent with 1.990, because the value T count smaller than T tabel (-0.961 <1,990) and significance value of 0.339higher than 0.05, it can be concluded that the number of individual labor did not influence of the seaweed production. Farming experience (X_3) significance at level 5% where T table value was equivalent with 1.990, because the value of T count higher than T table (2,161> 1,990) and significance value where 0,002 smaller than 0,05. Hence, it can be concluded that farming experience individually influence to the seaweed production.

Analysis of farmers' income Seawood

The influence of the seaweed production to the farmers' income in Bantaeng Regency was done through a simple linear regression analysis in which the results obtained in Table 2 below:

Table 2. Estimation of farmers' income Seawood

Independent Variable	Dependent Variable	Coeficien of Regression (B)	Koeficien of Correlation (r)	T_{count}	Sig.	A
Constanta X	Y	1344660,430 13407,849	0,991	69,964	0,000	significant
R = 0,991; Rsquare = 0,982						

Note : Significant at α = 0,05

Table 2 showed results of simple linear regression analysis of seaweed production function (X) to farmers' income (Y) showed that regression coefficient of independent variable so that can be formed simple linear regression equation that was: Y = 1344660,430 + 13407,849X from simple linear regression equation, value a which was a constant of 1344660,430. This showed that if the variable value of seaweed production is 0 or none then the farmers' income will be valued with 1.344.660,430 IDR. The regression coefficient of seaweed production variables (X) was 13407,849. It meant thatif theseaweed production increase, the farmer's income would be increase with 13.407,849 IDR.

The regression coefficient value of each independent variable affected to the seaweed production in Bantaeng Regency. This result explained that the regression coefficient of varieties of use of seed (X_1) was 1.087 which meant use of seed giving effect. If use of seed increased by one kilogram, seaweed production will also increase with 1,087 kilograms in dry seaweed, assuming other variables were constant. The regression coefficient of number of labor variable (X_2) was -0,032 which meant the number of labor had no effect. If the number of laborwas reduced by one farmer, seaweed production will decrease by 0,032 kilogram dry seaweed, in assuming the other variable was constant . Coefficient of variable regression of farming experience (X_3) was 0,028. It meant that duration tried to give influence. It meant that if farming experience increased by 1 year, seaweed production will be increased by 0,028 kilogram dry seaweed, assuming other variableswere constant.

The result of Cobb-Douglas production function analysis showed that jointly factor of use of seed (X_1), number of labor (X_2), and farming experience (X_3) had significant effect on seaweed production (Y) in Bantaeng Regency. According to Sulaeman (2006) said that seaweed business was expected to (1) build a robust seaweed agribusiness whose main actors are SMEs; (2) provide economic value added for seaweed commodities; (3) create jobs for people, especially the coastal villagers (4) increase the income and living standard of the seaweed farmers (5) increase the foreign exchange reserves. The regression coefficient of seaweed (X) is 13407,849, meaning

that the production of seaweed had an effect. If the production of seaweed was increased, the farmer's income will increase by 1.3407,849 IDR.

The effect of seaweed production (X) on farmers' income (Y) in Bantaeng Regency was calculated through simple linear regression analysis thatwas formed by the equation: Y = 1344660,430 + 13407,849X. From the simple linear regression equation, obtained a value of a constant was 1344660,430. It showed that if variable value of seaweed production was 0 value or none then the farmers' income will be value 1.344.660,430 IDR. The regression coefficient of seaweed (X) was 13.407,849 IDR which was production of seaweed had an effect. If seaweed production was increased, the farmers' income will be increase by 1.3407,849 IDR.

Simple linear regression was used to determine the relationship between seaweed production variables and farmers' income. The value of correlation coefficient (r) obtained for 0.991 which meant that there was a positive relationship between two variables. This was also proved by the value of T count (69,964)higher that T table (1,990) and significance value (0.000) smaller (0,05) which can be concluded that seaweed production variables (X) . It meant that the income of seaweed farmers in Bantaeng Regency depended on the amount of seaweed production.

The coefficient of determination (R^2) of 0.982 meant that this result indicated various of up and down of farmers' income as 98.2%. It was caused by the effect of seaweed production while the remaining 1.8% was caused by other factors. According to Soekartawi (1986) opinion, there are several measures of farm income, among others: (1) the gross income of the farm consists of the total product value of farming in a certain time that is sold or not sold, (2) net income of farming is the difference between farm gross revenues and total farming expenditures. Total expenditure of farming is all input value which is used in the production process, but includes own interest and interest on loan capital. The net income of the farming business is obtained by reducing the net income with loan interest.

CONCLUSIONS

The conclusions of this research were all production factors such as the use of seed, the number of labor, and farming experience significantly affect of seaweed farmers' income. The use of seed and farming experience individually affected the production of seaweed while the number of labor had no effect on seaweed production. Production of *E.cottonii* seaweed was significantly affecting farmers' income in Bantaeng specially in three disctricts at Bantaeng Regency as centrals of seaweed production.

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REFERENCES

Anggadiredja, J.T., Istini, S., Zatnika, A., Purwoto, H. (2009). *Seaweed*. Jakarta: Penebar Swadaya.

Daryanto A. (2007). *Cluster Model Spurs the Competitiveness of the Seaweed Industry.* Bogor: Bogor Agricultural University.

Marine and Fishery Service of Bantaeng. (2014). *Bantaeng Seaweed*, Bantaeng.

Harifuddin, Aisyah, Budiman.(2011). *Analysis of Margin and Efficiency of Seaweed Market in Mandalle, Mandalle District, Pangkep Regency.* Fishery Study Program, Agricultural Polytechnic, Pangkep.

Kartasaputra. (1989). *Marketing of Agriculture Products and Industry.* Bina Aksara,Jakarta.

Soekartawi.1995. *Basic Evaluation of Project Preparation*. University of Indonesia Press. Jakarta.

Soekartawi.2001. *Farming Scienceand Research for the Increasing Small Farmers*. University of Indonesia Press. Jakarta.

Sulaeman, S. (2006). *Agribusiness Development of Seaweed Commodity by the Cluster Business Model.* Infokop Magazine No.28,XXII-2006. Jakarta.

Valderrama, D. (2012). *Social and Economic Dimensions of Seaweed Farming : A Global Review*. USA: Food and Resource Economics Department University of Florida.