

Increasing Farmer's Income with Production of Seaweed *Eucheuma cottonii* sp

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Abstract This paper examines the production of seaweed *Eucheuma cottonii* sp as a major fishery commodity which produces carrageenan in supporting poverty eradication. The specific objectives are to determine factors of production in increasing seaweed production and to analyze income generated seaweed farmers in a harvest season. The research employed Multiple Linear Regression Analysis and Income Analysis. The results show that factors affecting the production of seaweed *Eucheuma cottonii* are long stretch (X_1), seed (X_2), labor (X_3), farmers experience (X_4), and the distance tie (X_5). Enterprises of seaweed *Eucheuma cottonii* sp is a business that is able to increase the farmers income. The research suggests that to increase production of seaweed can be done by improving seed quality, labor, long stretch, connective distance and improvement of marketing management.

Keywords Production Factors, Aquaculture, Seaweed *Eucheuma Cottonii* Sp, Income, Poverty

1. Introduction

Poverty is a complex social phenomenon that cannot be seen by one view point meaning many factors associated with poverty itself, not only internal factor such as household human resource and production factors ownership, but also more importantly the impact of external factors such as access to social services and information availability in the community across developing countries (Arsyad and Kawamura, 2009). One of the ways to move out poverty is encouraging production of seaweed farmers in rural coastal area. It is important to note (Zamroni & Yamao, 2011) that, the reasons fishermen choose seaweed farming as an alternative livelihood is its introduction by the government through livelihood and income augmentation projects that aim to improve the general economies of coastal communities. Secondly, according to the farmers, seaweed farming involves relatively low operational costs. Thirdly, seaweed farming requires only easy maintenance that will

allow some time to engage in other income generating activity, and finally, farmers can realize more profit from farming than from fishing. Seaweed farming is frequently promoted as a lucrative alternative occupation for artisanal fishers in Southeast Asia (Nicolas *et al.*, 2011) by improving communication pattern of seaweed farmers and extension services to enhance agricultural-aquaculture developments (Ekasari *et al.*, 2013).

Extension agents are also expected to play a key role in linking small farmers to agricultural scientist and researchers (Haile and Abebaw, 2012) and extension's role in advancing both development and women's empowerment (Rivera and Corning, 1990). With increasing population density (and hence fishing pressure), alternative sources of income become more important. One possible economic activity is seaweed farming, which has been introduced in many communities since the 1980's (Blankenhorn, 2007). Seaweed farming has generated substantial socio-economic benefits to marginalized coastal communities in developing countries, most of which have reduced access to alternative economic activities. In some communities, seaweed farming has emerged as the most relevant livelihood strategy (Valderrama, 2012) by strengthening farmer institutional or inter-agencies coordination (Arsyad *et al.*, 2013). Therefore, corporate commitment is at the core to translate the concept of seaweed farming into tangible benefits to the farming community through social corporate responsibility (Krishnan and Narayanakumar, 2010).

Aside from the various opinions on the above, the general poverty is caused by two factors, namely internal and external factors. Internal factors are factors that come from in the poor, such as :1. Attitude to accept what is, 2. Not earnestly sought, and 3. The physical conditions are less than perfect. While external factors are factors that come from outside of the poor, such as: 1. Isolation due to limited access, 2. The lack of employment, 3. The lack of opportunity, 4. The natural resources are finite, 5. The policies are not aligned and others, 6. The local and global economic growth are low, 7. The high population growth, and political stability is not conducive. Greater part of the factors that led to the poor is an external factors. As a result, although the ratio of

poverty in developing countries has declined sharply, the number of poverty stricken people has increased numerically at an unexpected level, widening the gap between the rich and the poor not only between the developed and developing world but also in each country itself (Ratnayake and Silva, 2012).

Automatic Trickle Down

Policies trickle down effect on the principle of the policy position the haves as the preferred class in terms of moving the economy of a nation. With the opening of access and overall funding for all activities the domestic investment is expected to be running and multiplied by intensifying the focus on the business sector as well as financial market infrastructure that in turn this scheme will create a structure that increases production capacity. Writhing production will lead prices in the lower level and create jobs for the middle class and under-middle class.

This scheme is run in a basic idea, where revenue (income) can be enabled through three main channels, namely taxes, domestic demand, and savings. Empowerment sector revenue through taxes would be stretching the public investment sector. This public investment could be the development of tourism activities, the construction of infrastructure such as roads, ports and electricity, agriculture sector investment in the opening lines of integrated irrigation and mechanization, as well as investments in the development of alternative energy sources or power. Investment in these sectors will certainly attract both domestic and foreign investors to participate in the development given the attractiveness of the industry that has been filled by a variety of facilities that support the smooth running of business. Stretching of the main industries in the end will make a positive contribution to economic growth.

Meanwhile on the other hand, rising incomes will increase the proportion of domestic demand which can contribute directly or indirectly to economic growth. It is natural walking as we all know that the consumer sector is the main pillar of economic growth in the last decade. Strip last empowerment is through savings. Increased revenues will increase the proportion of income that can be saved. Funds in the savings then can be enabled through the national banking system and then distributed for private investment needs. Increased private investment is expected to boost economic growth through a variety of schemes being operated. In conclusion, the transmission mechanism is certainly suggests that the injection is given to the middleclass group is able to provide a positive impetus to economic growth. Therefore, in the context of economic growth trickle down, ie inclusive growth, economic growth will occur widely enjoyed by the public.

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In Indonesia, development of the fisheries sector increasingly leads to efforts to increase the number and quality of production in particular areas of seaweed business. In line with the trend of increased market Seaweed increasing the South Sulawesi has a chance to become the main producers Seaweed in Indonesia, even in the world given the natural resources owned by a broad beach is so large that the potential for seaweed cultivation. Indonesian waters which constitute 70% of the archipelago with 13,667 islands the potential Seaweed large enough. Residents of coastal areas and islands in Indonesia have long been utilizing Seaweed for the needs of daily life in various forms, for example, eaten raw as a salad, made of vegetables, pickled, made cakes snacks and sweets, even for the world's pharmaceutical product takes almost the most widely also for drugs (Zaneveld, 1955). Seaweed utilization then evolved towards a commercial for export and traded as a raw material for the manufacture of gelatin and carrageenan and the type of Seaweed *Eucheuma cottonii* sp produces carrageenan and this is needed in the domestic and international markets. World market share Seaweed containing carrageenan average reached 130,000 tons per year. Europe's largest market (35%), Asia Pacific (25%), North America (25%) and South America (15%). The companies that dominate the market producing carrageenan seaweed are United States, Denmark and France. Trade Seaweed farmers are oligopolistic in which farmers or producers can only sell to a small number of buyers. The world carrageenan industry is experiencing significant growth, especially that of conventional products Semi Refined Products (SRC). This is because many downstream industries such as meat and dairy industry in the United States market requires carrageenan (Agribusiness Agency, 1996).

Seaweed *Eucheuma cottonii* sp particular type is one of the leading commodity fisheries in South Sulawesi which tends to increase the production and Export. In 1999 to 2003 Seaweed production in South Sulawesi has increased. Every

year, the global demand for Seaweed average of 18,000 tons to 20,000 tons, even the development of shrimp aquaculture in the Asia and Pacific Region needs carrageenan as binders in pelleted feed shrimp / fish also increased. Estimated demand for shrimp feed in Asia in 2000 alone will reach 1.1 million tons. Thus seaweed market opportunity is widely open. Seaweed production and export of South Sulawesi during the last 10 years fluctuated quite high as displayed in Table 1.

Graphic 1 shows that the production and export of Seaweed in 1999 to 2008 the highest amounted to 58743.1 tons and 19,339 tons in 2008, the lowest production and export of 7752.2 tons respectively in 1999 and 2478. The data above shows a very large market opportunity for this commodity so Jeneponto District which has a very long coast have the opportunity to develop seaweed is more leverage anymore. In line with the development trend of the market continues to increase Seaweed the export of South Sulawesi, among others, addressed to Japan, Denmark, Hong Kong and Canada. In 2009 the volume of exports reached 19,339 tons and capable of absorbing large enough manpower in the sectors of production, processing and marketing in the district / city level.

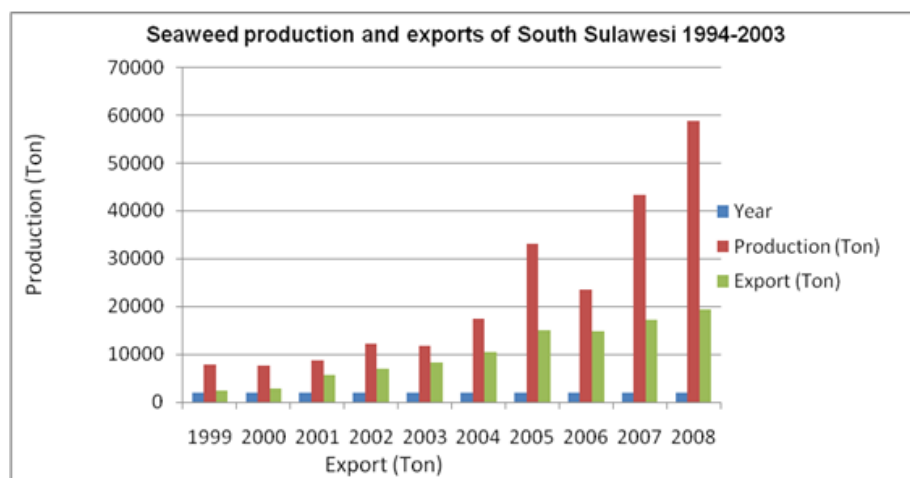
Commodity seaweed expected to become more dominant agricultural products as well as a source of foreign exchange is a very important contribution in the structure of the Indonesian economy. In addition, commodity seaweed as fisheries sub-sector is the leading sector in employment reached about 400 thousand farm households. On the side of interstate commerce, almost all products seaweed *Eucheuma cottonii* sp Indonesia used to meet export market (up 80.64%) and continued to grow approximately 15% over the last twenty years to the major importing countries such as the USA and Japan

As reported by the Center for Socio-economic Analysis and Agricultural Policy that theoretically, trade between countries unhindered opportunity to benefit each country through commodity production specialization of each

country favored it. But in reality, with the opening of an economy does not necessarily create wealth for countries involved. In this latest development, many countries tried to find an alternative to the liberalization of trade through Free Trade Zone. As of October 2004, has registered 300 limited trade area (preferential trade area) or the Free Trade Agreement of the whole world. With developments such as these, Indonesia is in dire need of information and data that can be used as a consideration in deciding whether or not to agree to do Free Trade Limited.

Recent phenomenon indicates the number of seaweed farmers seek other types of work (rickshaw drivers, construction workers, etc.), due to insufficient income from seaweed *Eucheuma cottonii* sp as seasonal plants to make ends meet. This indicates that insufficient or poverty can affect the structure of production. If this happens, it is very difficult to expect to exceed production positions seaweed *Eucheuma cottonii* sp Philippines. With this situation, Indonesia also requires synergy between production policies (fisheries seaweed *Eucheuma cottonii* sp) at the farm level, which is still poor with the poverty rate should be immediately addressed by the activity and effectiveness across various wiser mainly agri-based policy support based Free Trade Zone (Free Trade Zone).

District of Bangkala Mallasoro village is one of the villages in Jeneponto potential for the development of seaweed as extensive territorial waters are very broad and supported by the region is still beautiful. Based on reports from the local fisheries office area of maintenance and seaweed production has increased. This is due to several factors, from the technical aspects of the cultivation of seaweed is easy to do and relatively short maintenance time, while the economic aspect of the business is profitable because of low maintenance costs. The Research Objectives is determining factors of production in the cultivation of seaweed *Eucheuma cottonii* sp in Jeneponto and analyzing the income of farmer seaweed *Eucheuma cottonii* sp a decent effort developed in Jeneponto.



Sources: Department of Fisheries and Marine, South Sulawesi 2008

Graphic 1. Seaweed Production and Exports of South Sulawesi 1994-2003

2. Research Methodology

1. Site and Time

This research was conducted in Jeneponto Distric, South Sulawesi, Indonesia. This research is a case study, namely to analyze the factors that affect the production of seaweed in the village Mallasoro Jeneponto. In this case it is assumed seaweed production is a function of long stretch(X_1), seeds (X_2), labor (X_3), farming experience (X_4), and plant distance (X_5). Thus seaweed production (Y) as the dependent variable.

2. Population and Sample

The population in this study is the seaweed farmers in the village of Mallasoro Jeneponto as many as 90 farmers. Sampling was conducted randomized study simple (simple random sampling) is a method of sampling by means of random sampling, which every member of the population has an equal chance of being sampled. The number of samples taken 20% of the total population, thus the sample size is 18 people.

3. Types and Sources of Data

Primary Data

Primary data is data collected in the field through interviews with a sample of farmers based on pre-prepared list of questions (questionnaire).

Secondary Data

Secondary data is data that is obtained from the institution or foundation related with the research such as central agency statistics, district office, and the local agricultural department.

4. Data Collection Techniques

Data collection methods used in this study are as follows:

- i. Observations by researchers with a way to interact directly with the real conditions of the targets to be known to obtain information for seaweed farmers in the study area.
- ii. Interview, ie direct communication to obtain information from the seaweed farmers in the village Mallasoro, district of Jeneponto by asking questions that have been prepared in advance.
- iii. Literature namely data collection techniques done by studying the references relating to research.

5. Data Analysis

To determine the factors that affect the increased production of seaweed production, the use of multiple regression analysis (Soekartawi, 1995) while the regression models used are:

$$Y = a + b_2X_2 + b_1X_1 + b_3 + X_3 + b_4X_4 + b_5X_5 + e$$

Specification:

Y = number of seaweed production (rupiah / kg)

a = intercept

b_1 - b_5 = regression coefficient

X_1 = length stretch (m)

X_2 = seeds (kg)

X_3 = labour (number)

X_4 = farming experience (years)

X_5 = plant distance (cm)

e = standard error

Having in mind the factors that influence the increase seaweed production then continued to the benefit analysis to determine how much income is generated every harvest.

3. Background of the Study

Production factors in determining the results to be achieved in the production process, namely:

1. Land

In the agricultural sector, land factor is one of the main factors of production. Factors of production in agriculture are the principal means that absolutely must be available. Mubyarto (1994), said that the land as a factor of production is the result of plant - agriculture is a place where the plant running and production land has an important position, it is evident from the amount of remuneration received by the ground compared to other production factors.

Land production factors are described by Mubyarto (1994) in improving production is determined by the level of soil fertility in addition to geographical location. The higher the fertility of the soil, the higher the rent of land that must be accepted cultivators. Salvatore (2001) refers to the transformation of production inputs or resources into outputs in the form of goods. Herjanto (2004) states that production and operation activities are associated with the creation of goods and services through the process of transformation of inputs into outputs desired.

2. Seed

Selection of seeds in seaweed farming is very important. Quality seeds will largely determine the success of seaweed farming. It should be noted that the seaweed seedlings should be obtained easily although it must be brought in from elsewhere. Several factors must be considered in choosing the seeds are seeds in the form of cuttings should come from plants that clean and fresh, with a superior feature of having many branches, seeds should be collected from coastal waters around the location of cultivation and the number is adjusted to the area (Aslan, 1998).

3. Labor

Labor factor in increasing production is a factor that is important to the other factors. Djyohadikusumo (1997) suggested that the terms of the absolute economics building is labor should be more productive, especially developing countries by using more labor. The use of labor as a variable in the production process is determined by the labor market,

in this case influenced by labor costs and output prices (Nopirin, 2000). Gitosudarmo (1998) labor is human efforts directed at the creation of goods and services. Labor in the workforce motivated and will produce more active when given adequate benefits or services.

4. Capital

Capital is one of the factors of production used in the production process. Production can be increased by using tools or machines efficiently. In the production process there is no difference between equity and loan capital, which each act directly in the production process. Capital accumulation occurs when a portion of the income is saved and reinvested with the aim of enlarging the productivity and income.

Riyanto (1997) capital stock is divided into two, namely active and passive capital. Active capital according to its function can be divided into working capital and fixed capital. While passive capital can be divided between equity and foreign capital or capital enterprises and capital creditors. Brigham and Houston (2001) Working capital is the investment in the short term include cash, accounts receivable, inventory. The amount of working capital can be easily scaled up or adapted to their needs, as well as elements of working capital will change according to the needs.

5. Expertise

Expertise farmers determine the size of the production or revenue. This can be exemplified for the farmers who do not have the knowledge and expertise in an effort to expand its business primarily related to an increase in production. Farmers who have the knowledge and expertise will be trying to find the right way to use so that production can be increased their business. Besides, with the knowledge of farmers will be able to utilize time efficiently and effectively only in terms of the proper planting schedule (Irmayani 2007 in Abdullah, 2010).

4. Results and Discussion

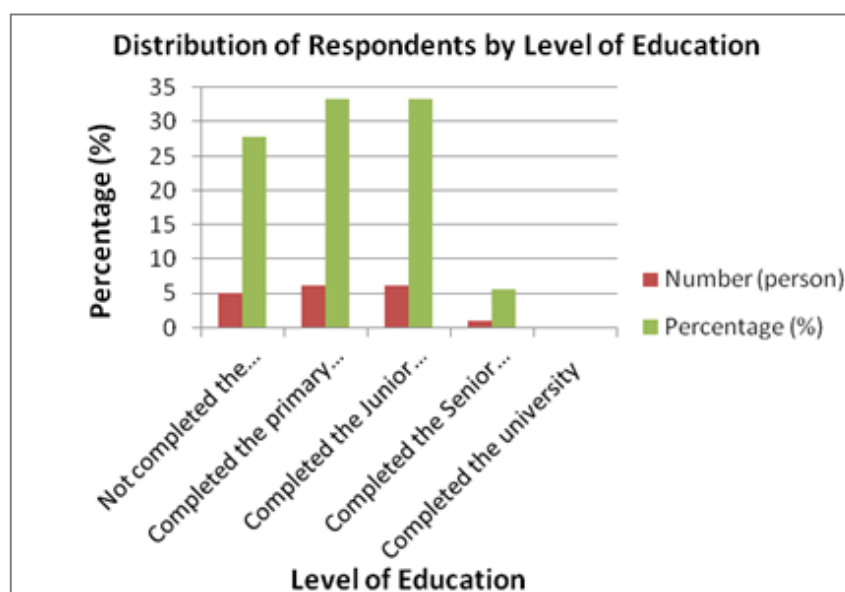
1. Identification of the Farmers

Some characteristics of the seaweed farmers include: level of education, age, number of dependents, and farming experience will be described below.

a. The Education Level

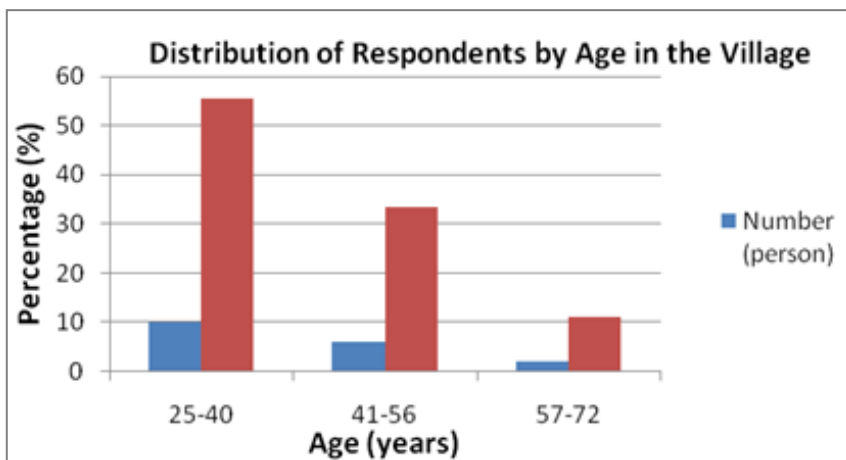
The education level of a person's considerable influences both decision making and in receiving a variety of knowledge and technology for the betterment of their business. Sinungan (2008) stated that the level of education an individual has nothing to do with the level or quality of a person's ability to perform tasks and work performed or given. It is based on the assumption that individuals who have higher education will be able to understand and answer the question of implementation of tasks and jobs. The following classification of farmers according to educational level in the Mallasoro Village District of Bangkala Jeneponto.

Graphic 2 shows that 27.8% of farmers were people who did not complete his education at the primary level, 33.33% were farmers who just finished his education at the primary level and 33.33% who had completed his education at the junior high level the rest as much as 5.56% of graduating high school. Assessment of the knowledge of individuals is determined by the level of education, educational background gives insight possessed characteristics and its disciplines. Quality education according to the competency of human resources is high, appropriate background extensive knowledge, discipline that aims to have a confident attitude towards the importance of individual knowledge for human resource (Sinungan, 2008).



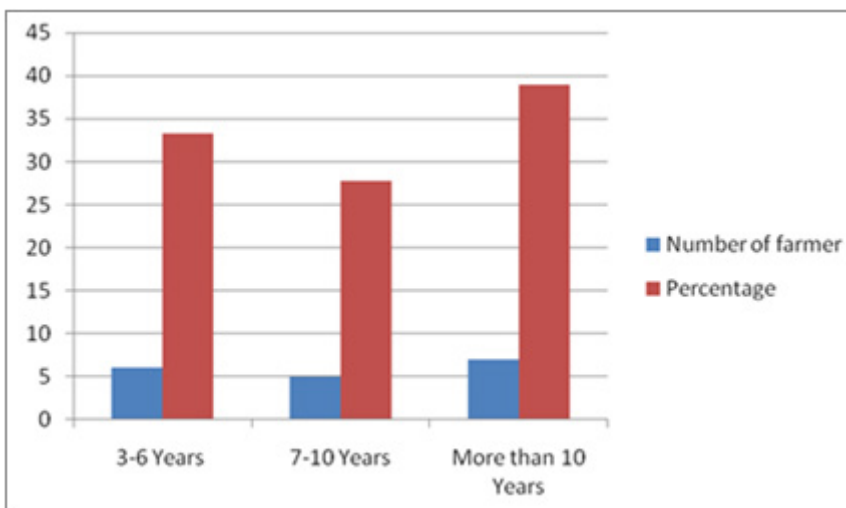
Source : Primary data that have been processed, 2013

Graphic 2. Distribution of Farmers by Level of Education



Source : Primary data that have been processed, 2013

Graphic 3. Distribution of Farmers by Age



Source : Primary data that have been processed, 2013

Graphic 4. Distribution of Farmers by Number of Dependents Families in the village

b. Age of farmers

Age of a person as labor directly or indirectly affect the various activities undertaken. Workers who have childbearing age would have a better physical condition so it helps the success of the business. Similarly, in seaweed farming. Age is the age of the farmers were grouped ages ranging from the youngest to the oldest and one of the factors that affect the ability of farmers in agribusiness management. Age of farmers determine maturity have great influence on the way or a better mindset.

Graphic 3 indicates that farmers belonging to the age range of 25-40 years of 10 people (55.56%) while those belonging to the age range of 41-55 years or the useful life of 6 people (33.33%), so it can be categorized more easily receive a given technology and skills.

c. Number of Family Dependents

Dependents family is home and everyone who does not live at home with farmers living expenses borne by the farmers. Family members as dependents are also the capital

of the workforce, where they helped in seaweed farming activities. Number of dependents tends to affect the lives of farmers burden. The greater the number of family dependents, the greater the costs to be incurred in an effort to meet their daily needs. The magnitude of a farmer family can be used as a source of labor that affects the head of the family in terms of decision making to assist in getting their seaweed. The number of dependents of farmers in the location of research can be seen in Graphic 4.

Graphic 4 shows that the majority of farmers have a number of dependents in a family of 4 people, amounting to 22.22%. Furthermore, farmers with dependents number seven as 38.89%, the lowest number of family dependents by 22.22% of people are those who have dependents at most 4 people.

2. Use of Factor Inputs

This section describes the characteristics of *Eucheuma cottonii* seaweed farming in using such a broad expanse of inputs, number of workers, the seeds used, farming

experience. These variables will be described as follows:

a. Long stretch

Generally seaweed farming activities in rural Mallasoro conducted by farmers on a long stretch of varied, ranging from narrow to wide long stretch. The length of the stretch run of a farmer greatly affects their level of production and productivity of seaweed *Eucheuma cottonii* farmers themselves. The longer the stretch is managed by a farmer, the greater the likelihood of seaweed can produce large quantities (Table 5). Based on Table 5, it is seen that in general farmers use varying long stretch that is only one farmer who use along a stretch of 500-550 meters by 5.56%, but most farmers using 700-750 m long stretch by 50%.

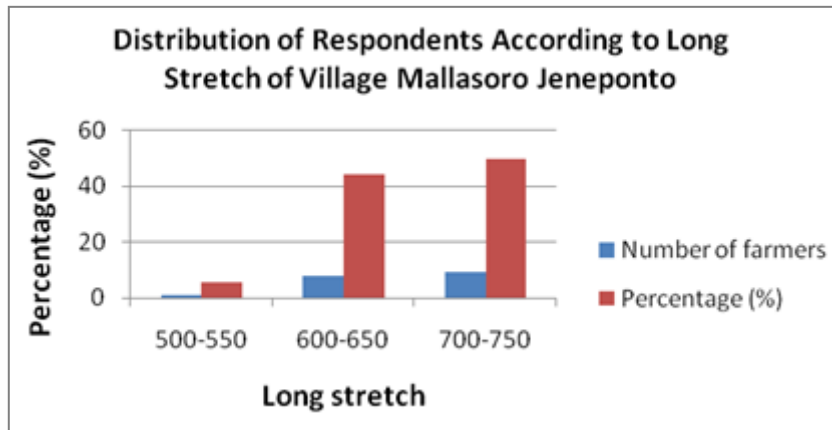
b. Seed

In the cultivation of seaweed *Eucheuma cottonii* sp farmers who responded generally get the seeds from the harvest seaweed itself then replanted. Seaweed seedlings to

be planted should be selected that have good quality so that the results obtained are also of good quality. The density (distance connective) seed planted by farmers generally within 10 cm - 15 cm from the stretch of the rope to another rope. Seaweed production is strongly influenced by the quality of the seeds are spread, in addition to the weather factor also affects the quality of seaweed. A large number of seeds used by farmers in the village of Mallasoro can be seen in Graphic 6.

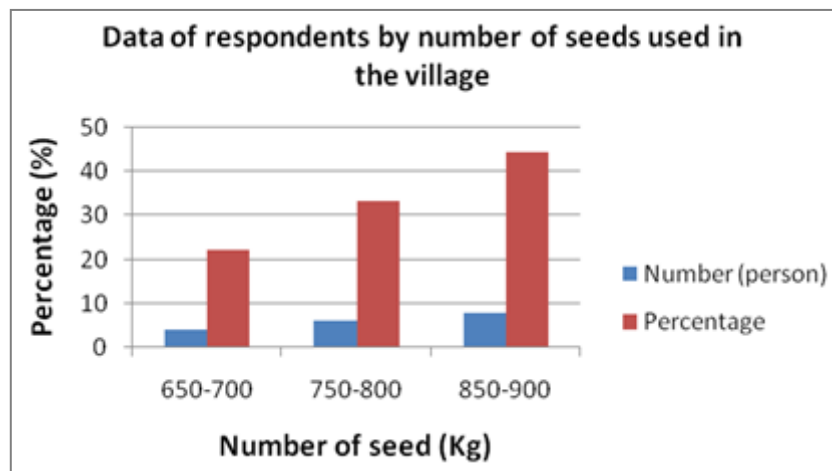
c. Labor

Labor input both from his own family and hired labor has a large share of the production process. Labor in seaweed *Eucheuma cottonii* sp serves to regulate and supervise state seaweed, both during maintenance and at the time of harvesting. Remuneration of labor, especially housewives who do the harvesting of seaweed that is paid a wage of IDR 1,000 to IDR 1500 per stretch. More detail can be seen in Graphic 7.



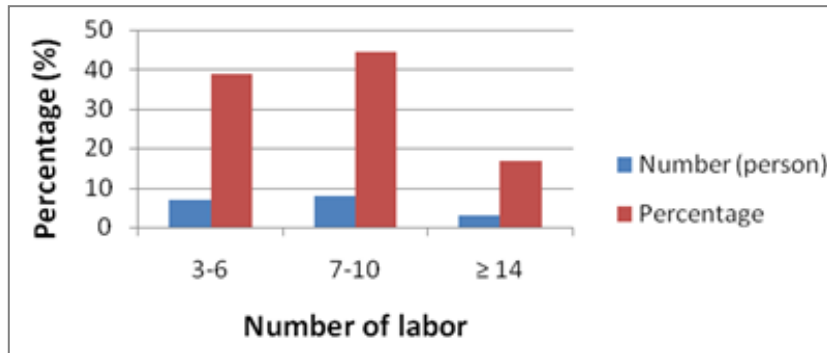
Source : Primary data that have been processed, 2013

Graphic 5. Distribution of Farmers According to Long Stretch of Village Mallasoro Jeneponto



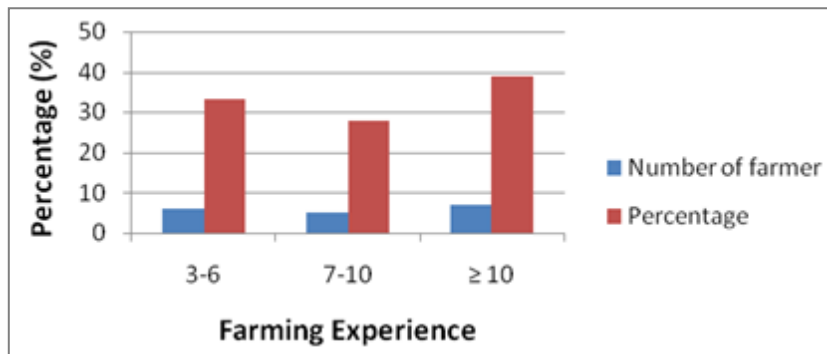
Source : Primary data that have been processed, 2013

Graphic 6. Distribution of Farmers by Number of Seeds



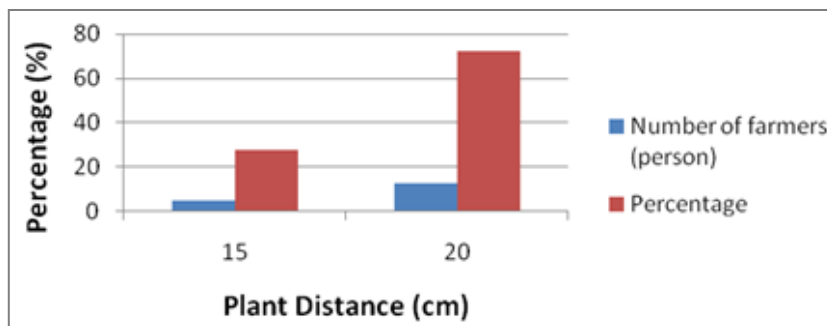
Source : Primary data that have been processed, 2013

Graphic 7. The Distribution of Farmers by Labour



Source : Primary of data that have been processed, 2013

Graphic 8. Distribution of Farmers by Experience Seaweed Farmers in the Village



Source : Primary of data that have been processed, 2013

Graphic 9. Distribution of Seaweed Farmers by Distance Connective in the Village

d. Farming Experience

Besides have sufficient educational level, experience in farming, especially the cultivation of seaweed is one of the factors that influence success. Seaweed farmers who have long been concerned with his efforts to gain a lot of valuable experience in managing and developing their business. People who are experienced in the field of work when faced with a problem will be trying to take precautions as soon as possible so that the problem can be avoided and are not repeated in the future. Therefore, the experience in trying particular seaweed is indispensable. It is known that most of the seaweed farmers have seaweed farming experience between 3 years to 10 Years, as clearly depicted in Graphic 8.

e. Plant Distance

Plant Distance on the cultivation of seaweed is seaweed seedlings binding on straps stretch. Binding of seeds is done with proper estimates that seaweed growth is not compromised. With the distance is too close to the sea grass growth stunted and long distance (length) becomes effective and efficient. Distance connective used seaweed farmers consisting of 15 cm to 20 cm. Distance tie with a length of 20 cm are generally widely used by farmers in the village Mallasoro seaweed in Graphic 9.

f. The number and rate of production

Product of *Eucheuma cottonii* sp seaweed farmers in the growing season varies from one farmer to another, depending on the length of the exposition, tie spacing, and differences in other factors of production. The failure of the harvest seaweed *Eucheuma cottoni* is due to pests or diseases

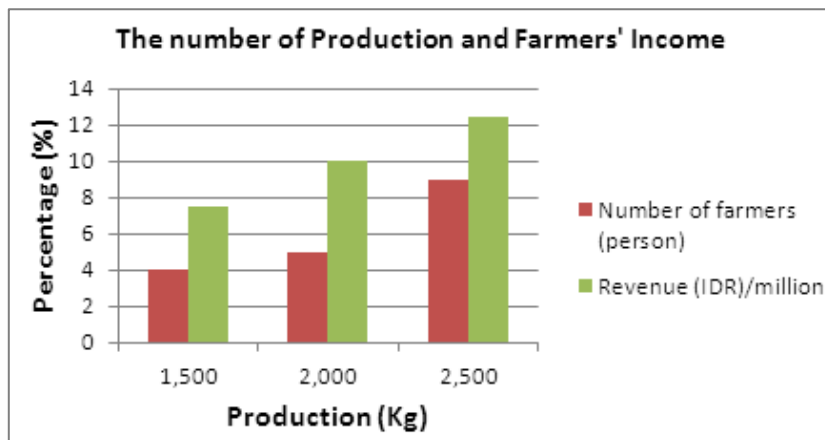
that attack plants, but this sort of thing rarely happens. Based on the results of the research at the site, usually seaweed plants damaged due to erratic weather conditions, sometimes rainy and dry. Price dried seaweed is IDR 5,000 / kg, while the price of IDR 2000 per wet kg. Total production of seaweed farmers varies, depending on the amount of stretch, and a long stretch of seeds used. Here are the results of seaweed production as displayed in Graphic 10.

Graphic 10 shows that the farmers are getting the results that they are getting the highest yield of 2,500 Kg were nine people, and that getting the lowest results in the amount of 1,500 Kg of 4 people farmers. Factors that affect the production of seaweed as it is known that the research is intended to study and analyze how much the relationship and influence Landscape of variable Long stretch (X_1), Seed (X_2), Labor (X_3), Farming experience (X_4), and Plant Distance (X_5) on seaweed production (Y) in the village Mallasoro. In this study the method used is multiple regression analysis with SPSS (*Statistical Product and Service Solutions*). Estimation results of Seaweed production function equation is presented in Table 1.

The results of the analysis in Table 1 can be re-written as

regression equation as follows:

Third, $B_3 = 124,266.816$, meaning that if one person workforce increases the seaweed production will increase by 124,266.816 kg by assuming that the other variables are given. This is because the amount of seaweed production increased, thus requiring a lot of energy to do work ranging from binding to the replanting seeds. Fourth, $B_4 = 192,480.327$, meaning that if the age increased by one year, then production will increase seaweed production by 192,480.327 kg. This implies that increasing a person's age, the seaweed production will also increase. Age does one determine the quality of thinking maturity to determine the policy to be pursued. Fifth, $B_5 = 91479.759$, meaning that farming experience has no significant effect on the increase in grass production. The length of one does not affect the increase in seaweed production farming. This happen because of a person's success in doing farming is influenced by one's tenacity in running their business, pay attention to the intensity of seaweed farmers. In addition, farmers are already plenty of seaweed cultivation information from many sources e.g local officer for agricultural extension.



Source : Primary data that have been processed, 2013

Graphic 10. The number of Production and Farmers' Income

Table 1. Estimated Effect of Independent Variables on Seaweed Production

Model	Unstandardized Coefficients		T	Sig.
	B	Std.Error		
Constanta	-220158.573	495791.620	-0.44	.168
Length of the stretch (X_1)	18093.491	12446.204	1.454	.172
Seeds (X_2)	27956.278	8244.427	3.391	.005
Labor (X_3)	124266.816	168889.531	.736	.137
Farming experience (X_4)	192480.327	140069.320	1.374	.195
Plant Distance (X_5)	91479.759	185455.634	.493	.120

Source : Primary data that have been processed, 2013

5. Conclusion

Summary of the Major Finding

Factors affecting the production of increased production of seaweed *Eucheuma cottonii* (Long Stretch of (X_1), Seed (X_2), Labor (X_3), farmers experience (X_4), and the distance tie (X_5) simultaneous mutual influence each other, but the most significant factor is the number of seeds. Enterprises of *Eucheuma cottonii* sp seaweed is a business that is able to increase the income of farmers.

Limitation of findings

Limitation of the findings in this study was to determine the factors that influence the increase seaweed production and how much income received by farmers in each harvest seaweed farming.

Further Study

The results of this study found that the seeds factor is a significant factor affecting the increased production of seaweed, so it is expected for the next research collaboration to develop seaweed aquaculture through cultivation techniques by means of tissue culture to produce a better quality of seeds and assess how much influence seedling tissue culture to help farmers increase income in this farming.

6. Problems and Prospects

The problem in this study is not known factors that affect the production of seaweed increased production and how much revenue received seaweed farmers each season. Seaweed has many benefits in various products so that demand is increasing every year from various countries, and Indonesia has not been able to meet that demand.

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REFERENCES

- [1] Arsyad, M., Y. Kawamura, 2009. A Poverty Causal Model of Cocoa Smallholders in Indonesia: Some Initial Findings from South Sulawesi. *Ryukoku Journal of Economic Studies*, 49 (2):1-27.
- [2] Arsyad, M., A. Nuddin, S. Yusuf, 2013. Strengthening Institutional Towards Smallholders Welfare: Evidence from Existing Condition of Cocoa Smallholders in Sulawesi, Indonesia. *Ryukoku Journal of Economics Studies*, 52(1):71-76
- [3] Blankenhorn, S.U., 2007. Seaweed Farming and Artisanal Fisheries in an Indonesian Seagrass Bed-Complementary or Competitive Usages. Doctoral Thesis of Natural Sciences, University Bremen.
- [4] Ekasari, Z. K., M. Saleh, S. Ali, K. Jusoff, D. Salman, A. Kasirang, M. Arsyad, A. A. Amrawaty, L. Fudjaja, 2013. Communication Pattern and Conflict in Agricultural Extension. *Asian Social Science*, Accepted to be published on Vol. 9(6):27-33.
- [5] Haile, M. G., D. Abebaw, 2012. What Factors Determine the Time Allocation Agricultural Extension Agents on Farmers' Agricultural Fields? Evidence from Rural Ethiopia. *Journal of Agricultural Extension and Rural Development*, 4(10):318-329.
- [6] Krishnan, M., R. Narayanakumar, 2010. Structure, Conduct and Performance of Value Chain in Seaweed Farming in India. *Agricultural Economics Research Review*, 23(conference number):505-514.
- [7] Nicolas, A., O. Hill, J. M. Rowcliffe, H. J. Koldewey, E. J. Milner-Guilland, 2011. The Interaction between Seaweed Farming as an Alternative Occupation and Fisher Numbers in the Central Philippines. *Conservation Biology*, 26(2):324-334.
- [8] Ratnayake and Silva. 2012. Japan's Grass-roots Technical Cooperation in Social Business Development and Poverty Allevation : The Conceptual Relationship. *Saga University Economic Review* 47(1), 29-60, 2014-05. Saga University
- [9] Rivera, W. M., S. L. Corning, 1990. Empowering Women through Agricultural Extension: A Global Perspective. *Journal of Extension*, 28(4).
- [10] Valderrama, D., 2012. *Social and Economic Dimensions of Seaweed Farming: A Global Review*. IIFET, Tanzania Proceedings.
- [11] Zamroni, A., M. Yamao, 2011. Coastal Resource Management: Fishermen's Perceptions of Seaweed Farming in Indonesia. *World Academy of Science, Engineering and Technology*, 60:32-38.