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SEAWEED FARMS MANAGEMENT BY SEAWEED FARMERS AROUND LABUHAN SANGORO WATERS, SALEH BAY, SUMBAWA REGENCY

Pengelolaan Kegiatan Budidaya Rumput Laut Oleh Pembudidaya Di Perairan Labuhan Sangoro, Teluk Saleh, Kabupaten Sumbawa

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ABSTRACT

West Nusa Tenggara (NTB) is one of the largest seaweed producers in Indonesia. Seaweed farming locations can be found in Lombok Island and Sumbawa Island waters. This activity has become one of the livelihoods, even the main livelihood for coastal communities. Apart from that, the NTB government is also encouraging the development of seaweed production through PIJAR (cattle, corn and seaweed) program. Saleh Bay, as one of the bays known as a megabiodiversity area, has long been used as an area for seaweed farming activities. However, recently, there have been problems related to seaweed diseases causing losses for farmers. To be precise, significant cases of this disease appeared in one of the waters in Saleh Bay, namely the waters of Labuhan Sangoro. Various predictions have emerged regarding the seaweed disease. However, it cannot be confirmed precisely. Therefore, a research regarding seaweed cultivation management by farmers in Labuhan Sangoro needs to be conducted. The method used in this research was interview using a questionnaire (primary data). Respondents were selected purposively. Those selected were seaweed farmers and the number of respondents was as many as farmers who were still actively cultivating seaweed. The data obtained was then analyzed descriptively and qualitatively. The result of this research shows that respondents have good knowledge in managing seaweed seaweed farming, and have a tendency to continue carrying out seaweed farming even though there are some obstacles they often face related to financial and natural factors. However, education is still needed regarding the potential causes of seaweed diseases and efforts to treat them.

Keywords: seaweed farming, management, Labuhan Sangoro

ABSTRAK

Nusa Tenggara Barat merupakan salah satu produsen terbesar rumput laut di Indonesia. Lokasi budidaya rumput laut dapat ditemukan di perairan Pulau Lombok maupun Pulau Sumbawa. Kegiatan budidaya ini telah menjadi salah satu mata pencaharian, bahkan mata pencaharian

utama bagi masyarakat pesisir. Pemerintan NTB turut mendorong pengembangan produksi rumput laut dalam program PIJAR (sapi, jagung, dan rumput laut). Teluk Saleh, telah dikenal sebagai kawasan *megabiodiversity*, telah lama dimanfaatkan sebagai kawasan kegiatan budidaya rumput laut. Namun, baru-baru ini, terdapat permasalahan terkait penyakit rumput laut yang menimbulkan kerugian bagi para pembudidaya. Tepatnya, kasus penyakit tersebut secara signifikan muncul di salah satu kawasan perairan di Teluk Saleh, yaitu perairan Labuhan Sangoro. Berbagai prediksi muncul terkait dengan timbulnya serta dampak dari kejadian penyakit rumput laut. Namun belum dapat dikonfirmasi secara tepat. Oleh karena itu, diperlukan penelitian mengenai kegiatan pengelolaan budidaya rumput laut oleh para pembudidaya di perairan Labuhan Sangoro mengenai kegiatan budidaya rumput laut di kawasan tersebut. Adapun metode yang digunakan dalam penelitian ini yaitu wawancara menggunakan kuesioner (data primer). Responden dipilih secara *purposive* yaitu petani budidaya rumput laut dan jumlah responden sebanyak petani yang masih aktif membudidayakan rumput laut. Data yang diperoleh selanjutnya dianalisis secara deskriptif kualitatif. Hasil penelitian ini menunjukkan bahwa responden memiliki pengetahuan yang baik dalam pengelolaan budidaya rumput laut yang mereka lakukan, dan memiliki kecenderungan untuk tetap melakukan kegiatan budidaya rumput laut walaupun terdapat kendala-kendala yang sering mereka hadapi terkait dengan faktor finansial dan faktor alam. Namun tetap dibutuhkan edukasi terkait penyebab-penyebab potensial munculnya penyakit rumput laut serta upaya penanganannya.

Kata kunci: budidaya rumput laut, pengelolaan, Labuhan Sangoro

INTRODUCTION

Seaweed cultivation activities are activities that contribute greatly to supporting seaweed production in Indonesia. Data from the Ministry of Maritime Affairs and Fisheries (KKP) shows that 99.73% of Indonesia's seaweed production results from cultivation activities (Priono, 2016). The types of seaweed that are generally cultivated are from the Eucheuma genus or what is currently known as the Kappaphycus genus (Soenardjo, 2011; Nurdiansyah, 2020).

West Nusa Tenggara (NTB) is one of the provinces in Indonesia that is developing seaweed cultivation. The type of seaweed cultivated in this area is Eucheuma cottonii (Kappaphycus alvarezii) (Yulius *et al.,* 2016). KKP data in 2015 shows that NTB is known to produce seaweed and has succeeded in supporting Indonesia to become a world seaweed exporter (Cokrowati *et al.,* 2018). Indonesia's seaweed production has experienced a very rapid increase. According to FAO Fisheries and Aquaculture data in 2012, in 2000, production reached 205,000 tonnes and in 2012 it had reached 3.9 million tonnes. Meanwhile, according to FAO in 2016, Indonesia's total seaweed production had reached 10.1 million tonnes or 37% of total world seaweed production (Rahadiati *et al.,* 2018).

NTB seaweed production is then encouraged to continue to increase by the local government through strategic programs, such as PIJAR (cattle, corn and seaweed) (Ghazali *et al.,* 2020). However, in recent years, NTB seaweed production has decreased. One of the obstacles faced in developing this business is the emergence of seaweed disease (ice-ice), which causes seaweed thallus to fall out. NTB as a seaweed producer also experiences this (Syachruddin *et al.,* 2020).

In NTB itself, an area that has long been developed as a seaweed cultivation area is Saleh Bay. This bay is known as a megabiodiversity area with great potential as a center for marine economic activities (Yulius *et al.,* 2018), one of which is the development of seaweed cultivation. The regional government has also established a priority program, namely increasing fisheries production in Saleh Bay as a mariculture production center (Marzuki *et al.,*

2017). One of the waters in the Saleh Bay area which is the location for developing seaweed cultivation is Labuhan Sangoro (Suniada & Indriyawan, 2014). However, recently, seaweed cultivated in these waters experienced an incident of infection by ice-ice disease. Based on the results of interviews with several cultivators in Labuhan Sangoro Village, it is known that the talus damage that occurred ranged from 20-30%. This is quite detrimental for cultivators.

Basically, seaweed cultivation activities really depend on several factors such as choosing the right location, selecting the right seeds, proper cultivation methods and maintenance during the growing season (Priono, 2016). Meanwhile, according to (Burdames Yanis, 2014), seaweed production and quality are influenced by ecological factors (oceanographic and water quality parameters). If these factors are not in accordance with the needs of seaweed cultivation, there is a high possibility of failure in seaweed production.
Regarding the growing season, it is necessary to consider the season that provides optimal environmental parameters for seaweed growth. If the season with sub-optimal water quality is known, disease infection in seaweed thallus can be avoided. In general, disease attacks generally occur from September to November each year, while in February environmental conditions are very suitable for seaweed growth (Ghazali *et al.,* 2020). However, related information needs to be obtained directly from the cultivators in Labuhan Sangoro. In this way, it is hoped that potential factors that can cause the emergence of seaweed disease can be identified. Therefore, the aim of this research is to collect information regarding the management of seaweed cultivation activities in the waters of Labuhan Sangoro, Saleh Bay, Sumbawa Regency, so that potential causes of the decline in seaweed production (including the incidence of ice-ice disease) can be identified. The information obtained from this research will later be useful as a basis for consideration in determining efforts to prevent a decline in seaweed production due to the emergence of disease.

METHODS

Place and Time

This research was conducted in February 2024 in Labuhan Sangoro Village, Maronge District, Sumbawa Regency, NTB.

Tools and Materials

This research used a questionnaire distributed to K. alvarezii seaweed cultivators.

Procedurs

Preliminary Survey

This survey was carried out to directly examine the location where the ice-ice disease that attacks the *K. alvarezii* seaweed occurs. In this activity, information was collected regarding farmers who are still actively cultivating seaweed, as well as information collected regarding potential sources of pollution that stimulate the emergence of the disease.

Method of collecting data

The selection of research locations was carried out purposively, namely selecting cultivation locations that were known to experience cases of ice-ice disease. Primary data collection (perceptions of cultivators) was carried out by conducting interviews with local people and using questionnaires. In this study, the population was 18 cultivators of *K. alvarezii*. If it is known that the number of research subjects is less than 100, then all research subjects are taken so that the research becomes population research (Arikunto, 2002).

Perception Evaluation Variables

This community assessment perception variable is described in 15 assessment criteria including:

K1. The location used for seaweed management is suitable for seaweed cultivation activities
K2. Seaweed farmers often pay attention to the location of seaweed every day
K3. Seaweed farmers have carried out trials planting seaweed seeds
K4. Before planting seaweed farmers clean the cultivation area
K5. The seeds used for seaweed cultivation come from superior/quality seeds?
K6. The seeds used for seaweed cultivation come from our own seeds
K7. Seaweed farmers always care for and pay close attention to seaweed plants
K8. Seaweed farmers always maintain and inspect seaweed plants every day
K9. Seaweed cultivation activities in this area provide benefits for seaweed farmers from an economic perspective
K10. There are many obstacles in seaweed cultivation activities
K11. Seaweed disease always appears every year
K12. There are certain efforts to prevent cases of seaweed harvest failure
K13. Financial losses occur as a result of the emergence of disease
K14. Seaweed farmers will continue seaweed cultivation activities to support increased seaweed production in NTB
K15. Seaweed farmers have other sources of livelihood apart from seaweed cultivation activities

The average score and scale range for each criterion is then calculated using the following equation

$$\text{Average score} = \Sigma\frac{statement\ score\ x\ score\ frequency}{n}$$

$$\text{Scale range} = \frac{(m-1)}{m}$$

Where,
n = number of samples
m = number of alternative answers for each item

Based on the results of calculations using the equation above, it is known that the range of the average community assessment score scale is 0.8 with the average score grouping as presented in Table 1.

Table 1. Average Score of Criteria Assessment by Cultivator

Average score	Information
1,0-1,8	Strongly disagree
1,8-2,6	Don't agree
2,6-3,4	Doubtful
3,4-4,2	Agree
4,2-5,0	Strongly agree

Data Analysis

Data analysis was carried out using a qualitative descriptive approach.

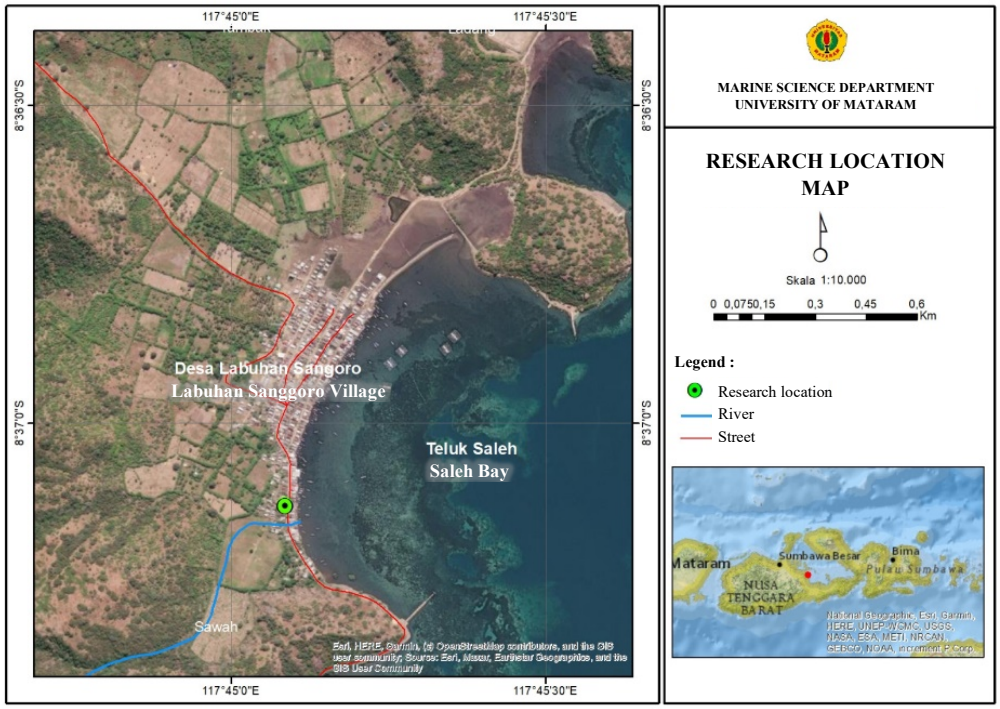

Figure 1. Research location in Labuhan Sangoro, Saleh Bay, Sumbawa

RESULT

From the questionnaire filled out by respondents in this study, information was obtained which was then analyzed and shown in Table 2 as follows.

Table 2. Average Score for Each Assessment Criteria Obtained

Number	Assessment criteria	Average Score Value	Information
K1	The location used for seaweed management is suitable for seaweed cultivation activities	4,2	Strongly agree
K2	Seaweed farmers often pay attention to the location of seaweed every day	3,5	Agree
K3	Seaweed farmers have carried out trials planting seaweed seeds	2,3	Don't agree
K4	Before planting seaweed farmers clean the cultivation area	3,0	Doubtful
K5	The seeds used for seaweed cultivation come from superior/quality seeds?	3,9	agree
K6	The seeds used for seaweed cultivation come from our own seeds	2,7	Doubtful
K7	Seaweed farmers always care for and pay close attention to seaweed plants	3,8	Agree

Number	Assessment criteria	Average Score Value	Information
K8	Seaweed farmers always maintain and inspect seaweed plants every day	3,5	Agree
K9	Seaweed cultivation activities in this area provide benefits for seaweed farmers from an economic perspective	4,2	Strongly agree
K10	There are many obstacles in seaweed cultivation activities	3,8	Agree
K11	Seaweed disease always appears every year	3,7	Agree
K12	There are certain efforts to prevent cases of seaweed harvest failure	3,7	Agree
K13	Financial losses occur as a result of the emergence of disease	4,0	Agree
K14	Seaweed farmers will continue seaweed cultivation activities to support increased seaweed production in NTB	4,0	Agree
K15	Seaweed farmers have other sources of livelihood apart from seaweed cultivation activities	4,0	Agree

DIISCUSSION

In this study, 15 assessment criteria were used which were stated in a questionnaire which was then given to all 18 respondents. The questions in the questionnaire are arranged in such a way that they are easy for respondents to understand. Apart from that, when filling out the questionnaire, the research team continued to accompany the respondents to avoid mistakes in understanding the questions given.

Figure 2. Interview Activities with Seaweed Cultivators in Labuhan Sangoro

Personal data for all respondents shows that the majority (78% of respondents) are aged 45-60 years with the highest level of education being elementary school (SD). Furthermore, 37% of respondents were aged 35-46 years with their last education being Junior High School (SMP). Meanwhile, the smallest percentage of respondents was 30 years old with the highest education being Senior High School (SMA). By looking at the in-depth interview process with respondents, it is known that, the lower the respondent's education, the more difficult it is to convey information.

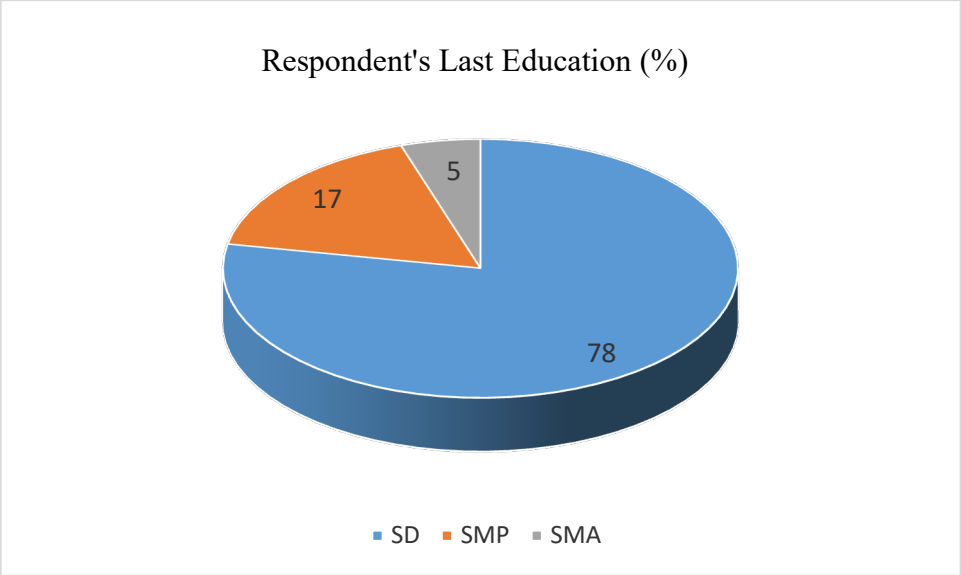

Figure 3. Percentage of Respondents based on Last Level of Education

The first criterion received a score of 4.2, which indicates that the respondent strongly agrees that the location currently used for seaweed management is suitable for seaweed cultivation activities. This is quite contrary to known water conditions. As happened at the beginning of 2023, there was loss of seaweed talus cultivated in the Labuhan Sangoro waters. The results of the analysis of water quality parameters during the case showed that the waters at that time were at a moderately polluted level, making them less suitable for developing seaweed cultivation (Astriana *et al.,* 2023). The difference between the perceptions of cultivators and the results of existing research in this area shows that there is a lack of cultivators' knowledge regarding the quality of sea waters in Labuhan Sangoro. The perception that farmers currently have encourages them to continue carrying out seaweed cultivation activities in the hope that the seaweed can grow well.

Criterion 2 obtained an assessment score of 3.5, which indicates that respondents agree that they often pay attention to seaweed cultivation locations every day. This shows that cultivators are aware of the importance of monitoring environmental conditions. However, farmers have limited knowledge regarding water quality parameters that support seaweed growth. The observations they made were limited to visual observations of sea water, so that changes in water quality from physical and chemical aspects of water were not noticed.

Criterion 3 obtained an assessment score of 2.3, which indicates that the farmer did not test planting seaweed seeds before large-scale planting. Basically, seaweed seed planting tests are needed to ensure whether the seeds used are of good quality so that they influence seaweed production (Priono, 2016), and to find out that the aquatic environment is suitable for seaweed growth. However, from the results of interviews, it was discovered that the cultivators did not carry out planting tests because they thought that the seeds they had were superior seeds and the water conditions in Labuhan Sangoro were very suitable for seaweed cultivation.

Criterion 4 obtains an assessment score of 3 (doubtful). This shows that not all cultivators clean their cultivation areas. Basically, this cleaning activity tends to be carried out for cultivation activities using the bottom method, because cultivation activities using the floating method using long lines are of course more difficult to carry out, considering the conditions of the cultivation location that will be used. For the basic method, the water needed is shallow water close to the beach. Meanwhile, the floating method (long line) is carried out in relatively deeper waters so it is more difficult to clean, except for the surface of the waters. Efforts that can be made to clean the cultivation area are by cleaning the bottom of the waters of the

cultivation location from wild seaweed and other nuisance plants that usually grow abundantly, as well as cleaning the pond from coral, rocks, starfish, sea urchins and other predatory animals (Priono, 2016).

Criterion 5 obtained an assessment score of 3.9, which shows that the farmers agree that the seeds they use for seaweed cultivation come from superior/quality seeds. According to Pong-Masak *et al.,* (2011), seaweed seeds obtained from cultivation development usually have advantages compared to other seed sources. The criteria for quality seeds that can meet the criteria for seaweed seeds include: having high adaptability; high daily growth rate (LPH); seedlings 20-30 days old; the appearance of the thallus is cylindrical, clean, fresh, hard, not slimy, and does not have a fishy smell; and not pale; seedlings with many branches that grow centrally from one base and spread out; and seeds that are not mixed with other types of seaweed (Pong-Masak *et al.,* 2011). Meanwhile, according to information from respondents, the seeds they consider to be superior seeds are the seeds they obtain from harvested talus that they do not sell, and some also say that the seeds are obtained from cultivation locations in other districts, and from harvest collectors. seaweed. The characteristics of the thallus they used as seeds were not specifically explained.

Criterion 6 obtained an assessment score of 2.7. This score is obtained from combining the values given by respondents and shows that respondents are unsure about the source of the seeds they obtain. However, based on information from respondents, it is known that the source of seeds obtained by cultivators comes from their own seeds (previous harvest results), from collectors, and from cultivation locations in other districts. Criterion 6 is still closely related to criterion 5 regarding seaweed seeds used by seaweed farmers in Labuhan Sangoro. Currently, seaweed seeds used by farmers from various regions show a decline in quality. This is characterized by relatively slow or stunted growth, as well as seaweed's susceptibility to ice-ice disease infection. The potential cause of this condition is the repeated use of cultivated seeds (Parenrengi *et al.,* 2017; Loura Pandelaki, 2012).

Criterion 7 and criterion 8 received assessment scores of 3.8 and 3.5 respectively. This shows that respondents agree that they always care for seaweed well. According to respondents, monitoring of grass conditions is carried out almost every day, especially when the rainy season comes. Controlling cultivated seaweed is of course very important, especially for cleaning epiphytes or moss which often stick to seaweed thallus and can inhibit seaweed growth. Some epiphytes that often attach include Enteromorpha sp., Chaetomorpha sp., and Ectocarpus sp. (Pong-Masak *et al.,* 2011).

Criterion 9 obtained an assessment score of 4.2, which indicates that respondents strongly agree that seaweed cultivation activities in this area provide benefits for seaweed farmers from an economic perspective. According to respondents, 1 longline they plant can produce 4 times the weight of seaweed seeds for harvest. The price of wet seaweed sold from farmers is 4000/kg, while the weight of wet seaweed is around 11,000/kg. An average farmer in the Labuhan Sangoro waters has 15 longlines of seaweed. Of this amount, when the harvest takes place, the results obtained are around 3 sacks or the equivalent of 100 kg of dried seaweed. The profits obtained by the cultivators show that seaweed cultivation activities can improve the welfare of the cultivators.

Criterion 10 received an assessment score of 3.8 which shows that in this seaweed cultivation activity, the respondents agreed that there were many obstacles faced. Some of them are the presence of epiphytes, limited capital or finances, the absence of waves (the waters are too calm), and the most important, according to respondents' opinion, is ice-ice disease which attacks seaweed. According to Plaimo *et al.,* (2022), there are other obstacles in seaweed cultivation activities, namely biofouling such as barnacles and green mussels, or other types of algae such as Enteromorpha sp., Sargasum sp., Gracilaria sp., and Ulva sp. which is often found attached to cultivated seaweed.

Criterion 11 obtained an assessment score of 3.7 which shows that respondents agree that seaweed disease always appears every year. In fact, it can occur up to 2 times in 1 year, namely between February-April and November-December. This incident is one of the causes of losses for cultivators. Several respondents said that the appearance of this ice could damage 10% - 35% of the seaweed talus they planted. Meanwhile, research conducted by Arisandi *et al.,* (2013) shows that during the 30 day maintenance period, the spread of ice-ice disease can reach 19-57% and incidents can occur every time the season changes from rainy to dry and vice versa.

Criterion 12 obtained an assessment score of 3.7. This shows that respondents agree that they make certain efforts to prevent cases of seaweed harvest failure. Some of the efforts made include cleaning seaweed talus with a brush if you see moss/epiphytes attached to the seaweed talus (usually done once a week) and separating seaweed that looks white (affected by disease) from other seaweed to prevent disease transmission. This prevention effort is one of the easiest and cheapest ways that can be done by farmers, and according to (Maryunus, 2018), this cleaning effort makes a big contribution to preventing the spread of disease and healing seaweed affected by disease.

Criterion 13 obtained an assessment score of 4.0 which indicates that respondents agree that they experienced financial losses as a result of the emergence of the disease. The losses suffered by cultivators are energy and financial losses. The financial losses suffered by cultivators range between 10-50% of the capital they have spent.

Criterion 14 obtained an assessment score of 4.0. This shows that respondents agree to continue seaweed cultivation activities to support increasing NTB seaweed production. Some respondents have reasons for continuing this activity, namely that seaweed cultivation has been their livelihood for a long time; some cultivators do not have alternative livelihoods because they do not have agricultural land or other skills; and some of the cultivators have already purchased seaweed seeds and already have cultivation facilities and infrastructure. However, some respondents believed that they would continue to carry out cultivation activities as long as the obstacles they faced were resolved first.

The final criterion, namely criterion 15, obtained an assessment score of 4.0, which means that respondents agreed that they had other sources of livelihood apart from seaweed cultivation activities. Several respondents have livelihoods, namely rice farmers, corn farmers and fishermen.

Based on the discussion above, it is known that efforts are needed to manage seaweed cultivation activities that are integrated between farmers and local governments. Regional governments are expected to play a more active role in outreach activities regarding handling various obstacles faced by cultivators. Apart from that, farmers are also expected to have direct access to seaweed prices and markets so they can maximize their profits (Wardhani *et al.,* 2021). Another program that can also be developed in this area is integrating seaweed cultivation with marine ecotourism so that cultivators and local communities can have alternative livelihoods (Syafikri *et al.,* 2018).

CONCLUSION

The results of this research show that respondents have good knowledge in managing the seaweed cultivation they carry out, and have a tendency to continue carrying out seaweed cultivation activities even though there are obstacles they often face related to financial and natural factors. However, education is still needed regarding the potential causes of seaweed disease and efforts to treat them.

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