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VANAME SHRIMP AGRIBUSINESS SUSTAINABILITY STATUS IN PARIGI MOUTONG REGENCY

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ABSTRACT

This research generally aims to determine and analyze the sustainable vaname shrimp agribusiness development model. Whereas specifically aims to examine the sustainability status of vaname shrimp agribusiness in Parigi Moutong Regency. The sustainability status will be analyzed using Rapfish with five dimensions developed at the research location which are based on considerations that can reflect existing conditions.

The results of the research show that the sustainability of the use of vaname shrimp fishery resources in Parigi Moutong Regency from the five dimensions is shown in the kite diagram which overall is at an index value of > 50% indicating that the sustainability status of vaname shrimp agribusiness in Parigi Moutong Regency is good and quite sustainable. The government's efforts in overcoming problems in the sustainable management of vaname shrimp resources by cultivators and other stakeholders must be carried out in an integrated and well-coordinated manner by the Parigi Moutong Regency government with interested parties.

KEYWORDS: Sustainability status and index, agribusiness, white shrimp

INTRODUCTION

Background

Indonesia is one of the largest countries in the world, having a coastline of 81,000 km and more than 17,500 islands (Akrim, 2014; Hurtado et al, 2015). One of the potential fisheries that can currently be managed and developed sustainably is in the cultivation sector, especially shrimp. Shrimp is one of the leading commodities in the fisheries agribusiness subsector which has high value and has a large export and domestic market that can be developed, namely shrimp, especially tiger prawns (Penaeus monodon) and vaname shrimp (Litopenaeus vanamei). White shrimp (Litopenaeus vannamei) is one of the white shrimps that is quite commercial (BBAP Situbondo, 2006; KKP 2021).

Vaname shrimp cultivation in Indonesia is currently the mainstay of the aquaculture sector and is a priority for developing aquaculture in Indonesia to improve the national economy. In the 2012 -2018 period, the contribution of shrimp export value to the value of Indonesian fishery exports reached an average of 36.27% (BPS, 2019). This means that shrimp commodities have a very significant role in the export performance of Indonesian fisheries commodities. In 2018, the shrimp export volume was recorded at 197.43 thousand tons with a value of USD 1,742.12 million (DJPB, 2019). In the 2019 period, shrimp production was achieved at 517,397 tonnes and is targeted to increase by 250% in 2024 to 1,290,000 tonnes with a production value of 36.22 trillion in 2019 to 90.30 trillion in 2024 (KKP, 2021).

One type of superior fishery commodity that has quite high demand is shrimp. Shrimp are recorded as being in first place in Indonesian fisheries exports with an export volume contribution of 14.13 percent and export value of 42 percent to Indonesia's fisheries trade balance (KKP, 2015; Mashari et al., 2019). Indonesia's shrimp exports generally consist of three types, namely fresh, frozen and processed shrimp. However, only frozen and processed shrimp have quite large export values of 77.38 percent and 21.91 percent respectively (UN Comtrade, 2018; Mashari et al., 2019).

Production in the fisheries and marine sector of Central Sulawesi Province in 2022 will reach 1,112,785 tonnes, consisting of the marine capture sector of 149,776 tonnes with a production value of IDR. 3,602,358,452 and general water fisheries production of 2,892 tons with a production value of Rp. 66,763,367, and cultivation production of 960,117 tons (BPS Central Sulawesi Province 2022).

Central Sulawesi Province, which has a coastline of 4,013 km, has potential land for pond development of around 42,095 ha. These ponds are spread along the coast of Tomini Bay, the coast of the Makasar Strait and the Sulawesi Sea and Tolo Bay. The pond cultivation development area is in Parigi Moutong, Banggai, Banggai Islands, Morowali, Buol and Donggala with an area of 8,280 ha. The expected contribution from Central Sulawesi Province includes 3,672 Ha specifically for vaname shrimp and 3,093 Ha for tiger shrimp with an increase in shrimp production to around 14,000 tons in 2009. Through the revitalization program, the development of shrimp cultivation is directed through the application of correct fish/shrimp cultivation methods (CBIB). The implementation of CBIB will be aligned with Indonesian National Standards (SNI), Better Management Practices (BMP) and Good Aquaculture Practices (GAP), implementation of supervision and certification of good cultivation methods (DKP Central Sulawesi Province, 2009).

Parigi Moutong Regency is one of the regencies in Central Sulawesi Province which has fisheries potential. Administratively, Parigi Moutong Regency has an area of 6,231.85 km 2 and has a coastline of 472 km. Parigi Moutong Regency has a potential area for pond cultivation of 10,816 hectares spread across 16 (sixteen) sub-districts. Of this area, around 6,866 hectares (63.48%) have been utilized with a total production of 132,294.88 tons, including shrimp commodities of 4,626.65 tons and milkfish

commodities of 5,874.45 tons (BPS Parigi Moutong Regency, 2021) . Based on this, it is possible to develop the potential of land into a vaname shrimp cultivation pond area in Parigi Moutong Regency. The results of a study by the Central Sulawesi Province Maritime and Fisheries Service (2017) show that there are obstacles to development in the shrimp agribusiness sub-system in Parigi Moutong Regency. Obstacles in the upstream agribusiness sub-system include: (1) the gap in utilization area compared to the potential cultivation area, namely the area of cultivation land is not proportional to the production results of vaname shrimp cultivation where traditional pond production ranges between 500-1,000 Kg/Ha and semi-intensive shrimp pond production ranging between 5-7 tonnes/Ha while intensive shrimp farming reaches 40-60 tonnes/Ha; (2) cultivators still do not receive information about the suitability of land and the carrying capacity of waters for cultivation; and (3) cultivators also do not have access to superior seeds because superior seeds are obtained from outside Central Sulawesi Province, namely South Sulawesi Province and Bali Province, so that the cultivating community uses local seeds so that the quality and quantity of production is not optimal.

In the farming sub-system, cultivators do not have good knowledge about how to cultivate according to recommendations; so that productivity per unit area is not optimal. In the downstream business sub-system, there is no processing industry that can consistently absorb the production of cultivators. In the supporting sub-system, cultivators are faced with weak access to capital, trade and marketing systems. This condition shows that the development of the shrimp agribusiness system in Parigi Moutong Regency has not been integrated between subsystems.

The status of sustainable management of natural resources, especially marine and fisheries, can be determined using various methods. One of them is the Rapid Appraisal for Fisheries (RAPFISH) method. This method is basically a fast calculation technique based on multidimensional scaling (MDS) (Fauzi and Anna, 2005). In this research, the Rapid Appraisal for Vaname Shrimp Agribusiness Sustainability (RAPVANS) analysis method is used, which is a replication of the Rapfish method. This was done to analyze the sustainability of vaname shrimp agribusiness in Parigi Moutong Regency, Central Sulawesi Province. The vaname shrimp agribusiness sustainability status index is used as input for policy analysis for the sustainable development of vaname shrimp agribusiness.

OBJECTIVE

Based on the background above, then This research aims at a sustainable vaname shrimp agribusiness development model. Whereas specifically aims to examine the sustainability status of vaname shrimp agribusiness in Parigi Moutong Regency.

RESEARCH METHODS

Types of research

The research carried out is included in descriptive research, which aims to highlight facts, circumstances, variables and phenomena that occurred during the research and present what actually

happened (Subana, 2005). In this research, the researcher did not control or manipulate the conditions during the research (Morissan, 2012).

The method of collecting data in this research uses survey studies, especially analytical surveys. Survey techniques are used to describe and explain the reasons a situation occurs and allow researchers to test relationships between variables and draw conclusions from these relationships

Research Location and Time

The research was carried out in 12 sub-districts which are centers of shrimp cultivation production in the coastal area of Parigi Moutong Regency, Central Sulawesi Province. The research was carried out for 1 (one) year, from July 2023 to June 2024.

Method of collecting data

Data collection consisting of primary data and secondary data. Secondary data was obtained through literature and document studies from several related agencies and the results of previous research studies and field identification. Meanwhile, primary data was obtained from shrimp cultivation business actors who were used as respondents, broadly defined as actors in shrimp agribusiness activities in Parigi Moutong Regency, starting from those involved in procurement and distribution of fishery business production facilities (catching, cultivation, processing, marine tourism and services). environment), primary production activities, processing activities and marketing activities.

The stages in this research consist of:

1. Determine the number of respondents. Overall, the main fisheries and marine actors (cultivators) in Parigi Moutong Regency in 2022 will be 160 people which is spread across 10 sub-districts and 12 villages as well as 16 cultivator groups. From the number of shrimp cultivators, based on the Slovin formula, the number of samples in this study was 62 people. Respondents who came from experts in policy determination were 11 people.
2. Conduct a survey/Field Identification, to find out real data and problems in the management of vaname shrimp resources and then formulate the problem.
3. Collecting data through literature studies sourced from reading materials, references and publications from scientific journals, observations, in -depth interviews using a questionnaire guide

Data analysis

data analysis method in this research uses an approach Sustainability status analysis using the *Multi-Dimensional Scaling* (MDS) method is a simple approach that can be usedto evaluate and determine sustainability status and indexes through *comparative sustainability* of vaname shrimp based on a number of attributes that are easy to score (Kavanag, 2004; Fauzi and Anna, 2002) approach with RAPVANS (*Rapid Appraisal for Vaname Shrimp Agribusiness Sustainability*). This method is a modification of the RAPFISH (*Rapid Assessment Technique for Fisheries) program.* where it is hoped that the results of this research can be used as material for consideration in formulating development

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and coastal village development policies in Donggala Regency. Data analysis with MDS includes sustainability aspects from ecological, economic, social and institutional dimensions, as well as technology.

This analysis includes ordination techniques in multivariate statistics with the *multi- dimensional scaling* (MDS) method which uses Euclidian distance as a calculation basis. The analysis used to assess the sustainability of fisheries businesses in Donggala district uses *Rapfish* with five dimensions developed at the research location based on considerations that can reflect existing conditions. From the results of these various findings, a study was carried out in the form of a model recommendation regarding shrimp agribusiness policy in supporting the shrimp agribusiness development model in Parigi Moutong district based on scientific evidence and information obtained at the research location. Data collection stages for sustainability analysis using the RAPFISH algorithm (*the Rapid Appraisal of the Status of Fisheries) Multi-dimensional Scaling (MDS)* method, with the aim of determining the sustainable status of fisheries resource utilization basedon a sustainability index which is assessed against two reference points, namely the "good" point. (*good)*" which is given a score of 100% shows a value (for each attribute) that reflects conditions that support sustainable capture fisheries. and the "bad" point *which* is given a score of 0% shows a value (for each attribute) that reflects conditions that do not support sustainable fisheries.

The ordination technique (distance determination) in MDS is based on *Euclidian distance* which in n-dimensional space can be written as follows:

$$d = \sqrt{|(x_1 - x_2|^2 + y_1 - y_2|^2 + z_1 - z_2|^2 + ..)} \quad \text{(1)}$$

The configuration or ordination of an object or point in MDS is then approximated by regressing the *Eculidian distance* (d_{ij}) from point i to point j with the origin (δ_{ij}) according to the following equation:

$$d_{ij} = \alpha + \beta \delta_{ij} + s \quad \text{(2)}$$

In assessing the sustainability index for the use of fisheries resources, each category consisting of several attributes is scored. Scores are generally ranked between 0 and 2. The score results are entered into a matrix table with i rows representing fishery resource utilization categories and j columns representing attribute scores.

The ALSCAL method optimizes the squared distance (squared distance = d_{ij}) to the square (origin = 0_{ijk}), which in five dimensions (i, j, k) is written in a formula called S- Stress as follows:

$$S = \sqrt{\frac{1}{m}} \sum_{k=i}^{m} \left[\frac{\sum_i \sum_j (d^2_{ijk} - 0^2_{ijk})^2}{\sum_i \sum_j 0^4_{ijk}} \right] \quad \text{(3)}$$

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Where the squared distance is the weighted *Euclidian distance, or written:*

$$d^2_{ijk} = \sum_{a=1}^{r} w_{ka} (x_{ia} - x_{ja})^2 \quad \text{.....,,,,,,,,,} \quad \text{.....(4)}$$

software is a development of MDS contained in SPSS *software, for the rotation (flipping)* process and several sensitivities analyzes which have been combined into one *software*. Through MDS, the position of the sustainability point can be visualized in two dimensions (horizontal and vertical axes). To project these points on a horizontal line, a rotation process is carried out, with "bad" extreme points given a score of 0% and "good" extreme points given a score of 100%. The position of sustainability status studied will be between these two extreme points. This value is an index of the current sustainability of fisheries resource utilization in Parigi Moutong district.

The agribusiness sustainability index value (B) is presented in a score with a basicscale range of 0-100. If the shrimp agribusiness studied has B>50 then it is in the"sustainable" category and if B<50, then it is in the "not yet sustainable" category. Following Kavanagh and Pitcher (2004), in this study four categories of sustainability status were arranged, namely if B<24.9 then the fishery is in the "unsustainable" category,if 25<B<49.9 then it is in the "less sustainable" category, if 50< B<74.9 then falls into the "fairly sustainable" category, and if B>75 then falls into the "sustainable" category.

The sensitivity value of an attribute for a sustainability dimension is measured from the change in *root mean square* (ΔRMS) if the attribute is not used in the analysis; The higher the ΔRMS value means the more sensitive the attribute is and vice versa. The most sensitive attribute in a dimension is the most important factor influencing sustainability and therefore deserves attention by fishery business managers (Kavanagh and Pitcher 2004; Fauzi and Anna 2002).

This analysis will go through 6 (six) stages, as follows:

1. Determination and Review of Attributes
2. Attribute Score Creation
3. *Rapfish* Ordination
4. Sustainability Status Index Scale
5. Sensitivity Analysis
6. Monte Carlo Analysis

The attributes and data requirements analyzed are as in table 1.

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Table 1. Attributes and Data Requirements in Determining Sustainability Status

No	Research Aspect		Attributes and Data Requirements
1	Ecology	1.	Illness
		2.	Production Quality
		3.	Suitability of pond land
		4.	Carrying capacity of the pond area
		5.	Pond pollution
		6.	Pond management
		7.	Waste management
		8.	Water Quality
		9.	Farm productivity level
		10.	Mangrove Ecosystem Rehabilitation
II	Economy	11	Sales system
		12	Shrimp marketing channels
		13	Shrimp production
		14	Business income level
		15	Labor wages
		16	Production cost
		18	Profit
		19	Business feasibility
		20	PAD Contribution (compared to other sectors)
		21	Loss rate
		22	Selling price
III	Social	23	Training activities
		24	Socialization activities
		25	Knowledge of pond farmers
		26	Education level of pond farmers
		27	Sales security
		28	Conflict of interest
		29	Absorption of labor
		30	Workforce knowledge
		31	Land ownership conflicts
		32	Employment Insurance
IV	Institutional	33	Business permit
		34	Maritime and fisheries law
		35	Enforcement of regulations
		36	Farm Company Involvement
		37	Banking Engagement
		38	Development of pond farmers

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		39	Law enforcement
		40	Traditional institutions
		41	Fisheries Cooperative
		42	Fisheries extension agency
V	Technology	43	Pond water quality management
		44	Shrimp Harvesting Technology
		45	Use of water wheel
		46	Waste management installation technology
		47	HACCP
		48	Handling shrimp infected with disease
		49	Identification of disease
		50	Use of drugs
		51	Fertilizer use
		52	Handling of harvest
		53	Feeding management

RESULTS AND DISCUSSION

Research result

The coastal area of Parigi Moutong Regency is a strategic location as a location for shrimp cultivation with potential natural, social and economic resources. The current potential can be increased with sustainable area management to support vaname shrimp agribusiness activities.

The sustainability of shrimp agribusiness in Parigi Moutong Regency needs to be analyzed more deeply in relation to production to marketing in order to achieve income for cultivators and regional development. In general, cultivators depend on shrimp farming in 12 sub-districts in Parigi Moutong Regency. The sustainability of this shrimp agribusiness will contribute to reducing poverty while preserving the environment. Therefore, the sustainability of shrimp agribusiness must be assessed from various aspects of the problem including ecological, economic, social, institutional and technological dimensions. The attributes of each dimension are determined based on data availability in the field.

1. Ecological Dimension Sustainability Status

The ecological dimension is the main indicator in assessing sustainability status and is a description of the quality of the environment and fisheries resources and the natural processes within them, whether they can or cannot sustainably support every economic activity carried out in relation to the ecological factors of shrimp cultivation management. The understanding of this dimension in the framework of sustainable shrimp development and management is translated into 10 (ten) attributes, namely; Pond pollution, suitability of pond land, carrying capacity of pond areas, water quality, waste management, pond management, disease attacks, mangrove rehabilitation, production quality and pond productivity. Operationally, these attributes can describe the condition of shrimp fisheries resources currently

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managed in Parigi Moutong Regency. The scoring value of each attribute in each ecological dimension studied can be seen in the attachment.

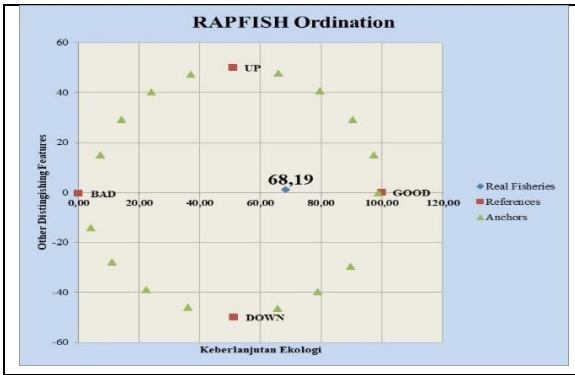

Figure 1. Position of Index Value and sustainability status in the Ecological Dimension

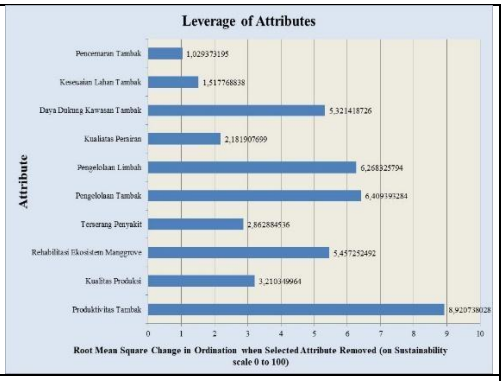

Figure 2. Ecological Dimension Attribute Sensitivity Values expressed in changes in *Roat Mean Square* (RMS) on a sustainability scale of 0 – 100.

Rapfish ordination analysis, it shows that the sustainability index value for the ecological dimension is 68.19. This value is in the range of 50.00 – 75.00 (Figure 1). In this condition, it can be said that the management of shrimpresources undertaken by cultivators in Parigi Moutong Regency, when viewed from the ecological dimension, is at a fairly sustainable status. Sensitivity analysis aimed at seeing how it affects the sustainability score in the resource ecology dimension using the *leverage analysis method* for 10 attributes obtained 3 (three) sensitive attributes, namely pond productivity, pond management, waste processing, which are the most sensitive attributes in the sustainability of shrimp management in Coast of Parigi Moutong Regency. Changes to these 3 *leverage factors* will easily influence the increase or decrease in the value of the sustainability index based on the ecological dimension. The results of *the leverage*analysis are presented in Figure 2.

the leverage analysis above, it can be seen that the pressure attribute on waters hasthe highest RMS value, namely 8.92. This can be interpreted to mean that these attributes have the greatest influence on *the sustainability* of shrimp resource management from an ecological perspective. This is supported by the area of ponds owned and production levels that always increase every year according to the data in table 4.1 of production produced in 2022 and the previous year. Apart from that, the abilities and expertise possessed by the cultivators are quite goodand they have followed the government's efforts to use good fish cultivation methods (CBIB) and manage the cultivation time.

2. Economic Dimension Sustainability Status

This dimension reflects whether or not a shrimp resource management activity in Parigi Moutong Regency can obtain results that are economically viable in the long term and sustainable. In this

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dimension, 11 (eleven) attributes were developed that can describe the management conditions of shrimp cultivation businesses at the research location, namely: sales system, shrimp marketing, shrimp production, labor wages, total income, production costs, profits, business feasibility, loss levels.

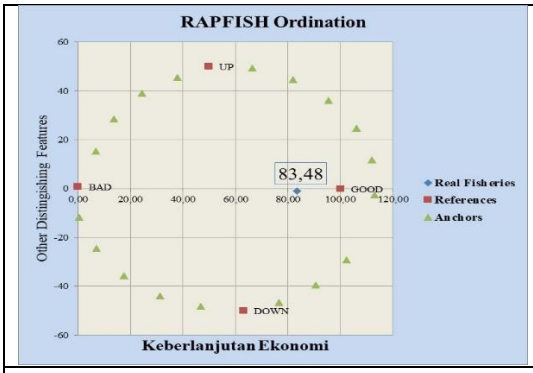

Figure 3. Position of Index Value and sustainability status in the Economic Dimension

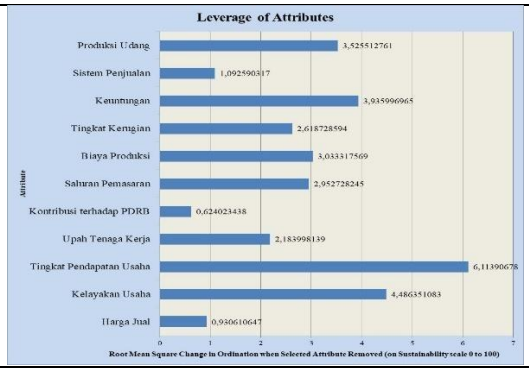

Figure 4. Sensitivity Values of Economic Dimension Attributes expressed in changes in *Roat Mean Square* (RMS) on a sustainability scale of 0 – 100.

Rapfish software on the economic dimension, it shows that the sustainability index value for the economic dimension of fishermen is 83.48. This value is in the range 75.00 – 100.00 in the sustainability category with very good sustainable status as shown in Figure 4.3. The results of the leverage analysis shown in Figure 4.4 show that the business income level attribute has the highest RMS value, namely 6.11, followed by the business feasibility attribute with an RMS value of 4.48. This can be interpreted to mean that these attributes have the greatest influence on the sustainability of shrimp cultivation business management from the community's economic perspective. The economic dimension study is aimed at allocating shrimp resources with economic carrying capacity efficiently, namely how resource utilization can increase profits in monetary terms and increase business unit growth while maintaining economic growth. In general, a fairly good level of business income can contribute to the fish farming community, this is because capital ownership and business development are very high.

Based on the research results, it was revealed that the level of income generated from the sale of shrimp fluctuates due to price games, in the last year the prevailing price according to size (Size 50 -100) reached between Rp. 51,000 – Rp. 73,000. This shows that if the production is large, it will have implications for the income earned. In general, the economic activities of shrimp farmers on the coast of Parigi Moutong Regency are fluctuating because apart from prices, they are also dependent on the productivity of pond production. If productivity is high, the income level of cultivators will also increase, but people's purchasing power is low and vice versa.

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The level of income from this business determines the welfare of cultivators who play an important role in conditioning economic growth in the coastal area of Parigi Moutong Regency. Utilization of shrimp resources is

directed at improving the welfare of cultivators, improving the community economy, creating jobs and generating local revenue from the fisheries and marine sectors. In an effort to increase profits and income in the shrimp cultivation business management area, government involvement, especially local governments, is urgently needed, both in terms of providing fisheries production facilities, increasing skills in fishing and cultivation activities to handling harvest and post-harvest. Apart from that, the role of the agribusiness and agro-industry sectors needs to be encouraged so that they can provide added value to the main actors supported by adequate marketing of produce and processed products. With strong support from the government, it is hoped that the benefits obtained by the community will also increase.

3. Social Dimension Sustainability Status

The social dimension reflects how the use of coastal environmental and resource activities has an impact on the social sustainability of local communities which in turn will also have an impact on ecological sustainability. People's high understanding of the environment, working in groups will lead to ease of management of utilization which means it leads to social sustainability.

Evaluation of the attributes developed in the social dimension is translated into 10 (ten) attributes which are technically operational and describe the social conditions of the community in the management and sustainability of businesses currently involved in Parigi Moutong district, including training activities, socialization activities, knowledge of pond farmers, education level of pond farmers, labor absorption, land ownership conflicts, conflicts of interest, sales security, labor insurance , and labor knowledge. The scoring value of each attribute in each institutional dimension studied can be seen in Appendix 04.

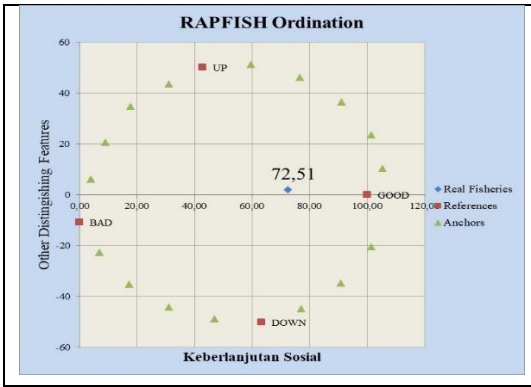

Figure 5. Position of Index Value and sustainability status in the Social Dimension Scoring value of each attribute in each social dimension

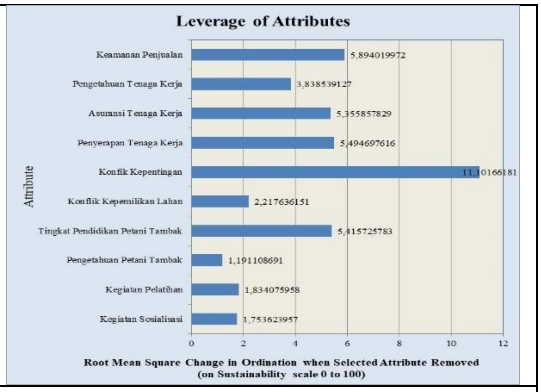

Figure 6. Sensitivity Value of Social Dimension Attributes expressed in change in *Roat mean Square* (RMS) sustainability scale 0 – 100

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Rapfish software on the social dimension show that the social dimension sustainability index value is 72.51. This value is in the range 50.00 – 75.00, a sustainability category with quite sustainable status as shown in Figure 4.5. Basedon the results of the *leverage* analysis, it can be seen that the conflict-of-interest attribute has the highest RMS value, namely 11.10, followed by sales security and employment, respectively with RMS values of 8.35 and 5.73. This can be interpreted to mean that these attributes have the greatest influence on *the sustainability* of shrimp resource management from the social dimension.

It is known that the aquaculture area in the Parigi Moutong district area which is being cultivated by communities located on the coast is conditionally important, especially in this area being occupied by the majority of fishing communities, most of the existing land is owned by people outside the area, the majority of the workforce is not who came from residents around the area.

4. Sustainability Status of Institutional Dimensions

The institutional dimension of society (main actors and business actors) describes how the institutional system at the level regulates human and environmental activities in the utilization of the fishery resources contained therein. The better the arrangements that are made, the more likely it is that every economic activity carried out in the fisheries sector can run in the long term and be sustainable. Aquaculture business activities cannot be separated from the social conditions of the cultivating community and other business actors who carry out activities utilizing these resources. This dimension is also a description of how the institutional system operates and whether or not an economic resource utilization activity can run well. In this dimension, 5 (five) attributes were developed that can describe the institutional conditions in the business of cultivating communities in Parigi Moutong Regency, including; Partnerships with pond farmer groups, partnerships with the government, partnerships with traditional institutions, fisheries cooperatives and the availability of fisheries extension institutions. The scoring value of each attribute in each institutional dimension studied can be seen in Appendix 04.

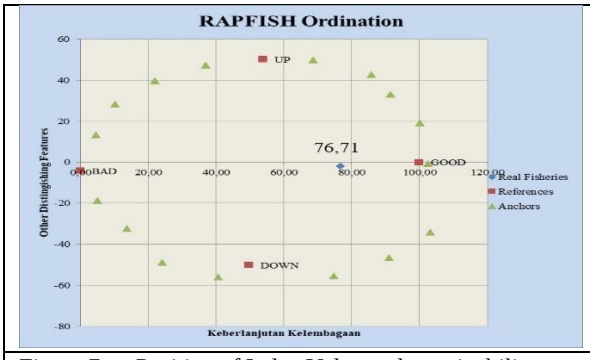

Figure 7. Position of Index Value and sustainability status in the Institutional Dimension

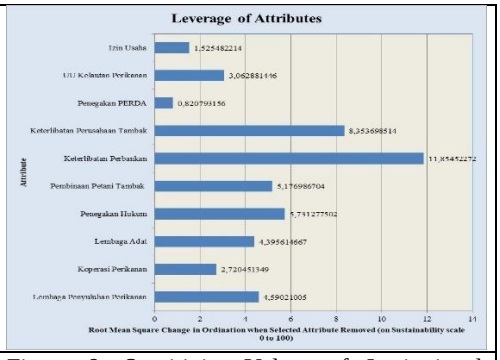

Figure 8. Sensitivity Values of Institutional Dimension Attributes expressed in changes in *Roat Mean Square* (RMS) on a 0–100 sustainability scale.

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Rapfish software on this institutional dimension show that the sustainability index value for the institutional dimension is 76.71. This value is in the range 75.00 – 100.00, a sustainability category with very good sustainable status as shown in Figure 4.7. Based on the results of the leverage analysis, it can be seen that the banking involvement attribute has the highest RMS value, namely 11.85, followed by the involvement of fish farming companies and law enforcement, respectively, with RMS values of 8.35 and 5.73. This can be interpreted to mean that these attributes have the greatest influence on the sustainability of shrimp resource management from the institutional dimension.

The existence of banks and fish farming companies in the Parigi Moutong Regency area has an influence on the business sustainability of shrimp farmers. Considering the source of financing in business management, cultivators expect

credit from banks in their business development efforts. Apart from that, the results of shrimp cultivation are also expected to be directly processed by the company. This is a follow-up to the business involved, so that the marketing results are quickly purchased by the pond company. This will provide fast income for every cultivator in Parigi Mouton Regency. Awareness of the importance of regulations that have been prepared by technical agencies, both in regulating prices, healthy seeds, control of cultivation land, so that every business actor (cultivator) does not do things that are detrimental to their business, including the security and protection of their business.

5. Sustainability Status of the Technology Dimension

technological sustainability dimension is an effort driven by economic motives and meeting needs to improve community business operations. This dimension is a reflection of the degree of utilization of fishery resources in the use of technology. Evaluation of the attributes developed in the technological dimension is translated into 11 (eleven) technically operational attributes that describe the condition of the technology used and the facilities Business support on the coast of Parigi Moutong Regency includes the use of fertilizer, handling of harvests, shrimp marketing technology, disease identification, handling of diseased shrimp, HACCP, use of medicines, waste processing installation technology, use of water wheels, feeding management and pond water quality management . The scoring value of each attribute in each technology dimension studied can be seen in the attachment.

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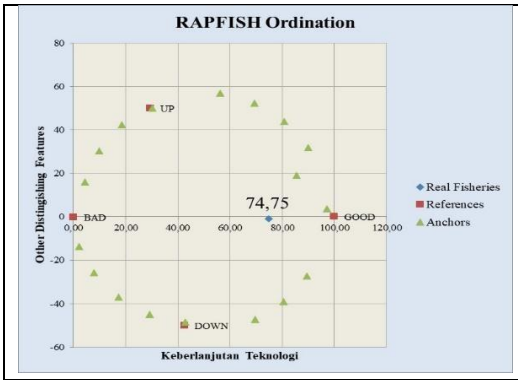

Figure 9. Position of Index Value and sustainability status in the Technology Dimension

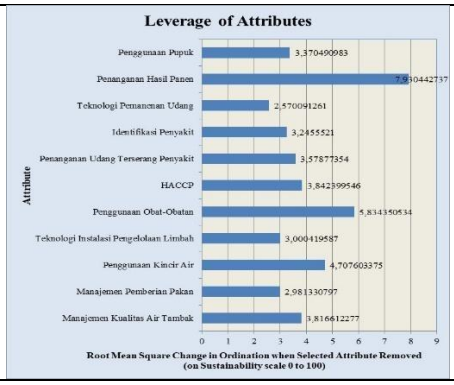

Figure 10 Technology Dimension Attribute Sensitivity Values expressed in changes in *Roat Mean Square* (RMS) on a sustainability scale of 0 – 100.

Rapfish software on the Technology dimension, it shows that the sustainability index value for this dimension is 74.75. This value is in the range 50.00 – 75.00. Sustainability categories with moderately sustainable status are shown in Figure 4.9. Sensitivity analysis on the technological dimension using the *leverage* analysis method on 11 attributes from the technological dimension, three sensitive attributes were obtained (Figure 4.10), namely handling of crops, use ofmedicines and use of water wheels. Changes to these 3 *leverage factors* will easilyinfluence the increase or decrease in the value of the technological dimension sustainability index.

6. Multidimensional Sustainability Status

The use of coastal areas for shrimp agribusiness management in Parigi Moutong Regency is dynamic, and currently community activities including fishing, cultivation, product processing, marine tourism and other environmental services are still and are ongoing in several coastal areas of Parigi Moutong Regency. The results of the Rapid Appraisal for Vaname Shrimp Agribusiness Sustainability (Rap-VANS) sustainability analysis in the utilization of fishery resource areas , especially shrimp on the coast of Parigi Moutong Regency from the five dimensions are shown in the kite diagram (Figure 4.11) which overall is at 2 (two) between 50 – 75 % and 75 – 100% which indicates that the sustainability status of shrimp agribusiness with the support of shrimp resource management on the coast of Parigi Moutong Regency is in good status and quite sustainable . This index value is obtained based on an assessment of 53 attributes from five dimensions of sustainability, namely ecological, economic, social, institutional and technological dimensions. Sensitive attributes that contribute to the sustainability index value can be increased by making improvements to several attributes (variables) that influence increasing the sustainability index value, both in the ecological, economic, social, institutional and technological dimensions. The attributes that need to be addressed immediately are those that are sensitive to the value of the sustainability index of fisheries resources, without ignoring the attributes that are not or are less sensitive to influence based on the results of the Laverage analysis.

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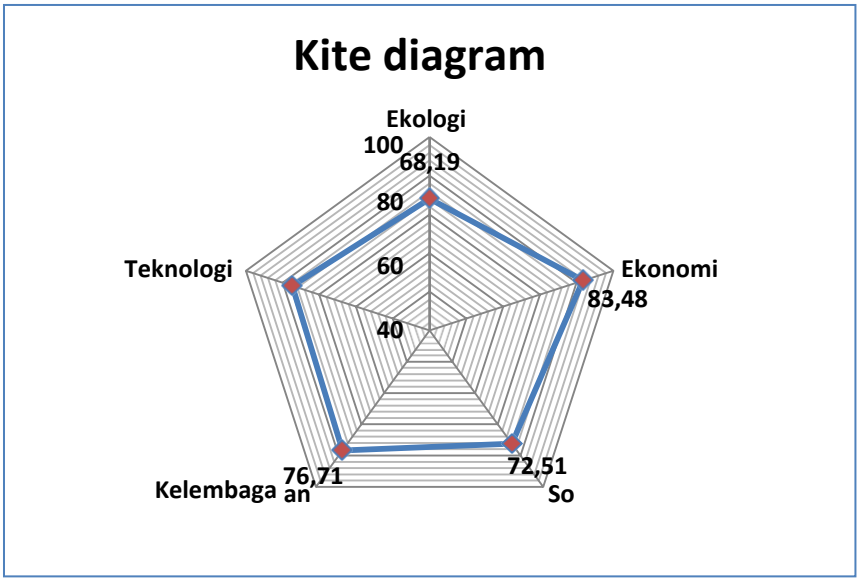

Figure 11. Agribusiness Multidimensional Sustainability Kite Diagram shrimp in Parigi Moutong Regency

In the context of development Shrimp agribusiness in Parigi Moutong Regency, needs benchmarks to determine whether the sustainability status with the support of shrimp resource management has increased or decreased from the management activities carried out, including improvements to attributes in each dimension. One of the benchmarks commonly used to assess regional sustainability in the future is to establish agribusiness sustainability indicators.

Based on needs, this research analyzes the sustainability of shrimp agribusiness with the support of fisheries resources developed through the five dimensions above.

Achieving indicators that support increasing status in the ecological dimension can in principle be achieved by making improvements to the attributes in the ecological dimension, especially attributes that are sensitive to increasing the value of the sustainability index. These attributes include pond productivity, pond management and waste management. Based on this, in an effort to support the development of sustainable shrimp agribusiness, what needs to be done is to maintain and increase the productivity of the pond land, of course there needs to be control efforts by the farmers by monitoring the land, including the quality of the water in the pond and the cleanliness of the pond environment. It is also possible to observe pond waste in the form of water discharge when harvesting is carried out. Of course, by doing these things it is possible to maintain the productivity of the pond land.

Sustainability indicators in the economic dimension can be achieved through improving attributes in the economic dimension. The attributes that need to be addressed immediately are maintaining efforts to increase the income of cultivators in order to anticipate the sustainability of their business. Viewed

from an economic aspect, the main objective of developing shrimp agribusiness is of course with the support of feasibility indicators and profits from the business, of course providing space for them to further develop their business, whether by expanding the cultivation area or equipping it with cold storage facilities (to maintain quality and store the resulting commodities production before sale). Therefore, it is also important that the Government's role is to provide more adequate supporting facilities needed for business activities, so that the quality and quality of the products produced by cultivators can be maintained, including their role in terms of shrimp commodity prices, both at the provider level, including at the collector level. or export traders.

Social dimension, achieving sustainability indicators in this dimension can be achieved by improving attributes such as conflicts of interest, sales security and employment. In the coastal area of Parigi Moutong Regency, with the existence of shrimp cultivation businesses, there are still many conflicts of interest in an area, especially in terms of land use, because most of the existing land is owned by outsiders (not the surrounding community). Therefore, efforts to reduce frequency of conflict between main actors and enforcing common laws or regulations in fisheries resource management. This was done in an effort to increase the index value and sustainability of fisheries resources, especially shrimp. A sustainable shrimp development policy in the Parigi Moutong Regency area is very much needed considering that this area has great potential for development in the fisheries sector. Therefore, the government's role is needed through the creation of fishery resource management regulations so that it can reduce the level of conflict that occurs.

Not to mention the security of sales, because there is intervention from collectors as an extension of the company so that investors who are actually the family of the land owner cannot buy shrimp production from that land. Then the presence of the workforce is mostly not local residents but people employed by the owner who come from outside the area or village where the pond is located.

Sustainability indicators in this institutional dimension can be carried out through the involvement of banks, including fish farming companies and law enforcement. The existence of banks in providing business credit for cultivators is very necessary considering that to develop and expand a business additional capital is needed by each cultivator. However, in general, cultivators still rely on personal capital for their development considering that the land they own is still around 1 – 2 Ha. This includes the existence of pond companies that always prepare shrimp products, of course providing space for farmers to market their cultivated products. The group was formed with the aim of strengthening institutions and human resources, in an integrated manner so that they can manage fisheries resources sustainably, increase productivity and the competitiveness of fishermen (Zakiah, 2011)

Technological dimension, achieving sustainability indicators in this dimension can be achieved by improving attributes such as the level of technological mastery, availability of databases and support for facilities and infrastructure. In the Parigi Moutong Regency area, most of the main actors (shrimp farmers) still use simple technology so that efforts are needed to provide assistance and provide

training in introducing more advanced technology, including the existence of facilities and infrastructure to support fisheries businesses which are still very minimal, such as cold storage (containers).) and TPI in each coastal district. Mastery of technology for the existing workforce is still relatively low and access to fisheries information is still lacking. This condition greatly influences business sustainability in supporting the development of shrimp agribusiness in the future. Human with technological development capabilities it is hoped that it can provide solutions to obstacles in managing fisheries resources aimed at maintain or even increase land productivity so that it can provide high economic value has the potential to increase people's income.

The ability of each attribute to explain and contribute to the sustainability of the system is assessed by looking at the coefficient of determination (R 2) for each dimension analyzed. According to Kavanagh (2001) in Fauzi and Anna (2002), the uncertainty aspect is caused by several factors, including the impact of errors due to lack of information, the impact of variations in scoring due to differences in assessments, errors in data entry and the high stress values obtained. Determining the index value and multidimensional sustainability status of fisheries resource utilization performance is carried out by multiplying the index value for each dimension presented in table 4.1 2.

Rap-VANS Analysis Results for Stress Values and Determination Coefficient (R 2)

Dimensions	Index Value	Stress	R^2	Number of Iterations
Ecology	68.19	0.172	0.936	2
Economy	83.48	0.146	0.958	2
Social	72.51	0.192	0.932	2
Institutional	76.71	0.159	0.952	2
Technology	74.75	0.162	0.947	2

Source: Research Results, 2023

Note: Index value 68.19 .78 - 83. 48 is categorized as fair & goodStress value <0.25 means *goodness of fit*

$R^{2\ value}$ 95% or >95%: very good contribution

The stress value refers to Alder *et al* (2000) *in* Fauzi and Anna, (2002) stating that the stress value is said to be good if the value is smaller than 25% (S<0.25), while the coefficient of determination ($R2^{)}$ shows a very significant value. namely an average of 0.95 with a 95% confidence interval. From the table above, it can be seen that not all dimensions support the sustainability of shrimp cultivation significantly. The two main dimensions that support

sustainability are the economic and institutional dimensions. The accuracy of these dimensions' support for sustainability is proven by the stress values and coefficient of determination obtained. This means that all the attributes that are indicators in this research can reflect the original data or *goodness of fit value* in the MDS, and can explain the condition and sustainability status of shrimp agribusiness on the coast of Parigi Moutong Regency.

Table 4.13 shows that the MDS index value has not changed too much with the *Monte Carlo analysis results* being within the 95% confidence interval. Itcan be ascertained that scoring errors, the influence of score variations, the stability of the repeated MDS analysis process or errors in entering or missing data*have* no influence.

Table 3. Differences in Sustainability Index Values for *Monte Carlo Analysis and* Rap-VANS Analysis

Dimensions	RAPFISH	MONTE CARLO	Difference (MDS-MC)
Ecology	68.19	60.05	8.14
Economy	83.48	81.27	2.21
Social	72.51	70.48	2.03
Institutional	76.71	70.30	6.41
Technology	74.75	66.39	8.36

Source: Research Results, 2023

Management of fisheries resources, especially shrimp, by farmers in the coastal areas of Parigi Moutong Regency based on the five dimensions studied can be said to be in a promising and sustainable condition (good and quite sustainable). Therefore, improvements and efforts to improve attributes that provide high sensitive values and have negative effects must be carried out, so that the index value and sustainability status will be better. The government's efforts to overcome the above problems must be carried out in an integrated and well- coordinated manner by the Parigi Moutong Regency government with interested parties.

CONCLUSION

Sustainability status in supporting the development of sustainable shrimp agribusiness in Parigi Mouton Regency, the five dimensions studied with 53 existing attributes show good and quite sustainable status with an index value of > 50, where the ecological dimension has an index value of 68.94, economic with an index value of 83.48, social which has an index value of 72.51, institutional with an index value of 76.71, and the technological dimension with an index value of 74.75. To improve sustainability status in the future (long term), efforts need to be made to improve several attributes of these 5 dimensions.

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