Sustainability Level of Aquaculture Utilization and Its Management Strategy In Conservation Areas Regional Water (KKPD) Biak Numfor District, Papua

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Abstract. One of the uses that can be pursued in marine conservation areas (KKPD) is aquaculture. This is because aquaculture is one of the leading sectors and is the basis of Indonesian marine and fisheries production. The purpose of this study was to determine the level of sustainability of aquaculture utilization in the Biak Numfor District Marine Conservation Area (KKPD). The data analysis method uses the approach of sustainability analysis carried out by the MDS method (MultiDimensional Scaling) with the help of Rapfish software. Rapfish (Rapid Appraisal for Fisheries). The results showed that the analysis of Rapfish for the direction of the utilization of aquaculture obtained an ordination value of 44.80% or classified as less sustainable. Analysis results leverage for the direction of the utilization of aquaculture, it is found that there are 3 (three) attributes which are the most important indicators of sustainability from various other attributes, namely; cultivation technology (RMS = 8.81), number of business units (RMS = 7.00%), fish species and species (RMS = 6.85). The status of unsustainable aquaculture development in the KKPD is still ecologically profitable. However, economically, the contribution of the aquaculture sector has not been felt by the community.

1. Introduction

Aquaculture is one of the leading sectors and is the cornerstone of Indonesian marine and fishery production. However, in its implementation, of course it really depends on the condition of the waters, whether it is feasible to be developed or only limited to marine waters that can only be used for capture fisheries. The regional marine conservation area (KKPD) of Biak Numfor Regency is one of the water areas that not only functions as a habitat and ecosystem protection area but also in a sustainable fisheries zone that can be cultivated as a capture fisheries area and aquaculture area. However, in its utilization, it must pay attention to the capacity of the carrying capacity of the environment, so that the cultivation business can be sustainable.

Currently, aquaculture business is mostly pursuing increased production rather than conservation efforts, this was conveyed by[1] which states that the increase in aquaculture activities has recently become a concern of various parties, especially the problem of the impact on the aquatic environment. The impact of cultivation activities must be minimized or even eliminated. Therefore, all aquaculture activities must be environmentally sound so that these aquaculture activities can be sustainable. [2] found that in general the position of the marine and fisheries sector, especially aquaculture in the Indonesian economy, is included in the potential group. Furthermore, according to [3], in line with the depletion of natural resources on land and the abundance of coastal and marine resources owned by Indonesia, it is one of the considerations with the paradigm shift towards a maritime state from a
terrestrial state. This is one of the reasons for the importance of development in the marine and fisheries sector.

The management of coastal and marine resources, especially conservation areas, must be carried out holistically, where it cannot be separated between economic utilization alone, but must also be viewed from environmental and social aspects. Exploitation of fishery resources must not be done destructively, and must consider sustainable use [4]. Thus, it is very important to study the level of utilization of coastal and marine resources in the Biak Numfor District Marine Protected Area (KKPD), as an effort to see the level of management sustainability with various attributes of its continuation.

2. Materials and Methods

2.1. Types and Sources of Data

The type of data collected in the study of the level of sustainability of the utilization of coastal and marine resources in the Biak Numfor District Marine Conservation Area (KKPD) includes primary data and secondary data. Primary data is data that is obtained directly in the field, especially those related to the direction of resource use by taking measurements, sampling, surveys and field observations. Meanwhile, secondary data is data obtained from related agencies in the form of reports, data and other information. Types and methods of data collection carried out are more detailed in Table 1

| Variable                      | Type of data | Data source                      |
|-------------------------------|--------------|----------------------------------|
| Cultivation potential         | Secondary    | Marine and Fisheries Office      |
| Number of business actors     | Secondary    | Marine and Fisheries Office      |
| Cultivation                   | Secondary    | Marine and Fisheries Office      |
| Types / species of fish       | Secondary    | Marine and Fisheries Office      |
| Cultivated                    | Secondary    | Marine and Fisheries Office      |
| Source of fish seeds          | Secondary    | Marine and Fisheries Office      |
| Cultivation                   | Secondary    | Marine and Fisheries Office      |
| Type feed Allowed             | Secondary    | Marine and Fisheries Office      |
| Cultivation technology fish   | Primary      | Observation                      |
| Number of business units which is allowed | Secondary  | Marine and Fisheries Office      |
| Net B / C Value               | Primary      | Analysis                         |
| Endorsement social culture to | Primary      | Observation                      |
| cultivation activities        |              |                                  |

2.2. Data analysis method

The data analysis method was adjusted to the research objective, namely to analyze the level of sustainability of the utilization of aquaculture in the Biak Numfor District Marine Conservation Area (KKPD). The data analysis method uses the approach of sustainability analysis carried out by the MDS method (Multi-Dimensional Scaling) with the help of Rapfish software.

Rapfish (Rapid Appraisal for Fisheries), developed by [5] and [6]. This approach is based more on principles Multi Criteria Analysis (MCA) by relying on an algorithm known as the MDS algorithm [7]. Multi Dimensional Scaling (MDS) is a statistical analysis technique that performs multidimensional transformations [8]; [9]; and [10]. Furthermore, the score value of each attribute is analyzed in a multidimensional manner to determine the position of the sustainable use of the studied KKPD relative to two reference points, namely; point 'good (good) and the "bad (bad). To facilitate visualization, ordination analysis is used. Ordination process using Rapfish software [8]. Furthermore, [11] stated that MDS can present the ordination method effectively.
Analysis of the sustainability of management is intended to obtain an overview of the level of sustainability of the utilization of aquaculture fisheries in the Biak Numfor District Marine Conservation Area (KKPD). Following are the operational stages of a sustainability analysis using Rapfish software, by referring to [12]. Assessment of the sustainability of coastal resource and sea utilization of KKPD is carried out with an aspect / direction approach to the utilization of the KKPD area of Biak Numfor Regency [13], especially directions for the use of aquaculture with various attributes. More detailed attributes of aquaculture sustainability are presented in Table 2 as follows:

| Utilization Directive | Attribute Assessment | Assessment Indicators |
|-----------------------|----------------------|-----------------------|
| Aquaculture potential | 1; 2; 3; 4 | 4 | 1 | Very potential (> 50% of land can be used for cultivation) (4), quite potential 30-50% (3), less potential (10-30%) (2) and not potential <10% (1) |
| Number of actors aquaculture business | 1; 2; 3; 4 | 4 | 1 | Lots (> 50% from Housestairs) fishermen / RTN) (4), quite a lot 30-50% of RTN (3), less (10-30%) than RTN (2) and very less <10% RTN (1) |
| Types and species fish that cultivated | 1; 2; 3; 4 | 4 | 1 | Economically important > 50% species (4), 30-50% species (3), 10-30% (2) and <10% (1) |
| Source of seedfish cultivation | 1; 2; 3 | 3 | 1 | Local All (3), part local (2) all from outside (1) |
| Availability of fish feed type | 1; 2; 3 | 3 | 1 | Bulk feed (3); mixture (2) and total pellets (1) |
| Aquaculture technology | 1; 2; 3 | 3 | 1 | Environmentally friendly (3), semi (2) and not environmentally friendly (1) |
| Number of units allowed | 1; 2; 3 | 3 | 1 | Less than carrying capacity (3), according to the carrying capacity (2) exceeding the carrying capacity (1) |
| Net B/C | 1; 2; 3 | 3 | 1 | Net B/C Value > 1, feasible (3) Net B/C Value = 1 (feasible enough) (2) and Net B/C <1 tidak layak (1) |
| Social support culture against aquaculture activities | 1; 2; 3 | 3 | 1 | Low (1), Enough (2) and support (3) |

3. Result and Discussion

The sustainability of cultivation fishery utilization is a description of the level of sustainability of aquaculture activities in the Biak Numfor District Marine Protected Area (KKPD), which evaluation is based on 8 (eight) indicators / attributes of resource utilization for capture fisheries activities, including; a) Potential for cultivation, b) Number of cultivation business actors, c) Types and species of fish that can be cultivated, d) Sources of cultivated fish seeds, e) Availability of types of feed, f) Fish farming technology, h) Number of business units allowed, i) Net B / C Value and j) Socio-cultural support for cultivation activities. Graph of ordination of directions for the use of aquaculture, as follows:
The results of the Rapfish analysis for the direction of the utilization of aquaculture obtained an ordination value of 44.80% or it is classified as less sustainable. The results of the Rapish analysis are acceptable considering the validation test results obtained value Monte Carlo amounted to 44.88% which shows the difference is quite small, namely (0.08% or less than 1%. This value indicates that the effect of the error (error), or the impact of the scoring error is relatively small. Accordingly, the model Rapfish developed, it is declared adequate as an estimator of the value of the sustainability index. According to [8], that analysis Monte Carlo can be used as a simulation method to evaluate the impact of random /error (random error) in the statistical analysis carried out. The results of the accuracy test (goodness of fit) also shows that a model of estimating the sustainability index can be used, where the analysis results Rapfish earned value Squared Correlation ($R^2$) is 0.9447 or close to 1. $R$ value - square increasingly approaching 1 means that the existing data is getting mapped perfectly. This value illustrates that more than 94.47% of the model can be explained well, and the remaining <5.53% is explained by other factors / attributes. [14] states that value Squared Correlation ($R^2$) more than 80% indicated that the estimation model of the sustainability index was good and adequate.

On the other hand, the results of the inaccuracy test (a lack of fit measure) or stress value obtained 0.1365 or close to 0 (zero). The stress value is close to zero, the resulting output will be more similar to the actual situation or the lower the stress value, the better / suitable the model. Conversely, the higher the stress value, the less suitable the model is. [14] states that the tolerable stress value is <20%, thus the model is well accepted with a stress value of 13.65%. This ordination value illustrates the condition of resource use which is categorized as less sustainable in terms of aquaculture. This can occur because aquaculture activities for the Biak Numfor community still have many obstacles, especially: 1) cultivation technology has not been mastered, 2) fish seeds and feed are not yet available, 3) requires relatively investment and maintenance timelag time, 4) community culture has not been supportive, because fishing is much easier and more profitable.

Chart leverage attribute from the directions for the utilization of aquaculture can be seen in Figure 2. Results of the analysis leverage for the direction of the utilization of aquaculture, it is found that there are 3 (three) attributes which are the most important indicators of sustainability from various other attributes, namely; cultivation technology (RMS = 8.81), number of business units (RMS = 7.00%), fish species and species (RMS = 6.85). These results indicate that these three attributes are sensitive factors in supporting the sustainability of aquaculture in the Biak Numfor District Marine Conservation Area (KKPD), which in the future must be the attention of the Regional Government for improvement. This indicates that the communities around the Biak Numfor District Marine
Conservation Area (KPPD) are not familiar with cultivation technology, so not many have engaged in fish farming. This is also indicated by the low number of business units compared to capture fisheries business units. In addition, the limited fish feed also hinders the development of fish farming. The same thing was conveyed by [1], in the people of Central Lombok and East Lombok, NTB, that cultivation fishery technology that is feasible and prospective for development is still very poorly known by the community (cultivators), especially technology (cultivation methods, superior commodity development, and disease handling) to support the application. Blue Economy. From a social perspective, the community also considers that aquaculture is not so important because fishing is much easier and more profitable. [8] state that the RMS value shows the size of the role of each attribute in the sensitivity of the sustainability status.

Figure 2. Graph of leverage of attribute for sustainability direction of utilization aquaculture

Based on the results of the analysis leverage indicates that the attribute of the type of fish farming technology is the most sensitive attribute to the value of the aquaculture sustainability index. This sensitive attribute is a leveraging factor in the dimension of aquaculture, this is because in reality, in the field, most people still do not know the cultivation technology that can be developed as an alternative livelihood besides fishing. This is because the relevant agencies, especially the Department of Marine Affairs and Fisheries in Biak Numfor Regency, have not done much socialization about the importance of fish farming to increase community income.

The number of business units is the second leveraging attribute that affects the development of aquaculture businesses in the sustainable fisheries zone of the Biak Numfor Regency KKPDP. The number of business units also indicates people's interest in the aquaculture dimension. The more business units developed by the community, the more public interest will be to develop them. Likewise, if the number of business units developed is small, it shows that the community is still not interested in fish farming. Based on field observations, it shows that only a small portion of the community operates fish farming, and even that has not been handled professionally, only managing the cultivation because there is a pilot assistance program from the government.

Fish species and types are the third leveraging attribute that affects the development of fish farming in Biak Numfor Regency. The many types and species of economically important fish that exist and can be developed as superior cultivation commodities are also a determining factor which attracts
people to be able to cultivate them. The results of the study on the utilization of aquaculture in the Biak Numfor KKPD were classified as less sustainable with the value of ordination only reaching 44.80%. The lack of continuity of aquaculture activities in this area is more due to the lack of support in the natural conditions of the marine waters (cultivation potential), including deep waters, high waves and relatively strong currents. In addition, there are no nurseries and feed factories that can support cultivation activities. Another factor that affects the low development of aquaculture in this area is the culture of the Biak Numfor people in particular who prefer fishing to fish farming. By catching fish, people will immediately get fish for their daily needs, instead of having to raise fish which requires a lot of time, money and equipment investment. So it is not surprising that interest in fish farming is still low.

Based on the directions that have been set by the Regional Government through the [13] in an effort utilization of aquaculture in regional water conservation areas (KKPD), namely as follows:

a. The location of fish farming activities is carried out in sustainable fisheries in regional marine conservation areas (KKPD)

b. The development of aquaculture in regional marine conservation areas (KKPD) must be based on the following principles: a) cultivated fish types are not fish that are not included in the potentially invasive category, b) types of feed do not cause negative impacts on KKPD starting from preproduction, the production, harvest and post-harvest processes c) the technology used also does not have a negative impact on marine conservation areas, starting from the beginning to the end of production, d) it is necessary to pay attention to the number of business units and e) the carrying capacity and environment of fish resources in the conservation area.

c. The scale of business for the development of aquaculture in the Biak Numfor KKPD, the business must be on a micro or medium scale.

With reference to these directions, the status of the unsustainable aquaculture development in the KKPD is still ecologically profitable, because there are no environmental impacts caused by cultivation activities. However, economically, the contribution of the aquaculture sector has not been felt by the community. Of course, it needs improvement and special attention from the Regional Government, especially the Department of Fisheries and Marine Affairs of Biak Numfor Regency to be able to take advantage of this sector more concretely in accordance with its potential.

Cultivation fishery development strategies that need to be carried out by the Regional Government so that this sector can provide welfare for the community, namely the need for arrangement of potential aquaculture areas. In addition, the provision of cultivation facilities and infrastructure with adequate seeding. Strive to provide cheaper fish feed, as well as guarantee a more profitable marketing of fish farming products.

4. Conclusion

The direction for the utilization of aquaculture is classified as less sustainable with an ordination value of 44.80%. The attributes of leveraging the sustainability of the use of aquaculture consist of 3 (three) namely; cultivation technology (RMS = 8.81%), number of business units with RMS value = 7.00%, types and species of fish (RMS = 6.85%). The development of aquaculture in the KKPD is still ecologically profitable, because there is no environmental impact caused by cultivation activities. However, economically, the contribution of the aquaculture sector has not been felt by the community.

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