Socio-economic conditions in relation to seaweed farmers' income and independence

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Paper Info

Received: July 2023
Revised: August 2023
Approved: August 2023

Abstract

Background: With the potential of natural resources, seaweed become one of promising commodities which can improve and accelerate national development in general and marine and fishery sector development particularly. Marine and fishery sector development is not only exploitation approach but it is directed toward attempt to improve added value of cultivation.

Aim: This study aims to analyze the effect of social economic factor toward income and independence of seaweed farmer in Maluku Tenggara Barat Region.

Method: This study was designed with the type of model combination sequential explanatory design. The population in this study was all seaweed farmers in Maluku Tenggara Barat region as 1,485 people. The determination of sample was 10% from total population, so that sample of 148 seaweed farmers. The data was analyzed by using path analysis.

Findings: The result of reference study shows that (1) capital is the most affecting variable toward independence of cultivation as 55.6% (2) Land Area was the second affecting variable toward independence as 45.2%; (3) the number of dependent family member is the third affecting variable toward independence as 29.9%; (4) interaction education and counseling is the forth affecting variable toward independence as 24.4%; experiences was the fifth affecting variable toward independence as 24.3%; (6) age is the sixth affecting variable toward independence as 18.5%; (7) counseling intensity is the seventh affecting variable toward independence as 14.1%; (8) education is the eighth affecting variable toward independence as 11.8%.

Keywords: income, independence, social economic factor

Introduction

Seaweed has a promising prospect as one of trade commodity, both for fulfilling domestic demand and foreign demand (Damelia & Soesilowati, 2016; Mantri et al., 2022; Rimmer et al., 2021). This opportunity has to be taken by seaweed farmers and employers by managing the cultivation area of commodity in term of quantity, quality and competitive price. One of the main incomes of coastal society in Indonesia is seaweed cultivation (Laapo & Howara, 2016; Sudarwati et al., 2020; Zamroni & Yamao, 2014).

There are several reason why seaweed become staple income of coastal society in now and future. First, various kind of potential seaweed can be cultivated easily due to it simple technology and it does not need to be feed but only need fertile water, Second the opportunity of several type of seaweed which is used as food material and raw material of industry so that it has a strategic potential to be a commodity which has added value. The third, the potential market for both to fulfill domestic demand and export is relatively high. The forth, seaweed cultivation become the main source of income and become the opportunity of business and also
open job opportunity for coastal society particularly for low economic class of farmer. In addition the area of seaweed cultivation can improve water ecology balance (Zamhuri, 2013).

With the potential of natural resources, seaweed become one of promising commodities that can improve and accelerate national development in general and marine and fishery sector development particularly (Costa-Pierce, 2010; Gegg & Wells, 2019; Puspita et al., 2020). Marine and fishery sector development is not only exploitation approach but it is directed toward attempt to improve added value of cultivation (Okafor-Yarwood et al., 2022; Rudovica et al., 2021; Vázquez-Rowe, 2020).

West Southeast Maluku Regency is one of the areas that has huge seaweed potential in Maluku Province with a very strategic location because it is at the forefront of the archipelago and directly borders with Australia. Dry seaweed production can reach 10,714 tons with a value of IDR 96 billion. West Southeast Maluku Regency has a coastline length of 1623.2695 km (Soselisa et al., 2011). MTB (Maluku Tenggara Barat, West Southeast Maluku) district now has 10 sub-districts, namely South Tanimbar, Wertamrian, Wermaktian, Selaru, North Tanimbar, Yaru, Wuarlabobar, Nirunmas, and Molo Maru districts.

Seaweed cultivation was introduced by West Southeast Maluku government in 2007, starting with cultivation by the Fisheries Service in Saumlaki Bay using seeds from Takalar. Furthermore, the Seira fishing community started it, followed by the people of Selaru Island. Now almost all communities in the west and north coast of West Southeast Maluku (especially Seira, Larat, Molo-Maru), Selaru Island, and parts of the east coast (such as Arma, Watmuri, Tutukembong, Arui Bab) cultivate seaweed. The government uses seaweed production as an intermediate target to develop capture fisheries, in this case to attracting foreign markets to enter West Southeast Maluku, because according to the Government, although fish is abundant, there are no collection vessels.

The value of seaweed production in West Southeast Maluku Regency has a positive trend, this is followed by a fairly large stimulation of export opportunities to several countries, but the problem of seaweed cultivator income in West Southeast Maluku is still low when compared to other business fields, the cause of the low income of seaweed farmers in West Southeast Maluku Regency is affected by several determining factors, such as the fluctuating price of dried seaweed, which currently ranges from Rp. 12,000- Rp. 15,000 per kilogram, where the price range is not in favor of farmers, unlimited land ownership and limited business capital as well as the fulfillment of family life which is increasing. The decline in the number of farmers who cultivate seaweed, is a problem that needs to be considered how the next steps to develop potential seaweed widely. This seaweed business is labor intensive and is carried out simply and is able to expand employment opportunities and this business is carried out by farmers as a side job to take advantage of free time. It is both to increase income, as well as to improve the skills of farmers and their family members with more productive activities.

The approach used to analyze the above problems is the approach to farmer independence. The independence of farmers is closely related to production and fisheries, because independent farmers are characterized by being able to master their own problems, have the ability and competence and have a forum or organization. Increasing of farmers’ independence can be done in several ways, one of which is increasing income, so that farmers and their families are more prosperous and have independence in financial capital so that they are more independent in marketing and have a stronger bargaining position. This research was conducted
with the aim of knowing and analyzing the effect of socio-economic factors on the income and independence of seaweed farmers in West Southeast Maluku Regency. Furthermore, the research will contribute as a reference to the improvement of regional socio-economic conditions in Indonesia, especially east regions.

**METHOD**

This research was designed using a combination research model or sequential explanatory design, a research design that combines sequential quantitative and qualitative research methods, where in the first stage the research is carried out using quantitative methods and in the second stage qualitative methods are carried out. For the first stage of the quantitative method, the approach used is causal correlation to determine the effect of age, education level, experience, number of family members, land area, capital, counseling intensity, income on farmer independence in developing seaweed potential. Meanwhile the second stage of the qualitative method plays a role in proving and expanding the quantitative data that has been obtained at an early stage.

This research was conducted in West Southeast Maluku Regency, Maluku Province, because it is one of the seaweed development areas, with the time needed for two months, from September to November 2019. The population in this study was all seaweed farmers in West Southeast Maluku Regency as many as 1,485 people. Determination of the number of samples was 10% of the total population, so the sample was 148 seaweed farmers.

The types of data needed in this study are primary data and secondary data. Primary data were obtained from sample farmers using a questionnaire, namely data on age, experience, level of education, family members, land area, income, production, type of land, price, counseling and institutions, and the independence of seaweed farmers. Secondary data is obtained from related institutions/agencies related to this research. Secondary data is available in the form of written reports and other official documents. Secondary data is in the form of an overview of the research area and government programs in supporting development of seaweed potential. The data collection procedure is carried out in two stages, those are:

1) The first stage is carried out through literature study, by collecting data or literature from the results of researches which have been carried out to get a general overview and to plan the appropriate analysis to solve the problems.

2) The second stage was carried out by collecting primary data through distributing questionnaires to the research sample, seaweed farmers in West Southeast Maluku Regency.

The data analyses used were:

1) Descriptive analysis: to describe the research variables through descriptive statistics in the form of frequency tables which include variables of age, level of education, experience, number of family members, land area, capital, counseling intensity, type of land, income and independence.

2) Path analysis: it is an analysis to determine the direct or indirect effect of the variables. The software used was SPSS 22.00.
RESULTS AND DISCUSSION

This study examines the effect of the variables of age, experience, level of education, number of dependents, family members, land area, counseling intensity, capital on income and independence of farmers. For this reason, a statistical path analysis test is carried out which is stated by the following equation:

\[ Y = \rho x_1 X_1 + \rho x_2 X_2 + \rho x_3 X_3 + \rho x_4 X_4 + \rho x_5 X_5 + \rho x_6 X_6 + \rho x_7 X_7 + \rho x_8 X_8 + \epsilon \]

Where:
- \( Y \) = Farmer Independence
- \( Y_1 \) = farmers’ income
- \( X_1 \) = Age
- \( X_2 \) = Experience
- \( X_3 \) = level of education
- \( X_4 \) = Number of dependents
- \( X_5 \) = Land area
- \( X_6 \) = Counseling intensity
- \( X_7 \) = Capital used
- \( X_8 \) = Interaction of education with intensity of education

To prove these hypotheses, analysis was carried out on the research data, as shown in the following table:

### Table 1. Analysis of Correlation between Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>( X_1 )</th>
<th>( X_2 )</th>
<th>( X_3 )</th>
<th>( X_4 )</th>
<th>( X_5 )</th>
<th>( X_6 )</th>
<th>( X_7 )</th>
<th>( X_8 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( X_1 )</td>
<td>-</td>
<td>0.243</td>
<td>0.225</td>
<td>0.699</td>
<td>0.243</td>
<td>0.214</td>
<td>0.221</td>
<td>0.243</td>
</tr>
<tr>
<td>( X_2 )</td>
<td>0.243</td>
<td>-</td>
<td>0.273</td>
<td>0.404</td>
<td>0.202</td>
<td>0.255</td>
<td>0.318</td>
<td>0.202</td>
</tr>
<tr>
<td>( X_3 )</td>
<td>0.225</td>
<td>0.273</td>
<td>-</td>
<td>0.327</td>
<td>0.275</td>
<td>0.244</td>
<td>0.260</td>
<td>0.275</td>
</tr>
<tr>
<td>( X_4 )</td>
<td>0.699</td>
<td>0.404</td>
<td>0.327</td>
<td>-</td>
<td>0.232</td>
<td>0.261</td>
<td>0.309</td>
<td>0.232</td>
</tr>
<tr>
<td>( X_5 )</td>
<td>0.243</td>
<td>0.202</td>
<td>0.275</td>
<td>0.232</td>
<td>-</td>
<td>0.222</td>
<td>0.640</td>
<td>0.221</td>
</tr>
<tr>
<td>( X_6 )</td>
<td>0.214</td>
<td>0.255</td>
<td>0.244</td>
<td>0.261</td>
<td>0.222</td>
<td>-</td>
<td>0.219</td>
<td>0.222</td>
</tr>
<tr>
<td>( X_7 )</td>
<td>0.221</td>
<td>0.318</td>
<td>0.260</td>
<td>0.309</td>
<td>0.640</td>
<td>0.219</td>
<td>-</td>
<td>0.340</td>
</tr>
<tr>
<td>( X_8 )</td>
<td>0.243</td>
<td>0.202</td>
<td>0.275</td>
<td>0.232</td>
<td>0.221</td>
<td>0.222</td>
<td>0.640</td>
<td>-</td>
</tr>
</tbody>
</table>

The table above shows that there is a significant correlation between variables, namely between age, experience, level of education, number of dependents, land area, counseling intensity, capital and interactions between education and counseling. The relationship between these variables is significant at the 5% level of confidence. This shows that there is a significant relationship between the dependent variables.

Furthermore, to find out the path coefficient among variables \( X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8 \), to \( Y_1 \) and the path coefficient from \( Y_1 \) to \( Y_2 \) can be seen in the following table:

### Table 2. Statistical Path Analysis Test Results

<table>
<thead>
<tr>
<th>Parameter Structure</th>
<th>Coef. Path (Beta)</th>
<th>t-count</th>
<th>t-table</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>( X_1 ) toward ( Y_1 ) (( pY_1, X_1 ))</td>
<td>0.229</td>
<td>2.103</td>
<td>1.960</td>
<td>0.003</td>
</tr>
</tbody>
</table>
The results of the analysis in the table indicate that the path coefficient of the test results simultaneously is significant, so that a decision can be made to reject H0 and accept H1 which means that it can be forwarded to testing individually. From the results of individual testing, it turns out that the path coefficient of the variables $X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8$ to $Y_1$ is statistically significant, so that H0 is rejected and H1 is accepted.

The table above also shows the direct effect of the independent variable on income by 99.7% which shows that simultaneously, the variables age, experience, level of education, number of dependents, land area, counseling intensity, capital and the interaction between education and counseling have a significant effect to income of 99.7%. The direct effect of income on the independence of the farmers was 77.4%, which indicates that an increase in farmer income of 1 rupiah would increase 77.4% of farmer independence.

Furthermore, the results of the analysis in the table above are translated into a path diagram as in the following diagram:

![Figure 1. Structure of Correlation between Variables of $X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8$ With Variable of $Y_2$ through Variable of $Y_1$](image-url)
Based on the table and figure above and the calculation results in the appendix, it shows the direct and indirect effects of each variable as follows:

<table>
<thead>
<tr>
<th>Effect</th>
<th>Age (X_1)</th>
<th>Experience (X_2)</th>
<th>Education (X_3)</th>
<th>Number of Dependence (X_4)</th>
<th>Land area (X_5)</th>
<th>Counseling intensity (X_6)</th>
<th>Capital (X_7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct</td>
<td>0,052</td>
<td>0,099</td>
<td>0,029</td>
<td>0,097</td>
<td>0,191</td>
<td>0,046</td>
<td>0,248</td>
</tr>
<tr>
<td>Indirect Through X_1</td>
<td>-</td>
<td>0,039</td>
<td>0,008</td>
<td>0,049</td>
<td>0,024</td>
<td>0,010</td>
<td>0,025</td>
</tr>
<tr>
<td>Indirect Through X_2</td>
<td>0,017</td>
<td>-</td>
<td>0,014</td>
<td>0,039</td>
<td>0,027</td>
<td>0,017</td>
<td>0,050</td>
</tr>
<tr>
<td>Indirect Through X_3</td>
<td>0,008</td>
<td>0,014</td>
<td>-</td>
<td>0,017</td>
<td>0,020</td>
<td>0,008</td>
<td>0,022</td>
</tr>
<tr>
<td>Indirect Through X_4</td>
<td>0,049</td>
<td>0,017</td>
<td>0,017</td>
<td>-</td>
<td>0,031</td>
<td>0,017</td>
<td>0,049</td>
</tr>
<tr>
<td>Indirect Through X_5</td>
<td>0,024</td>
<td>0,024</td>
<td>0,020</td>
<td>0,031</td>
<td>-</td>
<td>0,020</td>
<td>0,139</td>
</tr>
<tr>
<td>Indirect Through X_6</td>
<td>0,010</td>
<td>0,017</td>
<td>0,008</td>
<td>0,017</td>
<td>0,020</td>
<td>-</td>
<td>0,023</td>
</tr>
<tr>
<td>Indirect Through X_7</td>
<td>0,025</td>
<td>0,050</td>
<td>0,022</td>
<td>0,049</td>
<td>0,139</td>
<td>0,023</td>
<td>-</td>
</tr>
<tr>
<td>Indirect Through X_8</td>
<td>0,021</td>
<td>0,080</td>
<td>0,023</td>
<td>0,048</td>
<td>0,011</td>
<td>0,022</td>
<td>0,012</td>
</tr>
<tr>
<td>Indirect Through Y_1</td>
<td>0,185</td>
<td>0,243</td>
<td>0,118</td>
<td>0,299</td>
<td>0,452</td>
<td>0,141</td>
<td>0,556</td>
</tr>
<tr>
<td>Total Toward Independence (Y_2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0,997</td>
</tr>
</tbody>
</table>

The table above shows that the biggest direct effect is the effect of the capital variable on income by 24.8%, which indicates that every 1 rupiah increase in capital will increase 0.248 rupiah in income. Meanwhile, the smallest effect was the education variable on income by 2.9% which indicated that every 1 year increase in education would increase income by only 0.029 rupiah; assuming other variables were constant.

For the age variable, it was indirectly the biggest effect is if it correlates with the number of dependents by 4.9%, which indicates that every 1 year increase in the farmers’ age and followed by an increase in the number of dependents by 1 person will increase income by 0.049 rupiah; assuming other variables were constant.

For the experience variable, it was indirectly the biggest effect is if it is correlated with capital by 5.0%, which indicates that each 1 year increase in cultivator experience and is followed by an increase in the amount of capital by 1 rupiah, will increase income by 0.050 rupiah; assuming other variables were constant.

For the education variable, it was indirectly the biggest effect is if it correlates with capital by 2.2%, which indicates that every 1 year increase in cultivator education and followed by an increase in the amount of capital by 1 rupiah will increase income by 0.022 rupiah; assuming other variables were constant.

For the education variable, it was indirectly the biggest effect is if it correlates with capital by 2.2%, which indicates that every 1 year increase in cultivator education and followed by an increase in the amount of capital by 1 rupiah will increase income by 0.022 rupiah; assuming other variables were constant.

For the variable number of dependents, it was indirectly the biggest effect is if it is correlated with age and capital by 4.9%, which indicates that every increase in the number of dependents followed by an increase in age 1 year or an increase in capital by 1 rupiah, will increase income by 0.049 rupiah; assuming other variables were constant.
For the variable of land area, it was indirectly the biggest effect is if it correlates with a capital by 13.9%, which indicates that an increase in land area of 1 hectare and followed by an increase in capital of 1 rupiah will increase income by 0.139 rupiah; assuming other variables were constant.

For the counseling intensity variable, it was indirectly the biggest effect is if it correlates with capital of 2.3%, which indicates that an increase in counseling intensity of 1 time and followed by an increase in capital of 1 rupiah will increase income by 0.023 rupiah; assuming other variables are constant.

For the capital variable, it was indirectly the biggest effect is if it correlates with a land area by 13.9%, which indicates that an increase in capital is 1 rupiah and is followed by an increase in land area of 1 hectare, it will increase income by 0.139 rupiah; assuming other variables are constant.

For the variable of interaction between education and counseling, it was indirectly the biggest effect is if it is correlated with experience of 8.0% which indicates that an increase in the level of education is accompanied by an increase in the counseling intensity and experience in fishing farming by 1 unit, it will increase income by 0.800 rupiah; assuming other variables are constant or do not change.

The biggest total effect on farmers’ income is the capital variable, which was 55.6%, which indicates that capital is the most dominant variable affecting the increase in income, assuming that this capital is supported by sufficient age and experience of farmers, adequate education, and the number of dependents that can be used as family labor, increase in land area and increase in counseling intensity. The effect of independent variables on the independence of farmers through income intervening variables was 99.7% which indicates that the independence of farmers can be increased by 99.7% if age, experience, level of education, number dependents, land area, counseling and capital intensity have increased together and comprehensively with an increase in income.

Based on the descriptive analysis, it provides evidence that the younger farmers, on average, have a higher income than the older ones. The results of research statistically and qualitatively provide support for the theory put forward by Soehardjo and Patong (2000) that a person's ability will increase up to a certain age level, then he will begin to decrease. The age of the cultivator will affect their physical ability, work and thinking. Farmers who are young and healthy have greater physical abilities and take longer time.

The results of this study provide support for the statement put forward by Hasan (2000) that the farming experience occurs due to the effect of the time factor that the cultivator has experienced. Farmers who are experienced in overcoming barriers to their farming will know how to overcome the barriers, unlike farmers who are inexperienced, in which they will have difficulty facing the obstacles. The more experience obtained by the farmer, the higher the productivity is expected in pursuing fishery farming activities.

Based on the results of the interview, it was also known that the experience of these farmers was obtained through observations in carrying out this seaweed cultivation. The experience of this cultivator is a reality in everyday life so that they have more skills in managing this seaweed cultivation business. This is in line with the opinion of Mahaputra, et al. (2006) that the experience of farmers is a cultivator's knowledge obtained through routine daily activities or events he has experienced. It was further argued that if farmers had more successful
experience in running their farming business, they usually had better attitudes, knowledge and skills than less experienced farmers. If farmers always experience failure in operating their farming business, it can cause a feeling of reluctance to operate the farming business.

Based on the results of statistical analysis, it appears that the level of education does have the least effect among the other six variables, but it is still statistically significant on increasing income. This implies that higher education without an understanding of the adoption of innovation and new technology has no real impact on income. Because education will have an effect on scientific thinking so that it can make logical decisions for the continuation of farming. This is in line with the opinion of Soekartawi (1998) that the level of a person's education actually affects the attitude and level of innovation adoption. Highly educated farmers are relatively faster in implementing innovation adoption, and vice versa, farmers with low education, it is rather difficult to accept innovation quickly.

Based on statistical analysis, it can be seen that the effect of the number of dependents together with other variables will provide an opportunity for an increase in income by 0.299 rupiah in one planting season. This shows that the number of family members contributes significantly to increasing income through the efficiency of labor costs. This is in line with the opinion stated by Sahara et al. (2004) that the number of family dependents is the number of people living in the same house, other than the head of the family. This will affect the production and consumption patterns of farmers and cause differences in production and income from one another. The more labor, the more expenses for consumption and the smaller the expenses to finance the farming business, but on the other hand, the more active the activities of other family members, have the opportunity to earn higher income.

Support for the results of statistical analysis which shows that there was an effect, either directly or indirectly, of the variable area of land on the income of farmers. It is also in line with Lion Berger's theory in Mardikanto (2000) that the extent of the narrow land affects the agricultural system carried out. Farmers with average land ownership are more receptive to changes in the farming system. Usually, the more land they have, the faster it will be adopted because it has better economic capacity.

The results of this study provide support for the statement of Mardikanto and Sutarni (2005) that counseling activities are one of the most effective efforts to increase knowledge, teach skills, and make people use natural resources through non-formal education by counseling agents.

The results of statistical analysis also provide support that among the other six variables, the biggest effect in total comes from the capital variable which is supported by an increase in the other six variables. This is in accordance with the opinion of Sujarmoko et al. (2008) that the greatest potential to increase farmers' income through increased production is by optimizing the investment function and capital function.

The indirect effect of age, experience, education, number of dependents, land area, counseling intensity on farmers independence through income was 0.997 or 99.7%; greater than the direct effect of income on independence. This shows that high income does not automatically increase the independence of the farmers, or in other words, farmers who have high income are not necessarily independent, because there are other variables that also affect the income itself, either directly or indirectly.
The results of this study indicate that the independence of the farmers can be increased through increasing income with the support of increased capital accompanied by an increase in land area, sufficient experience, number of dependents, sufficient age, and counseling intensity and adequate education. Without the support or effect of these seven variables, the cultivator's income cannot be increased and in the end an independent cultivator, both organizationally, mastery of the problem and ownership of the farming promotion system will never be achieved.

CONCLUSION

Capital was the variable which had the biggest effect on the independence of farmers by 55.6%. This is because the capital for seaweed farmers determines the scale of business and productivity so that there was a big opportunity to increase the farmers' income through increased production by optimizing investment and capital.

Land area was the second variable which affects the independence by 45.2%. This is because land was one of the factors of production that greatly determines the scale of production, productivity and income of farmers.

The number of dependents family member was the third variable which affects the independence by 29.9%. This is because the number of dependents was a source of labor so that the more active the activities of family members have the opportunity to earn higher income.

The interaction of education and counseling was the fourth variable that affects the independence by 24.4%. This is because through high education and accompanied by high intensity of attending counseling, farmers have higher knowledge so that they are easier to accept innovations both in terms of cultivation and post-harvest techniques which will ultimately improve the quality of production and income.

Experience was the fifth variable that affects independence by 24.3%. This is because through experience, farmers have higher knowledge, attitudes and skills so that they are easier to accept innovations both in terms of cultivation and post-harvest techniques which will ultimately improve production quality and income.

Age was the sixth variable that affects the independence of farmers by 18.5%. The insignificant effect of age is because age is not a constraint on the production factor in seaweed cultivation, so that regardless of the age of the farmer, it does not directly affect production.

The counseling intensity was the seventh variable that affects the independence of the farmers by 14.1%. The insignificant effect of counseling intensity is due to the low frequency and quality of counseling carried out by related agencies, so that it had not been effective in increasing knowledge, teaching skills, and making people aware of using natural resources.

Education was the eighth variable which affects the independence of farmers by 11.8%. This is because even though the level of education is low, but they have sufficient experience and good capital support, the independence of the farmers can still be improved.

The researcher, then, would like to suggest some points:

1) Increase farmers’ capital, through a system that is beneficial to both farmers and creditors, so that through the synergy of income, capital, land area, experience, counseling intensity, number of dependents, age and education so that farmers have the ability to master their own problems, have promotion of farming and empowering farmer groups as a unifying platform for farmers.
2) Increasing business scale through increasing networking
3) Optimizing the use of family labor which is the responsibility of farmers as a form of efficiency in labor costs.
4) Improve farmers’ experience through observation and observation of daily activities and transfer of knowledge and experience to other farmers, so that seaweed cultivation can be sustainable.
5) Increase the interest of young farmers to be more enthusiastic in seaweed cultivation.
6) Increase the counseling intensity, not only in terms of quantity but also in terms of the quality of the materials provided.
7) Improve farmers’ education informally through training in cultivation techniques as well as marketing and post-harvest processing.

REFERENCES
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