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Sustainability status of fisheries extension in support of mangrove management in Rembang district, central Java province

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Abstract
In the present study, analyzed the sustainability status of fisheries extension in support of mangrove management in Rembang District, Central Java Province. The results of this study obtained the status of sustainability of fisheries extension in the management of mangroves in Rembang for four dimensions, namely: the ecological dimension of the environment (85.49) and the dimensions of infrastructure and financing for fisheries extension (85.49) were in a sustainable status. However, the social, economic, and cultural dimensions (70.51) was sufficiently sustainable, and the fisheries extension in workforce dimension (47.76) was less sustainable.

Keywords: Fisheries extension, mangrove forest, RAPFISH, rembang, sustainability status

Introduction

Rembang District is one of the 14 districts in Rembang Regency, Central Java Province, and one of the 6 districts bordering the Java Sea [1]. Rembang District has a mangrove area of 60 hectares with sand and sandy substrate conditions with 16 types of mangroves, where the dominant genus is *Rhizophora* and *Avicennia*, and overgrown with hibiscus and sea pine (*Casuarina*) [2]. There is potential for fisheries, namely the production of fish, oysters, and crabs which are used as consumption by the community around the mangrove forest. Around the mangrove forest, there is also milkfish ponds cultivation. The fruit of the mangrove plant is also used by the community to make cakes, the leaves are also processed into chips [3].

Ecotourism is a good potential for greater development. Currently, mangroves in Rembang, aside from being a coastal protector and community income in the field of fisheries are also used as mangrove tourist attractions where the positive impact is felt directly by the surrounding community. The potential of mangroves in Rembang can be even greater if the community understands how to manage and use mangroves properly. To increase the community's economic income, diversification of fishery products needs to be known by the community [4, 5].

Efforts to utilize resources optimally and sustainably are very urgent demands for the prosperity of the people, especially to improve the welfare of the community. Fisheries extension workers have a very strategic role in efforts to manage marine and fishery resources because in carrying out their duties and responsibilities, extension workers are workers who have a lot of direct contact with the fishing community.

The performance of an extension worker, in essence, is directly correlated with the success of the extension worker in conveying their duties to change the behaviour of individuals, groups, or communities so that they know, want, and can solve the problems faced in their lives to be able to live better. The performance of extension units is a performance that always refers to the concept of empowerment [6]. The performance of the extension worker is the achievement of the work of the extension worker in carrying out the tasks assigned to him, based on ability, experience, and or seriousness and use of time [7].

Extension activities have a role as a liaison between the government and the fisheries businesses. Mangrove management in Rembang certainly has several problems that need solutions to solve problems. The location of mangroves, not far from community settlements and factories, is one of the causes of problems in the community. Therefore the role of extension workers is very important in helping solve problems for the sustainability of

mangrove management, it is necessary to have policies that can improve mangrove forests.

An extension strategy is needed in sustainable mangrove management. To realize this, it is necessary to have an extension instrument in mangrove management that focuses more on extension activities without ignoring the community and the potential of mangroves. This research was conducted on the fisheries extension system in mangrove management in Rembang by analyzing the sustainability of fisheries extension development to formulate a fisheries extension policy strategy in mangrove management in Rembang.

Material and Methods

Study area

This research was conducted in Pasarbanggi Village, Rembang District, Rembang Regency, Central Java Province, and lies in between -6.6986647 latitude and 111.3881600 longitudes. Pasarbanggi Village is located in the northern part of Rembang District and is a mangrove ecotourism area. Mangrove area is approximately 22 ha, with total mangrove density dominated by *Rhizophora mucronata* with a density of 1033 ind / ha. *Rhizophora apiculata* has a density of 67 ind / ha, and *Sonneratia alba* has a density of 200 ind / ha [2].

Types and data collection methods

The research includes several dimensions, namely (1) fisheries extension workforce, (2) infrastructure facilities and funding for fisheries extension, (3) social, economic, and cultural, and (4) environmental ecology. For this reason, the data used were primary data and secondary data. Primary data is data from respondents through interviews with questionnaires, which include the first three dimensions. While secondary data collected in the form of data related to mangrove management in Rembang which includes ecological dimensions, geographical conditions, community demographics, and fisheries extension activities carried out in the mangrove management area. Sampling in this study using the snowball method [8]. The research respondents included the community around the mangrove forest as the manager of the mangrove and the fishing community including fishermen, fish cultivators and other fisheries entrepreneurs, as well as from related institutions namely the Rembang District Maritime and Fisheries Department.

Analysis Method

This analysis uses a multidimensional scaling (MDS) statistical analysis method with the Rap-FISHEXCOME (Rapid-Fisheries Extension, Community and Ecology) approach which is a modification of the Rap-Fish (Rapid-Assessment Technique for Fisheries)[9][10]. Analysis of the sustainability of fisheries extension in mangrove management in Rembang Subdistrict consists of 4 dimensions, namely the dimensions of fisheries extension services, dimensions of infrastructure facilities and financing of fisheries extension, social, economic and cultural dimensions, and environmental ecology dimensions [11].

The categories of attribute assessment results are presented in Table 1 [9].

Table 1: Sustainability Status Assessment Category

Index Value	Category
0-25	Bad
26-50	Less
51-75	Sufficient
76-100	Good

Results and discussion

Results

The results of the Rap-FISHEXCOME analysis for the sustainability index value of fisheries extension from 4 dimensions were as follows:

Dimensions of Fisheries Extension Workforce

The results of the Rap-FISHEXCOME analysis show that the value of the sustainability index of fisheries education in the fisheries extension service dimension in Rembang includes 7 attributes of 47.76, meaning that it was in a “less sustainable” status in supporting mangrove management in Rembang District.

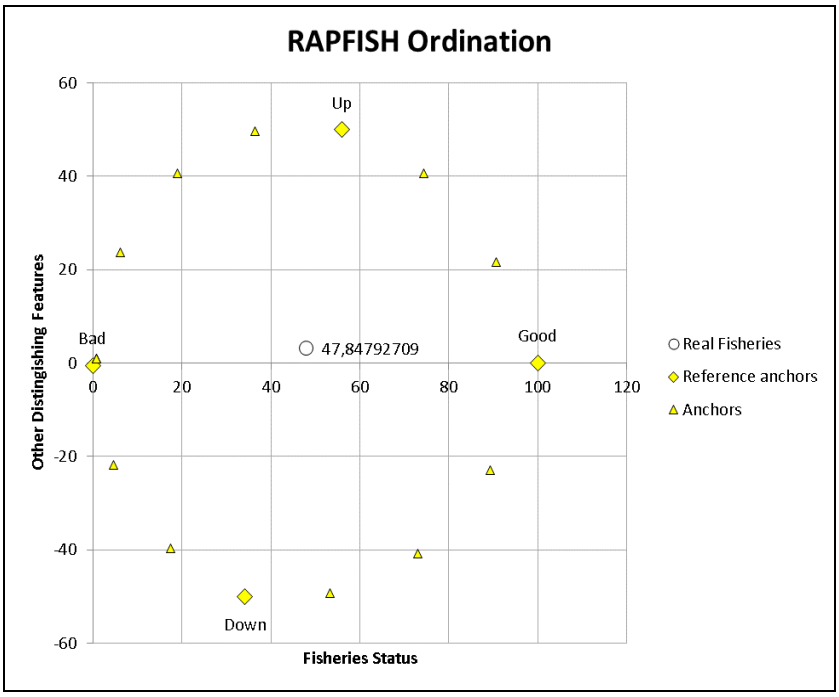

Fig 1: The value of the sustainability index of fisheries education in the fisheries extension workforce dimension in Rembang

Furthermore, leverage analysis was carried out which aims to determine the sensitive attributes of the condition index for fisheries extension development in Rembang. RMS (root mean square) results of the Rap-FISHEXCOME attribute leverage analysis obtained 3 clusters (cluster 1, RMS value 5.21; cluster 2, RMS value 2.06; cluster 3, RMS value 0.91-0.48). The highest attribute that most influences the sustainability of the fisheries extension workforce dimensions were the work area and the extension service with a value of 5.21.

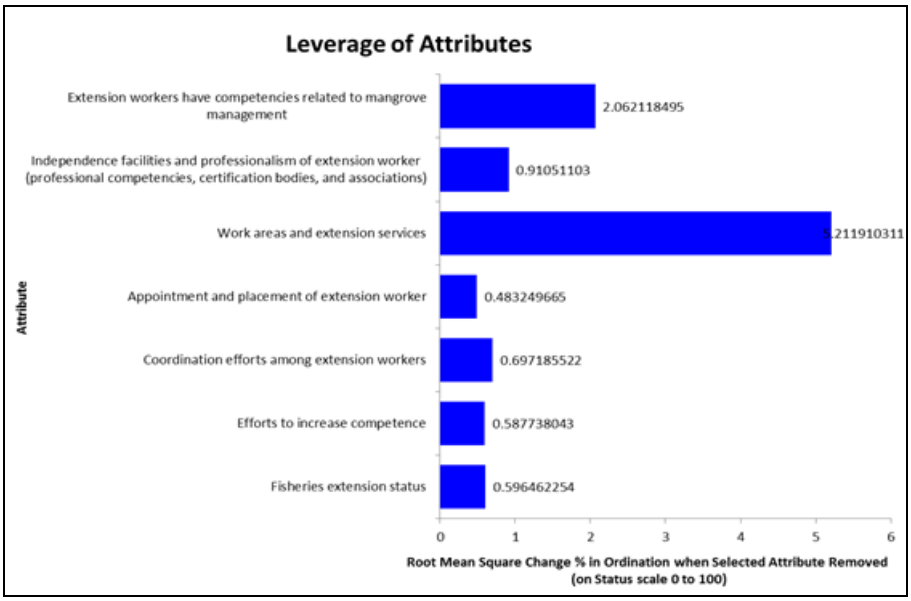

Fig 2: The value of the RMS attributes the dimensions of the workforce of fisheries extension that influence the management of mangroves in Rembang

Dimensions of Infrastructure Facilities and Funding for Fisheries Extension

The results of the Rap-FISHEXCOME analysis show that the value of the sustainability index of fisheries extension in the infrastructure and financing facilities for fisheries extension in Rembang includes 5 (five) attributes of 85.49, meaning that the sustainability was in "good" status in supporting mangrove management in Rembang.

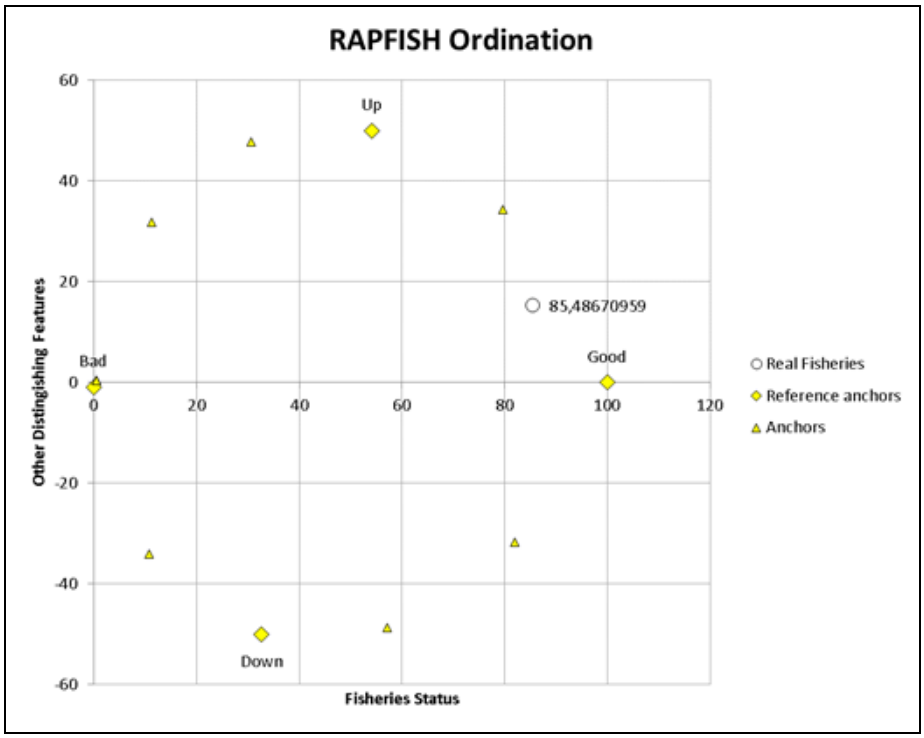

Fig 3: The index value of the sustainability of fisheries extension in infrastructure and financing of fisheries extension dimensions in Rembang

Furthermore, leverage analysis was carried out which aims to determine the sensitive attributes of the condition index for fisheries extension development in Rembang. RMS (root mean square) results of the Rap-FISHEXCOME attribute leverage analysis obtained 2 clusters (cluster 1, RMS value 14.51 and cluster 2, RMS value 4.52-3.64). The highest attribute that most influences the sustainability of infrastructure dimensions and financing for fisheries extension is the allocation of capital strengthening financing with a value of 14.51.

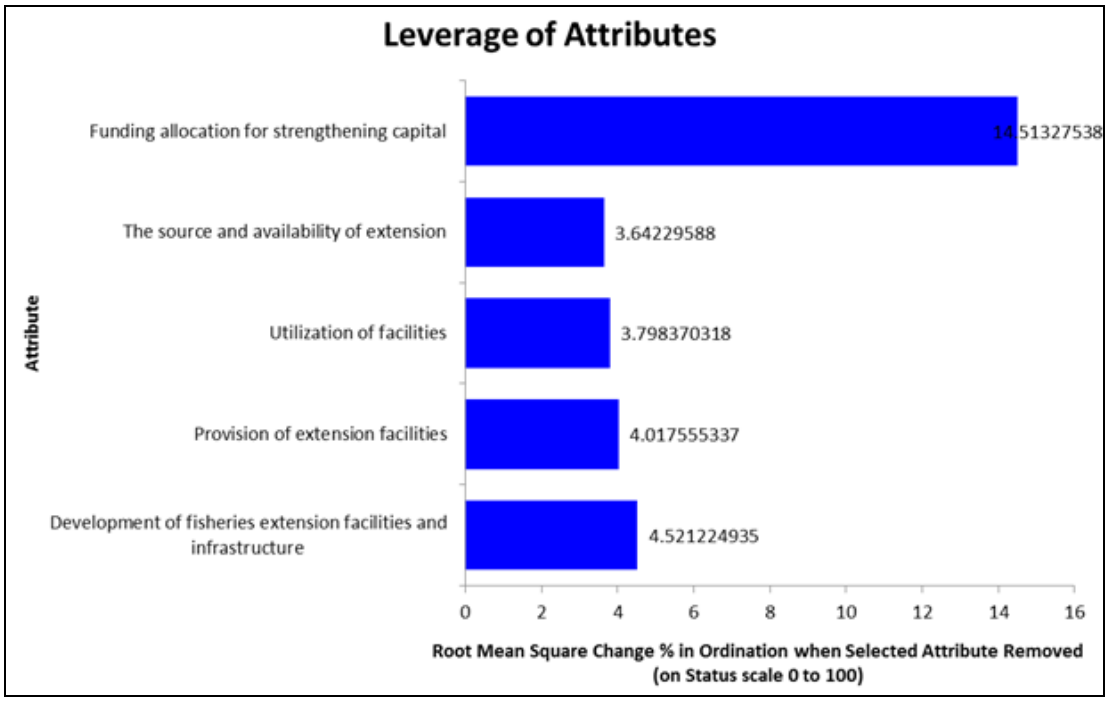

Fig 4: The RMS value attributes the dimensions of infrastructure facilities and financing for fisheries extension that influence the management of mangroves in Rembang

Social, Economic, and Cultural Dimensions

The Rap-FISHEXCOME analysis results revealed that the social, economic and cultural dimensions of fishery extension in the Rembang dimension include 7 (seven) attributes of 70.51, meaning that the sustainability was in a "sufficiently sustainable" status in supporting mangrove management in Rembang.

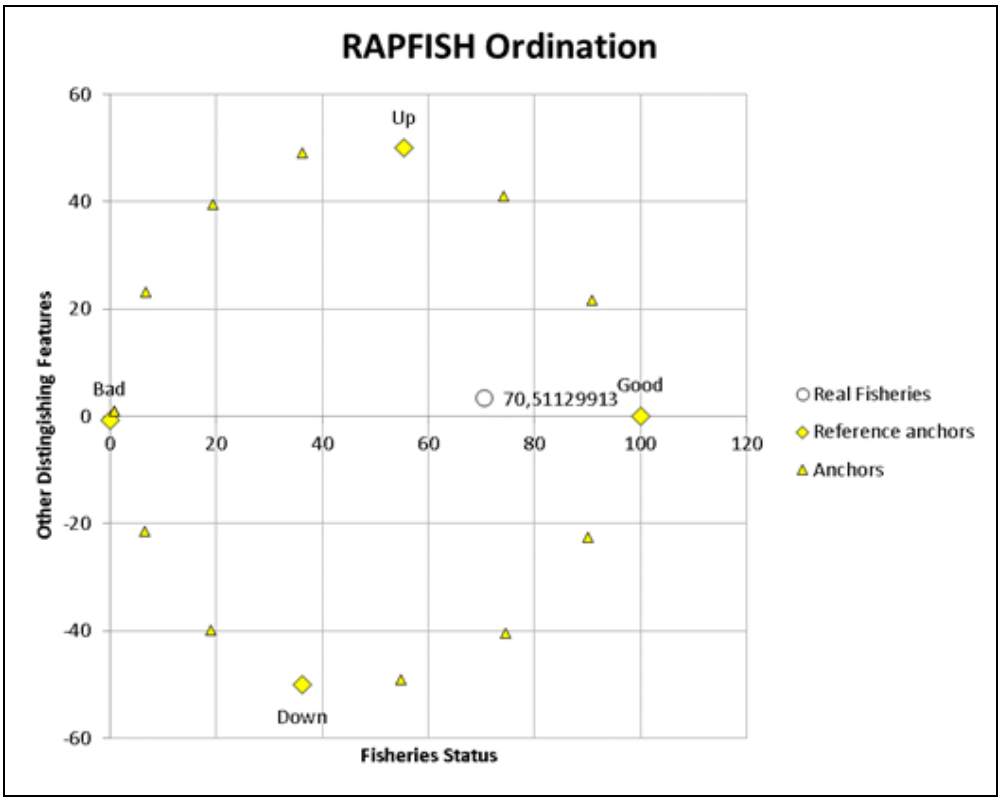

Fig 5: The value of the sustainability index of fisheries education in the social, economic, and cultural dimensions in Rembang

Furthermore, leverage analysis was carried out which aims to determine the sensitive attributes of the condition index for fisheries extension development in Rembang. RMS (root mean square) results of the Rap-FISHEXCOME attribute leverage analysis obtained 3 clusters (cluster 1 RMS value 7.39-6.34; cluster 2 RMS value 5.23-4.50; and cluster 3 RMS value 3.50 -2.99). The highest attributes that most influence the sustainability of social, economic and cultural dimensions are: 1) alternative livelihoods with a value of 7.39, and 2) access to media with a value of 6.34.

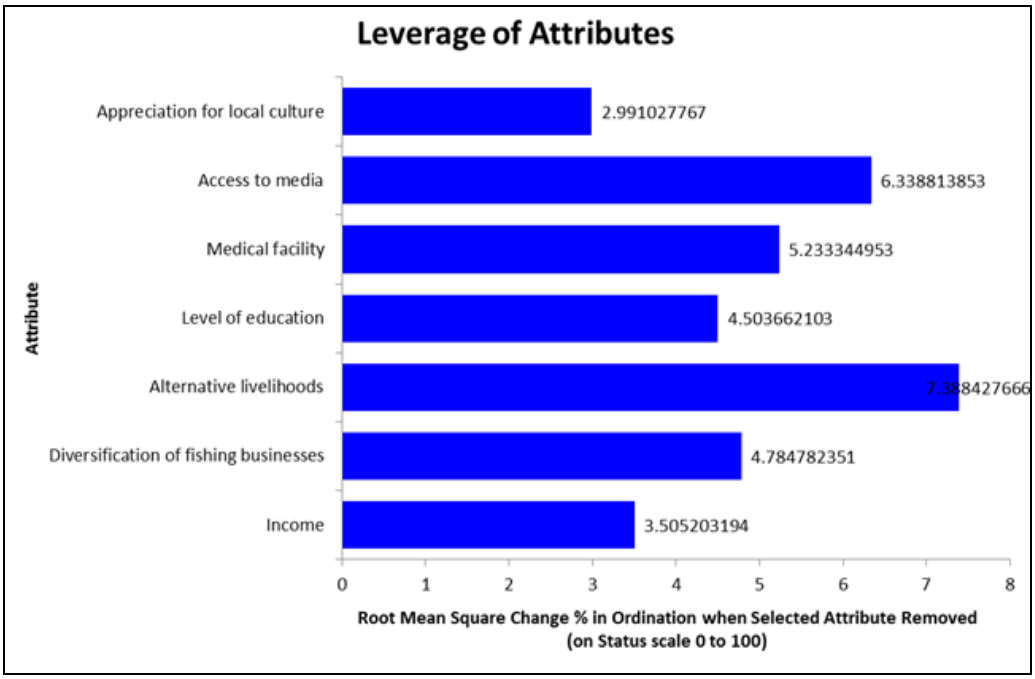

Fig 6: The value of RMS attributes the social, economic, and cultural dimensions that influence the management of mangroves in Rembang

Dimensions of Environmental Ecology

The results of the Rap-FISHEXCOME analysis show that the value of the sustainability index of the environmental ecological dimension of fisheries in Rembang which includes 5 (five) attributes of 85.49, means that the sustainability was in "good" status in supporting mangrove management in Rembang.

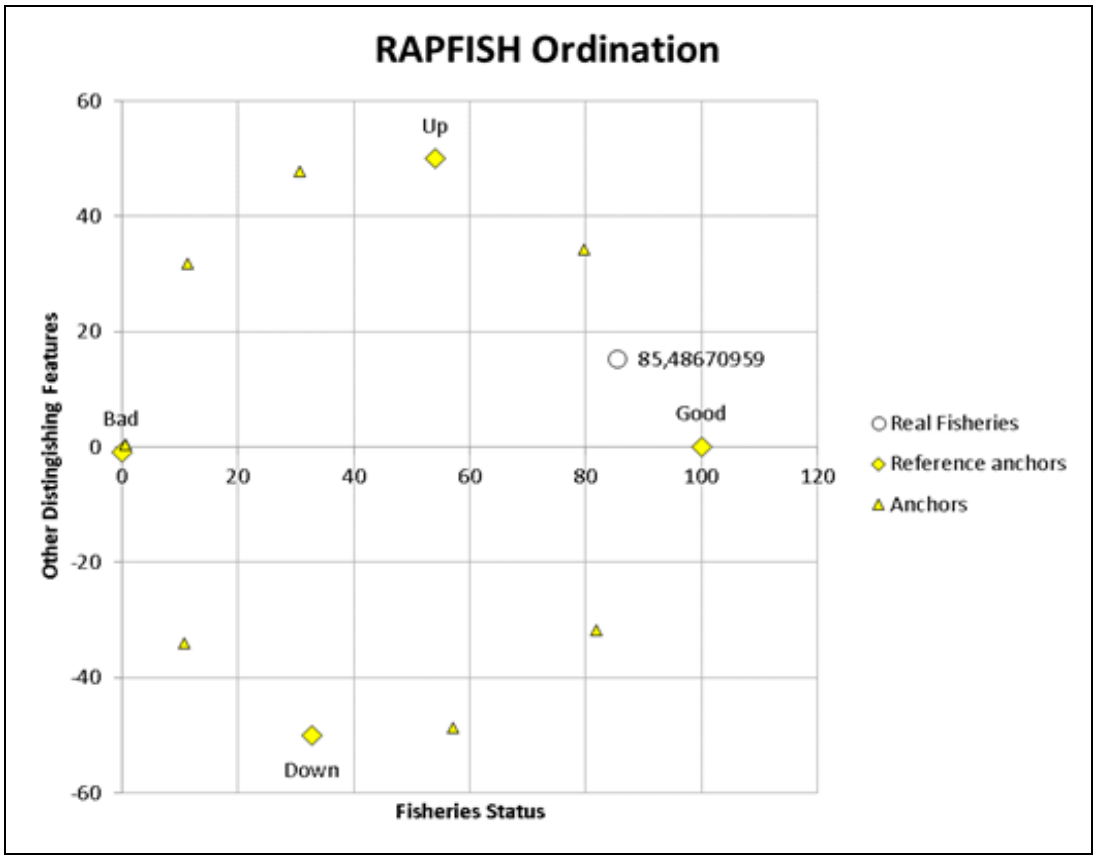

Fig 7: The value of the sustainability index of fisheries extension in the ecological dimension of the environment in Rembang

Furthermore, leverage analysis was carried out which aims to determine the sensitive attributes of the condition index for fisheries extension development in Rembang. RMS (root mean square) results of the Rap-FISHEXCOME attribute leverage analysis obtained 2 clusters (cluster 1, RMS value 14.51 and cluster 2, RMS value 4.52-3.64). The highest attribute that most influences the sustainability of the ecological dimension of the environment were the protection activity with a value of 14.51.

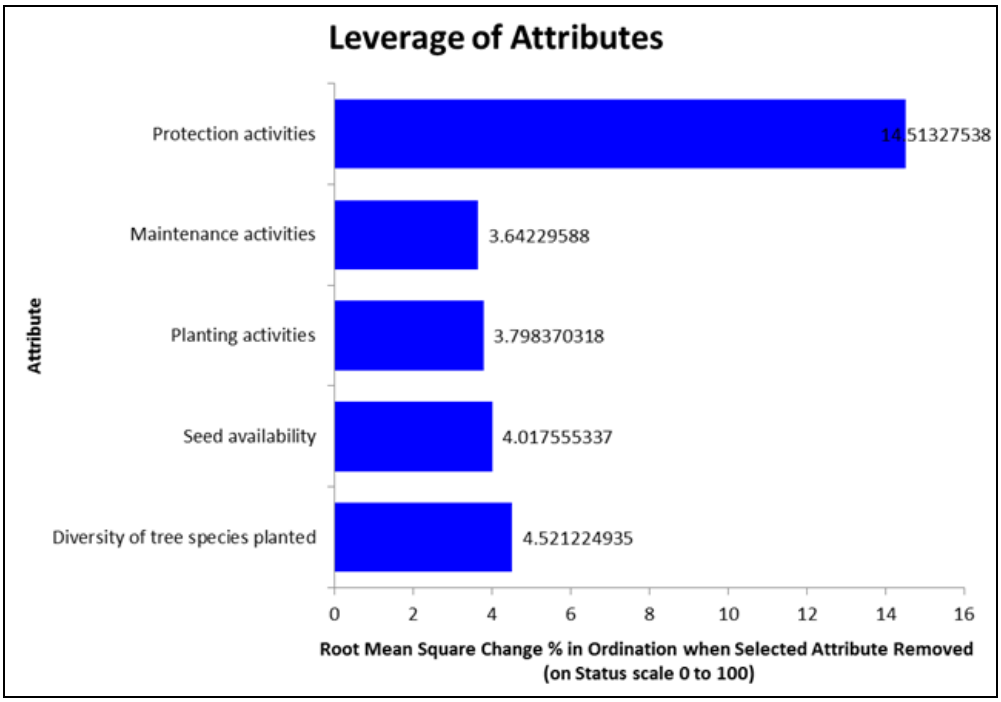

Fig 8: The value of RMS attributes the environmental ecology dimension that influences mangrove management in Rembang

Discussion

The first dimension of fisheries extension workforce that includes 7 attributes was in a "less sustainable" status in supporting mangrove management in Rembang District (Figure 1). The work areas and extension services were the attributes with the highest sensitivity value that most influence the sustainability of the fisheries extension workforce dimension with a value of 5.21 (Figure 2). The number of fisheries extension workers assigned was proportional to the area of work and the number of groups was ideal so that the main tasks and functions of the extension workers were effective and efficient. For Rembang Subdistrict, there were 7 extension workers, consisting of 3 civil servants and 4 extension fisheries assistants. There were two groups of mangrove management communities in Rembang District, while there were 7 groups of fisheries and salt cultivation groups, 11 fisheries processing groups, and 26 fishermen groups. The number of ratios recommended by the extension center itself between the number of extension workers and the target of the extension was 1 extension worker versus 10-15 target groups [12].

The second dimension of infrastructure and financing for fisheries extension that includes 5 attributes was in "good" status in supporting mangrove management in Rembang District (Figure 3). The funding allocation for strengthening capital was an attribute with the highest sensitivity value that most influences the sustainability of infrastructure dimensions and financing of fisheries extension services in Rembang with a value of 14.51 (Figure 4). At present, financing for capital strengthening in Rembang was carried out through a low-interest loan program. The program was carried out through the Maritime and Fishery Business Management Agency under the Ministry of Maritime Affairs and Fisheries. The funding for capital strengthening was aimed specifically at the fisheries businesses.

A capital strengthening funding program was needed by fishermen groups to increase income, especially during fish famine. Increased income can also be done through the development of other fisheries businesses such as aquaculture and fishery product processing, which of course also requires venture capital. Economic support in conservation activities or environmental management has a very strong influence to support its success [13]. Entrepreneurial financing, micro-business growth, and the role of informal finance also contribute positively to regional economic growth [14, 15].

The third social, economic and cultural dimension that includes 7 attributes is in a "sufficiently sustainable" status in supporting mangrove management in Rembang District (Figure 5). Alternative livelihoods are the highest attribute that most influences the sustainability of social, economic and cultural dimensions with a value of 7.39 (Figure 6). The main livelihoods of the people of Pasarbanggi Village, Rembang District were fishermen, while the alternative livelihoods of the community are aquaculture and fishery product processing, although there were also people who have switched to aquaculture ponds to become the main livelihoods.

Alternative livelihoods are poverty reduction strategies and protection of marine resources [16]. The great potential of Rembang's mangrove forest to be developed as an object of mangrove forest ecotourism could be an alternative livelihood for the people of Rembang [4]. Pasarbanggi mangrove ecotourism potential which consists of biological potentials whose conditions were still good and physical potential was quite complete. Potential tourism objects that already exist and were provided for mangrove ecotourism include a 100-meter boardwalk (red bridge) that divides the mangrove forest from south to north, a parking lot, and access roads in the form of pond embankments while supporting facilities such as food stalls or souvenir sellers were still quite minimal. Development of mangrove ecotourism in Rembang requires increased development of mangrove ecotourism in the field of promoting ecotourism programs and strengthening institutions as information on mangrove ecosystem knowledge, as well as increasing stakeholder participation in the development of sustainable mangrove ecotourism to improve services to visitors [5].

Access to media was the second-highest attribute that most influences the sustainability of social, economic, and cultural dimensions with a value of 6.34 (Figure 6). Access to media in Rembang District was helped by the existence of fisheries extension workers. The role of extension workers has been in assisting and developing communication with the community of key actors and business people to access reliable information in supporting mangrove management programs in Rembang District. Media literacy is needed so that people become smart. Ease of access to the media affects the success of the delivery of information to the public [17].

The fourth dimension of environmental ecology that includes 5 attributes was in "good" status in supporting mangrove management in Rembang District (Figure 7). Protection activity was an attribute with the highest sensitivity value that most influences the sustainability of the ecological dimension of the environment, with a value of 14.51 (Figure 8). Protection activities in mangrove management so far have been carried out by utilizing community groups in the Rembang mangrove forest area. There were 2 mangrove groups which consist of the main actors, business actors, and community leaders. The mangrove group supports the mangrove management activities by the government accompanied by fisheries extension agents, through the monitoring of mangrove forests from damage.

In carrying out mangrove protection activities, the active role of the community around the mangrove area is urgently needed, following the concept of community-based integrated coastal resource management [3, 18]. The sustainable use of natural resources for the welfare of the community is important for the protection of mangrove ecosystems. Even natural resources will be preserved if they provide benefits and become the main source of community income[18]. Communities in the mangrove ecosystem are the main actors who use the mangrove ecosystem, as well as human resources that can be used as a stronghold in the preservation of the mangrove ecosystem. In carrying out mangrove protection activities it must involve the active role of the community around the mangrove area so that the extension program can be successful in supporting the mangrove management program [18].

The problems of managing mangroves in Central Java were very complex, including the dichotomy between economic interests and conservation interests, as well as low awareness and understanding of the importance of preserving mangrove ecosystems. The concept of community-based mangrove protection activities was the best program that is expected to be able to increase community awareness of the importance of natural resources in supporting their lives and enhancing the capacity of the community, to be able to participate in each stage of management; and increase people's income through other forms of sustainable and environmentally friendly use [3].

The level of community understanding of environmental conservation awareness is very important because they were the main actors who interact directly with the region. Community participation in mangrove forest conservation activities can work well if they have an understanding and awareness of the importance of environmental conservation. This can be implemented in community-based integrated coastal resource management [3].

Conclusion

The results of this study obtained the status of sustainability of fisheries extension in the management of mangroves in Rembang for 4 dimensions, including the dimension of fisheries extension services was the only dimension that needs to get more priority because it was in the less sustainable category with a value of 47,848. The social, economic and cultural dimensions were in the quite sustainable category with a value of 70,511. For the ecological dimension of the environment and the dimensions of infrastructure and financing for fisheries extension were in the good/sustainable category with the same value of 85,487.

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