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MULTI-DIMENSIONAL SUSTAINABILITY ASSESSMENT IN MICRO-BUSINESS OF FIGHTING FISH CULTIVATION DURING PANDEMIC

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ABSTRACT

The economic value of Siamese Fighting fish (Betta splendens) cultivation at the micro-business level has good potential to be developed during this pandemic. Considering the potential of the betta ornamental fish business, not a few parties use this as an alternative solution to the community's income crisis. During the pandemic, many parties engaged as ornamental fish cultivators to become a commodity of economic value, which in the past was usually only fish for complaints and not specifically cultivated to become aesthetic fish. The research objective focuses on assessing multidimensional sustainability in micro-business Betta splendens aquaculture during the pandemic. The data collected in this study include primary data and secondary data. Primary data was collected based on a questionnaire through interviews with micro-business actors of betta fish spread across six villages community associations, while secondary data was collected based on reports, journals, and the results of relevant studies. Data analysis used multidimensional scaling (MDS), leverage test, and Monte Carlo test. The results of the analysis show that two dimensions are categorized as less sustainable, namely business feasibility and business strategy, and three other dimensions, namely market networks, infrastructure, and maintenance and handling categorized as moderately sustainable. Ten sensitive attributes are considered unstable. The conclusion of the five dimensions assessed shows a less sustainable category. Leveraging factors in each dimension can be used as a key to developing a sustainable strategy for micro-business betta fish farming in the future.

KEYWORDS: *Multi-dimensional scalling; Betta fish; Sustainability; Micro-business*

INTRODUCTION

Ornamental fish is one of the fishery commodities which has become a potential trade commodity both domestically and abroad. Ornamental fish can be used as a source of foreign exchange income for the country (Kartamihardja et al., 2017; Khoironi & Saskara, 2017; Ng, 2016). Ornamental fish has its charm to attract ornamental fish lovers (hobbies). Now many consumption fish entrepreneurs are turning to ornamental fish businesses. Maintenance and care for Siamese Fighting fish or Betta fish (Betta splendens) are relatively easy. Not only that, but fish farmers also have tricks in producing color combinations. There are 73 types of betta in the world, of which 52 are spread in public waters in Indonesia. One of the Betta types of ornamental fish that is commonly known in the community is Betta splendens (Nugroho & Hardjomidjojo, 2017; Nur et al., 2022; Panijpan et al., 2020). The production of ornamental fish during the COVID-19 pandemic experienced positive developments. This is indicated by an increase in the number of production and the number of ornamental fish cultivators. Betta fish micro-business actors generally work at home. The average capacity of the number of adult fish cultivated on a micro- business scale is 50-150 individuals. The average turnover is 3 million a month with a selling price per head with a price range of Rp.5 thousand to Rp.30 thousand per head (assuming 1 USD = 14,000 IDR).

Despite the pandemic conditions, the selling price of betta ornamental fish is booming. It has become a business that is in demand by many people. However, the risks and uncertainties of price fluctuations and the sustainability of the micro-business prospects for ornamental fish farming have not been predicted with certainty by micro-business actors. The problems of ornamental fish micro-business actors often appear on the surface such as business feasibility, competitors, market networks, infrastructure and maintenance facilities, and many more.

Lately, especially during a pandemic, the betta ornamental fish business is quite profitable, the segmented market makes the level of competition quite high and competitive. The economic value of ornamental fish cultivation at the micro level has good potential to be developed because in addition to having potential resources, suitable agro-climate, as well as adequate human resources. The betta ornamental fish business was decided on an alternative solution to the community income crisis (Nugroho & Hardjomidjojo, 2017; Sihombing, 2013) so that it was necessary to encourage ornamental fish cultivation to become a commodity of economic value (Hasnidar, 2017; Karimah et al., 2012; Khoironi & Saskara, 2017) for the development of micro-business during this pandemic. Based on the description above, the purpose of writing this paper is to examine the business sustainability of micro-business of betta fish in a multidimensional manner.

Studies on the assessment of sustainable ornamental fish micro-businesses during the COVID-19 pandemic are still quite limited, ornamental fish studies generally only limit the scope of lifestyle, hobbies, and types of classification. This study is quite important and strategic at this time. In the last two years, one of the main orientations of the community during the COVID-19 pandemic was to look for simple business opportunities to fulfill additional income. This study can provide adequate information for micro-business, regarding the prospects for business viability and the sustainability of their micro-businesses. This multidimensional perspective also helps micro-business actors to evaluate plans and or betta ornamental fish that are currently running during this pandemic. The purpose of this research is to focus on the study of the sustainability of the micro-business prospects for betta fish cultivation during the pandemic in a multidimensional manner.

MATERIALS AND METHODS

Method of collecting data

The data collected in this study include primary data and secondary data. Primary data was collected based on interviews with micro-scale ornamental fish business actors, and interviews with key informants who became betta fish breeders for commercialization. Meanwhile, secondary data is collected based on reports, journals, and the results of studies from various related agencies. The method of determining respondents is purposive. The determination is related to the characteristics of homogeneous ornamental fish micro-business actors such as business scale, products produced, to the application of simple aquaculture technology. The number of betta fish breeders is known as many as 56 people, but truly consistent breeders are fewer, around a dozen. In addition, the consideration of easy access and the limitations of researchers became the basis for selection (convenience sampling). As an illustration of the condition, traditional betta fish breeders in the city of Bogor, West Java province, generally operate at home. The location is spread out in a narrow alley. So the researchers took a sampling that is easy to access and affordable with a small vehicle.

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In this study, the actors involved in the commercialization of betta fish are micro-business who sell their fish in homes or not at kiosks with a business scale of under 100 adult fish. The selection of micro-business was carried out using a simple random sampling system and 12 betta fish micro-business were selected from six villages (VL) or sub-rural (*rukun kampung*). Data were collected from interviews using a semi-structured questionnaire designed to measure the attributes of each indicator on an ordinal scale, from 0 to 10 (Coll et al., 2013).

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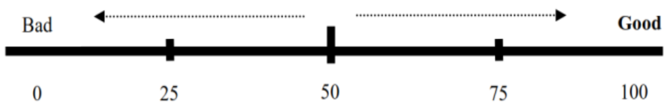
Data analysis method

Data processing conducted using the software tool Rapfish (Rapid Appraisal for Fisheries) version 2.0 based on Microsoft Excel. Data analysis carried out qualitatively and quantitatively. The qualitative analysis is the descriptive analysis of sustainability, while the quantitative analysis is the Rap-Betta analysis (a modification of Rapfish), leverage analysis, and Montecarlo analysis. These two analyzes are presented simultaneously and are interrelated in the discussion. The Detection of the level of sustainability used in Multidimensional Scaling (MDS). MDS is a multivariate statistical analysis method that determines the position of a concept based on its similarity or dissimilarity to other principles or concepts. Where, data analysis techniques that display conceptual similarities in the form of geometric images based on the Euclidean distance between concepts, based on questionnaire responses (Borg & Groenen, 2013; Sukwika et al., 2016) . This analysis is carried out through three stages, namely (Pitcher et al., 2013): (a) Determination of the dimensions of sustainability, in this case the prospects for the sustainability of the micro-business of betta ornamental fish cultivation during the pandemic which includes five dimensions: business feasibility, business actor strategies, market networks, infrastructure, maintenance and handling. Each dimension is then measured using an attribute score. (b) The assessment of each attribute on an ordinal scale is based on the sustainability criteria of each dimension. Respondents used scientific judgment to determine the attributes of each dimension. (c) Finally, this method is used to calculate the sustainability index and analyze the sustainability status.

In the MDS method, the position of the sustainability point can be visualized through the horizontal and vertical axes. Through rotation, the position of the point can be visualized on the horizontal axis with the values of the sustainability index scores. The estimated score for each dimension is stated from the lowest score (unsustainable) 0% to the best (sustainable) 100% (see Figure 1), and is grouped into four categories namely; 0-25.00% (poor or unsustainable), 25.01-50.00% (less sustainable), 50.01-75.00% (moderately sustainable), and 75.01-100.00% (very sustainable). The sustainability index includes the value of each dimension to describe the level of total sustainability. Table 1 describes the index and ranking.



Source: Pitcher & Preiksho, 2001; Sukwika et al., 2016

Figure 1. The value of the sustainability index score is 0% (bad) - 100% (good)

Sustainability index values in each dimension can be visualized simultaneously using a kite diagram. The symmetry of the kite diagram is determined by the sustainability index of each dimension (business feasibility, business actor strategy, market network, infrastructure, maintenance and handling). Next, the kite diagram displays the sustainability index values for each dimension.

Table 1. Sustainability status value categories

Index	**Category**
00,00 - 25,00	Poor Sustainable
25,01 - 50,00	Less Sustainable
50,01 - 75,00	Moderately Sustainable
75,01 - 100,00	Very Sustainable

Source: Pitcher & Preiksho, 2001; Sukwika et al., 2016

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The sensitivity analysis provides further information on the MDS and the sustainability index of the betta micro-business aquaculture. The sensitivity analysis shows which attributes contribute to the sustainability value of the resource. This sensitivity analysis uses leveraged attributes to assess changes in the analytical output of the MDS. The effect of each attribute is observed on changes in the root mean square (RMS), especially on the x-axis for the sustainability scale with extreme values or at least RMS worth 2.00 (Sukwika et al., 2016). The RMS formula is as follows (Borg & Groenen, 2013; Ding, 2018):

$$RMS = \sqrt{\left[\frac{\sum_{i=1}^{n}\{Vf(i,1)-Vf(,1)\}^2}{n}\right]} \qquad (1)$$

Description: Vf (i,1) = MDS output value (after rotation and flipping) Vf (,1) = MDS output median in column-1.

Monte Carlo analysis evaluates the effect of error by assessing ordination. The effect of errors can caused by various conditions, including errors in assessment due to imperfect understanding of attributes or field conditions, variations in scores from different opinions or assessments of researchers, repeated MDS analysis processes, errors in data input or missing data, iteration stability, and high-stress value (acceptable stress value should < 25%) (Borg & Groenen, 2013; Sukwika et al., 2016).

In the process of ordination analysis (the output is an index value), it is possible for an error to occur so it is necessary to evaluate the effect of the error. The Monte Carlo simulation approach can used to test the validity and accuracy. Sometimes there is an error in the Monte Carlo analysis. It can caused by several factors, including the impact of scoring errors due to lack of information, the impact of diversity in scoring due to differences in assessment, errors in data input, and high-stress scores obtained (Borg & Groenen, 2013; Ding, 2018). The results of the Monte Carlo simulation compared with the ordinance (95% confidence interval) have a small difference. It means that the error in scoring on each attribute and the error in the analytical method procedure are tiny. In other words, errors in the analysis can minimized both in terms of scoring each attribute, and variations in scoring. Kavanagh and Pitcher (2004) and Sukwika et al. (2016) state that the results of MDS (Multi-dimensional Scaling) and MC (Monte Carlo) are said to be accurate if the difference between the two is not more than 2 per cent. Sukwika et al. (2016) re-emphasize that although the confidence interval used is 95%, it recommends that the difference between MDS and MC results be lower, which is no more than 1 per cent because the smaller the error, the better or closer to validity/accuracy.

Meanwhile, Dwikora (2012) said that the results of the Monte Carlo analysis were at a 98% confidence level to obtain a maximum difference of 2% in MDS and MC results. Pitcher et al. (2013) provide a perspective that if the results of the Monte Carlo simulation do not change significantly or have a small difference in the ordinance value, it can be concluded that the ordinance results have been able to overcome random errors.

The Goodness of fit on the MDS is indicated by the magnitude of the S-Stress value which is calculated based on the values of S and R^2. A lower stress value indicates a good fit while a higher S value indicates the opposite. In the Rap-Betta approach, the good model contains a stress value of less than 0.25 or $S<0.25$ (Borg & Groenen, 2013; Ding, 2018), and the relatively better model has an R2 close to 1.0.

3. RESULTS AND DISCUSSION

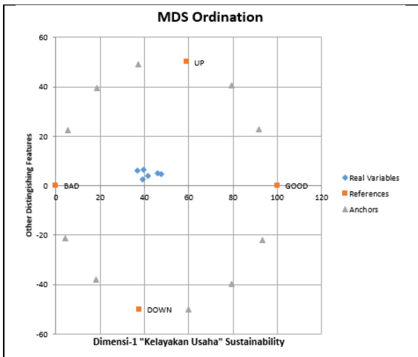
Multidimensional assessment

Based on the results of the MDS Rapfish 2.0 assessment, a description of the existing conditions of various sustainability statuses from each aspect of the dimensions measured includes: (1) Business feasibility, (2) Strategy of business actors, (3) Market network, (4) Infrastructure, (5) Maintenance and handling. The full explanation is presented in the following description.

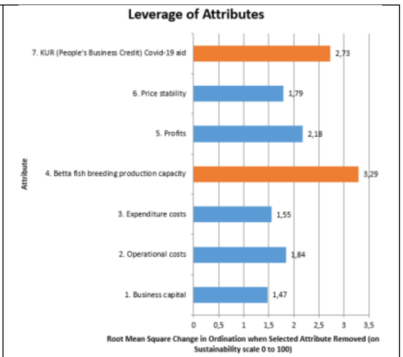
Dimension-1: Business Feasibility

The analysis of Rap-Betta shows that the sustainability index for the feasibility dimension is 41.75 (Figure 2a). This shows that the dimension of business feasibility is "less sustainable". The main factors that contribute to the unsustainable dimension are attributes that have the largest RMS (root mean square) values or are considered sensitive attributes in the business feasibility dimension (Figure 2b). For control, it must be handled or intervened with a plan or policy. It known that the sensitive attributes with the largest RMS are KUR (people's business credit) Covid-19 Aid (RMS = 2.73) and the production capacity of betta fish (RMS = 3.29).

Lam & Pitcher (2012) stated that the government needs to respect the local business culture, not only that but the government is also encouraged to institute social subsidies to support local micro-business that have maintained ornamental fish micro-businesses. The existence of financial assistance to strengthen micro-business actors so that they can change business viability for the better. Another form of encouragement is increasing the management capacity of fish farmers, which can directly increase the income of business actors and operational costs (Andriani et al., 2011; Ng, 2016). Furthermore, the obstacle for ornamental fish micro-business actors is related to the production capacity of ornamental fish breeds, where generally business actors are not able to manage aquaculture production optimally both in quality and quantity. Sometimes, it is not following the prevailing ornamental fish market demand (Anwar, 2019).



(a)



(b)

Figure 2. Sustainability index diagram (a) sensitive attributes (b) business feasibility dimensions

Dimension-2: Business Actor Strategy

This study shows that the strategic dimension of business actors has an average value of 40.48. This position is above the midpoint between unsustainable and moderately sustainable (Figure 3a). Thus, the strategic dimension of business actors categorized as “less sustainable” based on the value of the sustainability index. Of the seven attributes in the strategic dimensions of business actors, two sensitive attributes considered to have the most contribution to the sustainability status, namely price discounts on betta fish commodities (RMS = 3.82) and the diversity of betta fish species owned by sellers (RMS = 4). 51) (Figure. 3b).

Betta fish are very susceptible to bacteria which can cause the fish to become sick or even die. The emergence of bacteria can be due to food factors, contracting from other fish infected with bacteria, aquarium water conditions, and a humid and stuffy environment. So the anticipation when the disease attacks the betta fish must provide good medicine to avoid a worse situation. Betta breeders provide antifungal, antibacterial, and vitamin drugs to maintain the health and stamina of betta fish every week. Khoironi and Saskara (2017) found information that in addition to the price factor of ornamental fish medicine being more expensive than the price of ornamental fish itself, there is also a factor in the largest operational expenditure costs such as electricity. The ornamental fish price is determined by production costs and fluctuating selling prices (Nugroho & Hardjomidjojo, 2017). This marketing problem is a series of transactions that are not profitable for betta fish micro-business actors.

Historically, ornamental fish then became a commodity, starting from the interaction process of ornamental fishery enthusiasts. Then followed by emerging market demand, ornamental fish breeding technology, and the micro-business of the growing ornamental fish market (Lam & Pitcher, 2012). The attractiveness of betta fish consumers is largely determined by the collection of the diversity of betta fish species owned by betta fish sellers. Therefore, a strategy for betta ornamental fish business actors is needed, starting from the selection of brooders, the spawning process, the maintenance of eggs and larvae as well as fry and feeding (Florindo et al., 2017; Ng, 2016; Srikrishnan et al., 2017).

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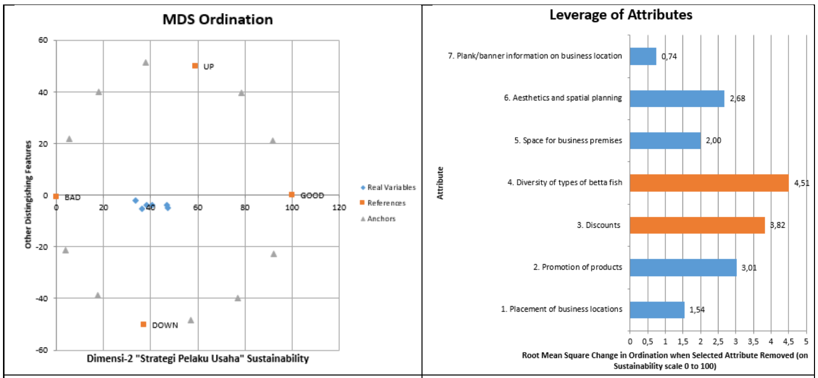


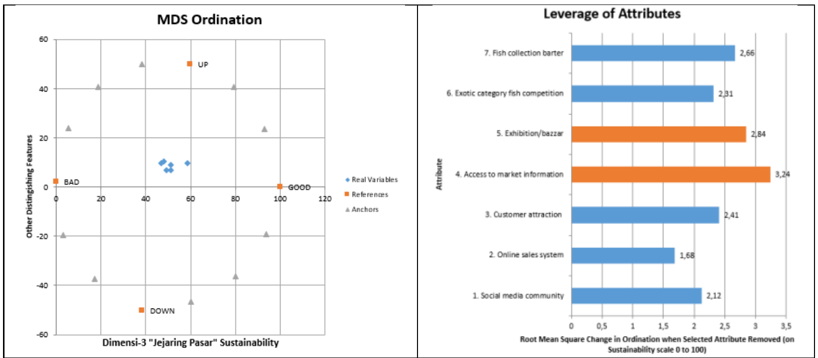
(a)	(b)

Figure 3. Sustainability index diagram (a) sensitive attributes (b) dimensions of the strategy of business actors

Dimension-3: Market Network

This study shows that average of sustainability index on the market network dimension is 50.87 (Figure 4a), so it is considered “moderately sustainable”. This score driven by the inability on adequately empower human resources and the low participation in betta fish events. There are two most sensitive attributes, both of which must receive attention to increase the sustainability value of the market network dimension, namely access to market information (RMS=3.24), exhibitions or bazaars (RMS=2.84) (Figure 4b).

Social media associations can play a role in increasing knowledge and access of ornamental fish micro-business actors to market information. This knowledge and market access relate to the development of the betta ornamental fish market and the dynamics of consumers of betta ornamental fish fans (Hendrizal et al., 2021). According to Lam and Pitcher (2012), the value of fish breeding culture is distinguished from the common property because the owners are intergenerational. Meanwhile, resource owners as well as community members whose relationships with fish maintain ecological integrity and culture or hobbies. Furthermore, its relation to increasing the sustainability of the market network dimension can be pursued in several ways, including promoting the participation of micro-business actors for betta ornamental fish commodities, increasing opportunities to introduce superior ornamental fish products, and building networks through access to market information.



(a) (b)

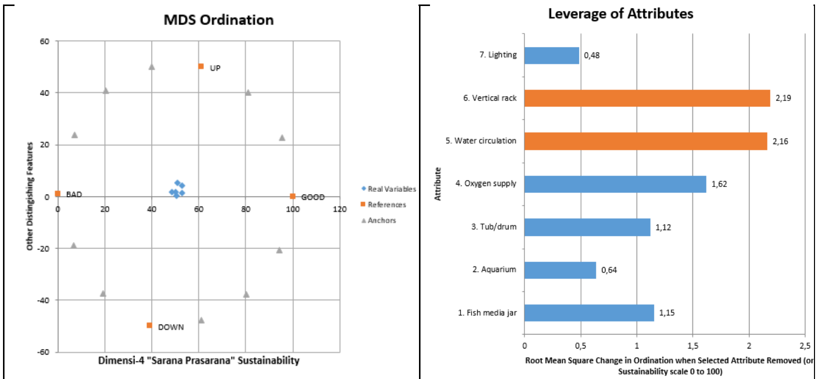
Figure 4. Sustainability index diagram (a) sensitive attributes (b) market network dimensions

Dimension-4: Infrastructure

The infrastructure dimension has a value of 50.94, indicating a “moderately sustainable” index score (Figure 5a). Of the 7 attributes on the dimensions of infrastructure (Figure 5b), the most sensitive attributes are water circulation facilities (RMS=2.19), availability of vertical shelves (RMS=2.16). To increase the sustainability index in this aspect, betta micro-business actors need to increase the number of vertical shelves so that the arrangement of betta fish jars is more space efficient and space effective.

The results of research by (Yulianto et al., 2014) stated that the condition of poor water circulation facilities affects the water quality for betta fish. The availability of recirculation system facilities determines the survival rate so it is useful for increasing the production value of betta micro-business actors.

Betta fish have an aggressive and aloof character, especially male betta fish which have a more beautiful body shape and color pattern, and have economic value than females (Awaludin et al., 2020; Ferdian & Fitrani, 2017; Florindo et al., 2017; Panijpan et al., 2020; Waisapy et al., 2021). For this reason, betta fish are usually placed in separate jars. The obstacle faced by micro-business actors for betta fish is the need for vertical shelves to place jars of betta fish. The unavailability of vertical racks causes the betta fish to be put together in one reservoir. As a result, male betta fish have the potential to compete with each other so that some die or are physically disabled.



(a) (b)

Figure 5. Sustainability index diagram (a) sensitive attributes (b) dimensions of infrastructure

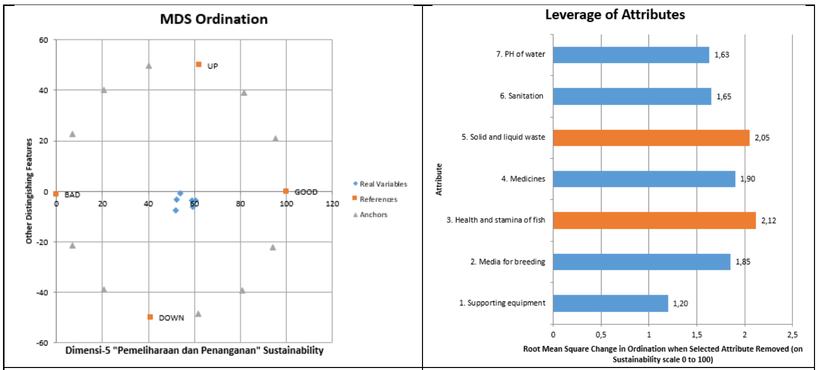
Dimension-5: Maintenance and Handling

The dimensions of maintenance and handling are measured to determine the performance of betta micro-business actors in 6 VL (Village). The sustainability index value of the maintenance and handling dimension based on the Rap-Betta analysis was 56.12, indicating a “moderately sustainable” index score (Figure. 6a). There are two attributes in the maintenance and handling dimensions that are the most sensitive, namely solid and liquid waste (RMS=2.05), health and stamina in betta fish (RMS=2.12) (Figure 6b).

The ability of ornamental fish micro-business actors to maintain health and stamina is very limited. Especially the limited ability of breeding to reach adult betta fish that are ready to be sold. In certain cases, the success of micro-business in treating betta fish to maintain their health and stamina is highly dependent on their experience and knowledge (Florindo et al., 2017; Ng, 2016; Srikrishnan et al., 2017).

Cleaning the aquarium, as well as feeding it regularly but not excessively, doesn't keep your betta fish far away from diseases that can kill them. Under certain conditions, according to Khoironi and Saskara (2017) as a more effective and efficient measure, if it is found that ornamental fish are infected with the disease, the ornamental fish are not quarantined and treated, instead dispose of them immediately rather than spreading the disease to other fish. Furthermore, solid waste that sinks into the pond can interfere with the betta fish hatchery and rearing process and ultimately interfere with the betta fish production process (Amparyup et al., 2020; Florindo et al., 2017; Ng, 2016; Srikrishnan et al., 2017; Yulianto et al., 2014).

The overall results of the leverage analysis on five dimensions yield 10 attributes that have a substantial impact on betta fish farming micro-business during a pandemic in a sustainable manner (see Table 2). These values were chosen based on the most extreme RMS (root mean square) value among the RMS with a minimum value of 2.00. These leveraging factors are important for developing a model for the sustainability of a prospective betta ornamental fish farming micro-business during a pandemic.



(a) (b)

Figure 6. Sustainability index diagram (a) sensitive attributes (b) maintenance and handling dimensions

This leveraged analysis approach is considered a practical decision support tool to identify scenarios for the management of ornamental fish farming micro-business (Rossetto et al., 2015), thus providing a good compromise between aspects of business feasibility, business actors' strategies, market networks, infrastructure, maintenance and development. handling of environmental, economic and social problems (Ng, 2016).

Validity and Accuracy Test

In this study, Monte Carlo analysis was used as a simulation method to evaluate the impact of random error on statistical analysis. Table 2 contains the results of Multidimensional Scaling (MDS) and Monte Carlo (MC). The results of the analysis of the validity of the Monte Carlo test at the 95% confidence level are generally below 1.00%. That is, the sustainability index value obtained by MC does not experience much different from the results of the Rap-Betta analysis. It means that the MDS analysis model is adequate to estimate the value of the sustainability index of the betta micro-business during the pandemic. A small validity value indicates a minimal error from data acquisition and analysis and does not compromise the results of this study (Sukwika et al., 2016).

On the other hand, the results of the Monte Carlo simulation can help betta fish micro-business actors in determining strategies. For example, to find out more realistic business-worthiness expectations. Wang et al. (2012) and Janssen (2013) believe that simulations with Monte Carlo analysis can be used as a reliable tool for business actors in analyzing risks and uncertainties, especially those related to financing for the sustainability of ornamental fish farming businesses.

The results of the MDS analysis accuracy test (good and fit) obtained a coefficient of determination (R^2) between 91.66% - 93.73%. This means that the attributes in the dimensions measured are able to explain the value of R^2 obtained in the sustainability system under study. The value of R^2 shows greater than 80% or close to 100%, so it is considered good category (Borg & Groenen, 2013; Ding, 2018; Sukwika et al., 2016). The resulting stress value is 0.192 - 0.226, or the range of stress values is still below 0.250. That is, the results obtained from the MDS analysis are very accurate (good and fit) reflect the actual data, and are sufficient to assess the sustainability index (Borg & Groenen, 2013; Pitcher et al., 2013; Sukwika et al., 2016). Table 3 contains the stress coefficient of determination from the Rap-Betta analysis.

Table 2. Differences in the value of the sustainability index and the Monte Carlo result of Rap-Betta

DIMENSIONS	MDS VL1	MC	Differ-ence	MDS VL2	MC	Differ-ence
[1] Business feasibility	36.73	36.92	0.19	47.49	47.12	0.37
[2] Strategies of business actors	38.30	37.54	0.76	46.86	47.01	0.15
[3] Market network	51.27	51.18	0.10	58.42	58.49	0.06
[4] Infrastructure	50.10	50.05	0.05	52.80	52.53	0.26
[5] Maintenance and handling	52.05	51.95	0.09	58.87	58.83	0.05
Average	**45.69**	**45.53**	**0.24**	**52.89**	**52.80**	**0.18**
DIMENSIONS	MDS VL3	MC	Differ-ence	MDS VL4	MC	Differ-ence
[1] Business feasibility	41.78	41.92	0.14	39.16	38.93	0.23
[2] Strategies of business actors	40.56	41.25	0.70	33.58	34.49	0.91
[3] Market network	51.38	51.50	0.13	46.92	46.97	0.05
[4] Infrastructure	48.40	48.05	0.35	50.67	50.57	0.10
[5] Maintenance and handling	52.33	51.86	0.47	59.15	59.47	0.32
Average	**46.89**	**46.92**	**0.36**	**45.90**	**46.09**	**0.32**
DIMENSIONS	MDS VL5	MC	Differ-ence	MDS VL6	MC	Differ-ence
[1] Business feasibility	45.88	45.89	0.01	39.43	38.83	0.60
[2] Strategies of business actors	47.15	47.69	0.54	36.44	35.52	0.91
[3] Market network	49.11	48.86	0.25	48.12	48.32	0.20
[4] Infrastructure	52.69	52.72	0.03	50.99	51.04	0.05
[5] Maintenance and handling	54.02	54.05	0.03	60.31	60.32	0.01
Average	**49.77**	**49.84**	**0.17**	**47.06**	**46.81**	**0.36**

Table 3. Index, stress and determination (R^2) value from Rap-betta

Parameter	**Dimensions**					
	[1] Business feasibility	[2] Strate-gies of business actors	[3] Market network	[4] Infra-struc-ture	[5] Mainten-ance and handling	Ave-rage
Index *value* *	41.75	40.48	50.87	50.94	56.12	48.03
Stress *value* **	0.209	0.192	0.210	0.226	0.226	0.213
R^2 ***	93.06	93.75	92.72	91.86	91.66	92.61
Iteration	2.00	2.00	2.00	2.00	2.00	2.00

Note: *) Index value 50,01-75,00 moderately sustainable. **) Stress value < 0,25 is good of fit. ***) R^2 95% or > 80% is a contribution of excellence

Kite Diagram

Based on the analysis of the value of the sustainability index of the five dimensions, Figure 7 illustrates a kite diagram of the sustainability of the micro-business of betta ornamental fish cultivation during the pandemic. Figure 7 shows that the business viability and strategy of business actors are “less sustainable” at 41.75% and 40.48%, respectively. The other three dimensions, namely market networks, infrastructure, and maintenance and handling, are “moderately sustainable” with sustainability indexes of 50.87%, 50.94%, and 56.12%, respectively.

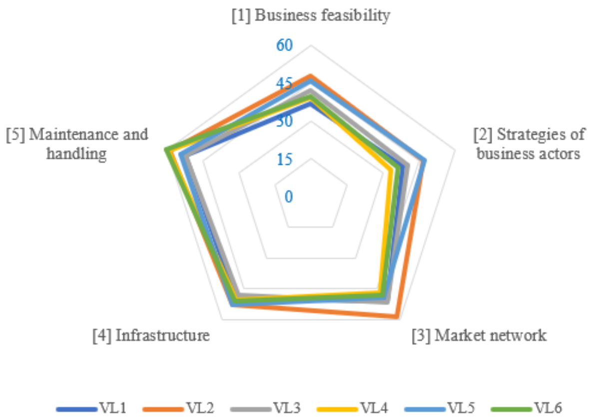


Figure 7. Kite diagram based on Rap-Betta analysis results

CONCLUSION

Simultaneously, the five dimensions that were built to measure the prospects for the sustainability of betta fish farming micro-businesses during the pandemic were categorized as less sustainable. More specifically, based on measurements of each dimension, it is known that there are two dimensions categorized as less sustainable, namely business feasibility and business actor strategies. The other three dimensions, namely market networks, infrastructure, and maintenance and handling, are categorized as moderately sustainable.

There are ten dominant leverage factors considered sensitive or unstable factors in the measurement of the prospects for the sustainability of the betta micro-business during the pandemic. Leveraging factors in each dimension can be used as a key to formulating a sustainable strategy for micro-business betta fish cultivation in the future.

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