Prospect of seaweed development in South Sulawesi through a mapping study approach

S Yusuf\(^1\), M Arsyad\(^2\) and A Nuddin\(^1\)

\(^1\)Departemen Management and Accounting, Faculty of Economics, Muhammadiyah University of Parepare, Jl. Jend. Ahmad Yani Km. 6, Bukit Harapan, Soreang, 91131, South Sulawesi, Indonesia.

\(^2\)Department Agricultural Socio Economic, Faculty of Agriculture, Hasanudddin University, Jl. Perintis Kemerdekaan KM 10, Makassar, 90245, Indonesia.

E-mail: aryus_umpar@yahoo.com

Abstract: Seaweed is one of fishery commodities which is extremely potential for foreign exchange income. Indonesia known as a nation which has many areas which are potential to develop seaweed, above all in Province South Sulawesi, encourages the researchers to know the prospect of seaweed production development. Therefore, this paper aims to present the potency of seaweed development in South Sulawesi in order to reduce poverty. The study was carried out in two regencies, namely Bantaeng and Luwu. The study identified the seaweed development potency by using mapping study approach with analysis method. The data was obtained by using structured interview. The research result showed that both regencies developed some species of seaweed, they were \textit{Eucheuma cottonii}, \textit{Eucheuma spimosum} and \textit{Gracilaria} sp. However, the farmers in both areas still used traditional ways. In Bantaeng, the farmer cultivated \textit{Eucheuma cottonii} and \textit{Eucheuma spimosum} utilizing long line method. Meanwhile, in Luwu, the farmer cultivated \textit{Eucheuma cottonii} and \textit{Gracilaria} sp with different method. \textit{Eucheuma cottonii} was cultivated by using long line method, whilst \textit{Gracilaria} sp was by bottom method. Generally, \textit{Gracilaria} sp was cultivated in earthen dam. Consequently, the amount of seaweed production was still low. In addition, in this research founded that some of farmers applied an islamic-based system in cultivating seaweed but it still needs in-depth understanding.

1. Introduction

Indonesia is known as maritime nation with 13,667 islands and becomes major producer of marine cultured seafood products, specially seaweed [1]. Seaweed is one of fishery commodities which is extremely potential for foreign exchange income. In fact, it has been utilized as the main source income [2]. Seaweed is widely used as food, medicine, and important materials in the food industry, cosmetics, and pharmaceuticals [3]. Increasing consumption of seaweed as a food extract, medical use, and bio-refining is expected to drive the demand for seaweed, above all the species \textit{Eucheuma cottonii} and
Glacilaria sp. Both of these seaweed species have a high economic value because it contains compounds used as raw materials for industries and food like agar and carrageenan [3]. Thus, both of these seaweed species are export things which is used for meeting the global market share, particularly for some big countries, such China, Germany, America, Japan and other countries in Europe. The demand of seaweed for meeting the global market share has achieved 80.64% and almost increase 15% per annum.

South Sulawesi is the largest producer of seaweed in Indonesia [4]. In South Sulawesi Province, seaweed has become the main means of livelihood for fishers’ communities. As we known that the production of seaweed in South Sulawesi is improved every year, particularly in two regencies, Luwu and Bantaeng. However, the important thing to be considered is that the development of seaweed farming is extremely affected by various factors, including the availability of socio-economic, resources, public policy, and technology [4]. Therefore, this research aims to investigate the potency and excellent of seaweed development in South Sulawesi in order to reduce poverty.

2. Research Method: Mapping Study Approach
This research was carried out in two districts in South Sulawesi Selatan, Bantaeng and Luwu, in 2016. Both of these districts are known as the largest seaweed producer in South Sulawesi. The researcher choose 115 respondents consisting of 15 respondents from bureaucracy, nine (9) collectors or traders, and 90 farmers. The study identified the seaweed development potency by using mapping study approach with analysis method. The data was obtained by using structured interview.

3. Results and Discussion
3.1. The Potential of Seaweed Cultivation Development
Based on the research findings in two areas, founded that the seaweed farmers cultivated three kinds of seaweeds, namely Eucheuma Cottonii, Euheuma Spinosum and Gracilaria sp). In cultivating the seaweed, they used two different methods presented in table 1.

| The cultivation area | Species                | The method used |
|----------------------|------------------------|-----------------|
| 1. Bantaeng Regency  | Eucheuma cottonii      | Long line       |
|                      | Eucheuma spinosum      | Long line       |
| 2. Luwu Regency      | Eucheuma cottonii      | Long line       |
|                      | Gracilaria sp.         | Bottom or basic method |

The research result showed that each area cultivated two species of seaweed using traditional ways. In Bantaeng Regency, the farmer cultivated two different species, namely Eucheuma cottonii and Eucheuma spinosum but both species were cultured by using same method, that was long line method. While, the species cultured in Luwu by farmer were two species, Eucheuma cottonii and Gracilaria sp. Both species were cultivated differently which Eucheuma cottonii was cultivated by using long line method, and was cultured using long line method, a seaweed cultivation method using raft (figure 1). Meanwhile, Gracilaria sp was cultured using bottom method (figure 2), a seaweed cultivation method by spreading the seaweed from the bottom [5]. Of both methods, the farmer of both regencies tended to cultivate seaweed by applying long line method. The farmers expressed that the usage of long line method was wear-resistant, practical and simple. The usage of long line method was tended to choice the seaweed farmers because simple and wear-resistant [6]. The difference of seaweed cultivation can be seen as follows:
In cultivating seaweed, the researcher found out that the farmers applied cultivation system which had similar procedures with Islamic economy system.

3.2. The Potential of Seaweed Production
Globally, the demand for seaweed production is increasing because of an increasing world population. The result of study indicated that seaweed farming has become the main income source for small-scale fishermen, particularly for both areas in South Sulawesi [2]. Therefore, the seaweed cultivation needs strategic management system to produce raw material with innovation and intervention [7]. Since 2010 until 2014, seaweed production in Indonesia increased 32% per annum [1]. The research result indicated that seaweed production was potential to meet the sustainability of farmer’s livelihood. The third of seaweed species developed have different characteristics, as shown in figure 3 below.

![Figure 1. Seaweed cultivation using long line method for E. cottoni and E. Spinosum](image1)

![Figure 2. Seaweed cultivation using bottom method for Glacilaria sp.](image2)

Figure 3. The kinds of seaweed cultivated in Bantaeng and Luwu

Although the farmers cultured the seaweed traditionally, the production of seaweed was very promising. The mapping study result of seaweed production for both areas showed different income. The production of E. cottonii was better than other species. The reason expressed by the farmers is suitable with Sukiman, et.al’s finding that E. cottonii is one of seaweed species that can be harvested faster and has high economic value [3]. The production of developed seaweed can be seen in table 2.
Table 2. Mapping result of Seaweed Production shown by both areas

| District | Type of Seaweed Species | Wide range (m\(^2\)/ha) | Production (kg) | Net Income (IDR) |
|----------|-------------------------|-------------------------|----------------|-----------------|
| Bantaeng | Eucheuma cottonii       | 337.07 m                | 1.750          | 2,837,000       |
|          | Eucheuma spinosum       | 600 m                   | 2.300          | 1,900,000       |
| Luwu     | Eucheuma cottonii       | 350.00 m                | 1.661          | 780,700         |
|          | Gracilaria sp.          | 1.24 ha                 | 1.030          | 1,986,400       |

Table 2 presents the production of seaweed species cultured in Bantaeng and Luwu District. Clearly, we can see that there is difference regarding net income for both areas. In Bantaeng, *E. cottonii* has better net income (IDR. 2, 837, 000.- with wide range of 337,07 m\(^2\)) than *E. spinosum* (IDR. 1,900,000.- with wide range of 600 m\(^2\)). While, in Luwu *Gracilaria sp.* has better net income (IDR. 1,986,400.- with wide range 1.24 ha) than *E. cottonii* (IDR. 780,700.- with wide range of 350.00 m).

4. Conclusion

Seaweed is one of the promising fishery communities that have high economic value. Both Districts in South Sulawesi, Bantaeng and Luwu cultivated three kinds of promising seaweed species namely *Eucheuma cottonii*, *Eucheuma sp.* and *Gracilaria sp.* However, the farmers still used traditional ways, namely long line and bottom (basic) method so that the seaweed cultivation needs strategic management system to produce raw material with innovation and intervention in order to improve the production volume.

Acknowledgment

The authors gratefully acknowledge the Department of Accounting, Faculty of Economy, Muhammadiyah University of Parepare. We would also thank the enumerators who have helped this research.

References

[1] Rimmer M A 2010. Mariculture development in indonesia; prospeect and constraints *Indonesian Agr. J.* 5 2.

[2] Da Costa D K, Mohammad M and Bambang S 2015 Enviromental and area support capability analysis for seaweed mariculture development in hading bay of East Florest regency *Int. Journal of Sci. and Tech. Res.* 4 (11) 143-147

[3] Sukiman, Fatuurrahman, Rohyani I S and Ahyadi H 2014 Short communication: Growth of seaweed eucheuma cottonii in multitropic sea farming systems at gerupuk bay, central Lombok, Indonesia *Nusantara Bioscience* 6 (1) 82-85

[4] Zamroni A, Laoubi K, and Yamao M 2011 The development of seaweed farming as a sustainable coastal management method in Indonesia: An opportunities and constraints assessment *WIT Transaction on Ecology and the Environment* 150 506-516

[5] Tatang 2011 Seaweed cultivation gracilaria verrucosa. https://suksesmina.wordpress.com/2011/05/03/budidaya-rumput-laut-gracilaria-verrucosa/. Accessed on 01 August 2016

[6] Al’Amin 2011 Strategi Pengembangan Berkelanjutan Budidaya Rumput Laut Eucheuma cottonii di Kabupaten Barru (Makassar: Prodi Ilmu Perikanan, Program Pascasarjana Universitas Hasanuddin)
[7] Saldyansah E, Hasanuddin A, Tantu F Y and Laapo A 2016 Determining potential volume of raw dried seaweed *Kappaphycus alvarezii* based on land suitability as agribusiness management plan *J. of Econ. and Sust. Dev.* 7 (20) 58-63