

Feasibility and Suitability Analysis of *Eucheuma cottonii* Aquaculture Area in Seriw Gulf, West Nusa Tenggara, Indonesia

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ABSTRACT: The purpose of this research is to know the suitability of an area for *Eucheuma cottonii* seaweed aquaculture in Seriw Gulf of West Nusa Tenggara. Method used in the research is ecological and suitability analysis of the water area (waves, temperature, depth, current velocity, transparency, salinity, dissolved oxygen, pH, total suspended solid, phosphate and nitrate) with a map digitizing using ArcGIS 10.1 software. The results on water quality parameters showed that Station 1 and Station 2 has shown suitable water quality with 0.27-0.3 m of waves, temperature about 28.4-29 °C, 2.6-4.3 m depth, 0.16-0.22 m/s of current velocity, transparency was 2.0-3.3, salinity was 32-35 ppt, dissolved oxygen was 6.63-6.63 ppm, pH 7.4-7.9, total suspended solid was 22.6-14.3, phosphate was 0.64-0.52 ppm and nitrate was 0.57-0.42, while Station 3 showed unsuitable water quality with 0.1 m waves, temperature was 28 °C, depth was 0.8 m, current velocity was 0.07 m/s, transparency was 0.6, salinity was 15.2 ppt, dissolved oxygen was 5.43 ppm, pH 6.78, TSS 24.4, 0.76 ppm phosphate 0.63 ppm nitrate.

Key words: Seaweed, *Eucheuma cottonii*, Water quality

INTRODUCTION

Seaweed is marine product from Indonesia. One of the provinces in Indonesia which supports seaweed product development program is West Nusa Tenggara Province. Seaweed as marine commodity is reliable as it is easy to cultivate, with short period of culture and can be harvested three times in a year [1]. There are many species of seaweed in Indonesia, and one of the seaweed species which is cultivated in the area is *Eucheuma cottonii*. It is one of seaweed species which is commonly cultured in tropical areas, especially in Indonesia [2].

Indonesian exports of *E. cottonii* are not as many as other South East Asian countries like The Philippines and Thailand. This is not caused by our culturer's incapacity to achieve the production target quantity of *E. cottonii* but it is caused by the declining quantity of it. This declining quantity is due to their lack of attention to the environmental factors as they are the main factors to achieve the culture production target. A research is then needed to know the area's feasibility and suitability for cultivation [3].

MATERIAL AND METHODS

In this research, data was achieved by on site observations, physical and chemical parameter observations of water area and they were analyzed descriptively, then a mapping was done ArcGIS 10.1 software [4]. Data collection was conducted in three stations with different characteristics. Station 1 is far from the shore as culture location, Station 2 is near the shore and the settlement and Station 3 is near the estuary. Samples collection was done with three repetitions. Collection sites or points where the samples were taken from were recorded with Global Positioning System (GPS) [5] as shown in Table 1.

Observation points like water quality parameters were analyzed with geostatic analysis, which interpolates points of data into area (polygon) data using Nearest Neighbour method. Interpolation results from each water quality were formed into thematic mappings [6]. To obtain satisfying results from seaweed aquaculture, locations which are chosen should be suitable for seaweed eco-biologically such as: (a) locations are hurricane-effect-free,

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(b) do not possess wide salinity fluctuation, (c) contain a lot of nutrients for growth, (d) free from predators and industrial or house-hold pollution, (e) locations are easy to access.

Table 1. Research site coordinates

Station	East Lon	South Lat
1	116° 30'455"	8° 54'109"
2	116° 30'472"	8° 53'717"
3	116°30'519"	8° 53'245"

RESULTS

Average data on water quality can be seen in Table 2, while area suitability map can be seen in Figure 1. Based on water quality parameters table, the highest recorded wave was in Station 1: 0.3 m and the lowest was in Station 3: 0.1 m. The highest temperature was in Station 1: 29°C and the lowest was in Station 3: 28°C. The deepest area was in Station 1: 4.3 m and the shallowest was in Station 3: 0.8 m. The strongest current was in Station 1: 0,22 m/s and the weakest was in Station 3: 0.07 m/s. The highest clarity was in Station 1: 3.3 m and the lowest was in Station 2: 0.2 m. The highest salinity was in Station 1: 35 ppt and the lowest was in Station 3: 15.2 ppt. The highest dissolved oxygen was in Station 1 and 2: 6.63 ppm and the lowest was in Station 3: 5.43 ppm. The highest pH was in Station 1: 7.9 and the lowest was in Station 3: 6.78. The highest TSS was in Station 3: 24.4 ppm and the lowest was in Station 1: 14.3 ppm. The highest phosphate was in Station 3: 0.76 ppm and the lowest was in Station 1: 0.42 ppm. The highest nitrate was in Station 3: 0.63 ppm and the lowest was in Station 1: 0.42 ppm.

Table 2. Water quality parameters from each stations

Kualitas Air	Station 1	Station 2	Station 3
Wave (m)	0.3	0.27	0.1
Temperature (°C)	29	28.4	28
Deepest (m)	4.3	2.6	0.8
Current (m/s)	0.22	0.16	0.07
Clarity	3.3	2.0	0.6
Salinity (ppt)	35	31	15.2
Dissolved Oxygen (ppm)	6.63	6.63	5.43
pH	7.9	7.4	6.78
TSS (ppm)	14.3	22.6	24.4
Phosphate (ppm)	0.52	0.64	0.76
Nitrate (ppm)	0.42	0.57	0.63

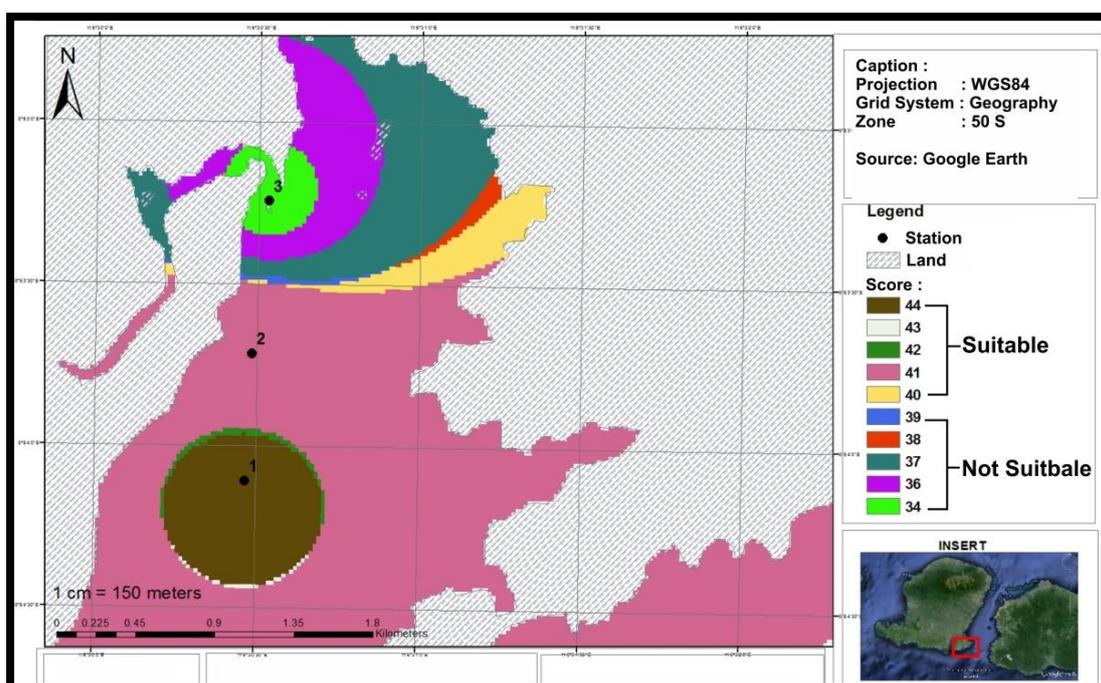


Figure 1. Aquaculture suitability map for *E. Cottonii*

This suitability map shows each station of *E. cottonii* aquaculture location in Seriw Gulf, West Nusa Tenggara. Station 1 and Station 2 are suitable for *E. cottonii* aquaculture while Station 3 is not suitable for that.

DISCUSSION

Based on the water quality parameter observations conducted in the research sites and compare them with reference researches which have been done before, Station 1 and Station 2 are locations which are suitable for *E. cottonii* aquaculture activity, while Station 3 is not suitable. This shows that the water quality parameters of Station 1 and 2 meet the growth and development requirements for *E. Cottonii* cultivation, while Station 3 does not meet the requirements.

E. cottonii aquaculture in Station 1 and 2 are suitable because the physical and chemical parameters such as depth, current velocity, clarity, salinity, nitrate, waves height, temperature, dissolved oxygen, pH, TSS and phosphate were in the suitable range of *E. cottonii* seaweed aquaculture.

Location of Station 3 was not in suitable range of *E. cottonii* seaweed aquaculture. This is caused by some of the limiting parameters like depth [7], current velocity [8], salinity [9] and clarity [10]. Current velocity in this station is too slow due to transitional condition from high to low water [11] during the data collection. Furthermore this station is also affected by Seriw estuary as the current from the river and the sea meet and slows down the current [12]. Clarity [13] of this station and its salinity [13] condition are very low with shallow water [14], these are caused by the effect of freshwater flow which carries farming outage and fish pond waste to the station [16].

CONCLUSION

Seriwe Gulfarea in West Nusa Tenggara has two locations which are suitable for *E. cottonii* aquaculture activity, they are Station 1 located in 116° 30'455"E-8° 54'109"S and Station 2 located in 116° 30'472"E-8° 53'717"S, while one location is not suitable for *E. cottonii* aquaculture activity which is located in Station 3 116° 30'519"E-8° 53'245"S.

Recommendation

Data and information acquired from this research can be used as references for the local government and *E. cottonii* aquaculturer in Seriw Gulf, West Nusa Tenggara to choose the correct locations and to improve the quality and quantity of *E. Cottonii* seaweed in the area.

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