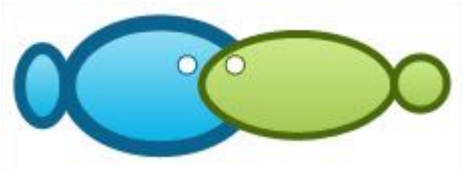

Evaluation of aquaculture development in the minapolitan area of Merangin Regency, Jambi Province, Indonesia

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Abstract. Merangin Regency is one of the aquaculture development areas located in the Minapolitan area of Jambi Province, Indonesia. In order for the development of aquaculture to run well and sustainably, it is necessary to evaluate various aspects of development, among others; physical, economic, institutional, and technological aspects. The main objective of this research is to evaluate the status of the sustainability of aquaculture development in the Minapolitan area of Merangin Regency and to find out the factors that influence it. The data collection method was carried out by using a structured interview method with the help of a questionnaire to 493 fish farmer households. Data were analyzed by multidimensional scaling (MDS) and leverage analysis, using RAPFISH software. This study has succeeded in evaluating the status of the sustainability of aquaculture development in the minapolitan area of Merangin Regency. The average index obtained by all fish farmer households from all assessed aspects is in the range 50.10-75.00 with a fairly sustainable status. Catfish farmer households obtained the highest average index of 53.33, pangas catfish farmer households obtained the lowest average index of 51.17, tilapia farmer households obtained an average index of 52.00, and gourami farmer households obtained an average index of 51.80. The physical aspect is the strongest aspect in encouraging the development of aquaculture in the minapolitan area of Merangin Regency with an average value of 59.89. Meanwhile, the institutional aspect is the weakest aspect among other aspects with an average value of 45.05. There are 8 sensitive attributes from all aspects that can be leveraging factors for the index of the sustainability of aquaculture in the minapolitan area of Merangin Regency, namely; the threat of natural disasters, knowing market prices, number of group members, useful training, personal assistance, group assistance, utilization of technology, and network availability.
Key Words: fish, management, stakeholders, sustainability, welfare.

Introduction. Minapolitan is a regional-based conception of marine and fisheries economic development based on the principles of integration, efficiency, quality, and acceleration (KKP 2010). Minapolitan areas are developed through the formation of fisheries activities with a sustainable agribusiness system that includes production, processing and marketing, as well as environmental services as a partnership system in an area (Rosdiana et al 2014). In general, the minapolitan program in Indonesia aims to improve the economic capacity of micro-scale communities, increase the number and quality of medium and upper-scale businesses so that they are highly competitive, and increase the fisheries sector to become a driver of the national economy (Raissa et al 2014). The concept of sustainable development is developed to meet the needs of today's life by considering the fulfillment of the needs of future generations (FAO, SDG 2017). Sustainable development contains two important ideas, namely the idea of needs and limitations. The notion of necessity is an essential need that continues human life. The idea of limitations originates from the condition of technology and social organization on the ability of the environment to meet present and future needs (Valenti et al 2018). The development of a minapolitan-based fishery area involves many parameters relating to the determination of natural resources, the availability of human resources, and the

accuracy of technology selection (Cahya & Mareza 2013; Wulanningrum & Jayanti 2016; Suharyatun et al 2018).

Merangin Regency is one of the developing areas for minapolitan aquaculture. The location for the development of aquaculture areas in Merangin Regency includes Pamenang Barat, Pamenang Selatan, Sungai Manau, Lembah Masurai, Tabir Lintas, and other districts as driving areas. The Regency is a center of aquaculture for catfish (*Clarias gariepinus*), tilapia (*Oreochromis niloticus*), pangas catfish (*Pangasianodon hypophthalmus*), and gourami (*Osphronemus goramy*). The fishery cultivation program in the minapolitan area of Merangin Regency refers to the regional master plan which contains several policies and strategies for managing fisheries potential. There are several strategies as an effort to develop the minapolitan area, namely; development of human resources, capital, people's economic institutions, fisheries sector business and technology, infrastructure and a conducive business climate (Pemkab Merangin 2014). The problem of the minapolitan program in Merangin Regency so far is that the evaluation of the success of the minapolitan program has not been optimal. Therefore a precise and comprehensive evaluation is needed. The evaluation of the minapolitan program includes several aspects, namely; physical, economic, institutional, and technological. Evaluation is a series of activities with the aim of measuring the level of success of a program (Wahyuni et al 2013). Evaluation of the minapolitan program in Merangin Regency is a process in providing various information about the extent to which the minapolitan program's objectives have been achieved and how the level of benefits obtained by the local community. Given the importance of the minapolitan program in improving the welfare of the community, it is necessary to evaluate the aquaculture development program in the minapolitan area that is currently running in order to determine the next development model in the future.

Material and Method

Description of the study sites. This research was conducted in Merangin Regency, Jambi Province, Indonesia from October 2020 to March 2021, which is located between 101032'11"-102050'00" East longitude and 1028'23"-1052'00" South latitude. This Regency can be easily accessed by a flight from Jakarta City to Jambi City, Indonesia, which takes about 1.5 hours. Then from Jambi City, proceed by road to Merangin Regency with a travel time of about 4 hours.

Data collecting method. Respondents were selected by purposive sampling method where sampling was carried out by determining certain criteria. The main purpose of the sampling is to produce a sample that can logically be considered representative of the population (Etikan et al 2016). The criteria for respondents in this study were households who worked as farmers of catfish, tilapia, pangas catfish, and gourami in five districts in the minapolitan area of Merangin Regency, namely; Pamenang Barat, Pamenang Selatan, Sungai Manau, Lembah Masurai, and Tabir Lintas. The number of respondents in this study was 493 fish farmer households. The household consisted of 327 catfish farmers, 97 tilapia fish farmers, 46 pangas catfish farmers, and 23 gourami fish farmers. The data was collected using a structured interview method with the help of a questionnaire. The questionnaire consists of 4 aspects of development, namely; physical, economic, institutional and technological aspects. The physical aspect consists of 7 assessment attributes, the economic aspect consists of 8 assessment attributes, the institutional aspect consists of 7 assessment attributes, and the technological aspect consists of 6 assessment attributes. Each attribute contains a statement that is scored from good to bad (4-1) (Table 1). This questionnaire serves to evaluate aquaculture activities in minapolitan areas in Merangin Regency. In the field interview, each respondent was asked about each of the attributes contained in the questionnaire. Each response was assessed by the interviewer using a predetermined scale. The data that had been collected from all respondents were checked, coded, and tabulated into a Microsoft Excel spreadsheet. The data in Microsoft Excel was then stored as a comma-separated value (CSV) file for further analysis (Kavanagh & Pitcher 2004).

Table 1

Aspects, attributes, and scores of the sustainability of fish farmers in the minapolitan area of Merangin Regency

Aspects	*Attributes*	*Scores* *Good (4) - Bad (1)*
Physical	1. Market location (Kurniati & Jumanto 2017);	4, or 3, or 2, or 1
	2. Market availability (Kurniati & Jumanto 2017);	4, or 3, or 2, or 1
	3. Threat of natural disasters (Kurniati & Jumanto 2017);	4, or 3, or 2, or 1
	4. Land ownership (Ningsih & Asriani 2016);	4, or 3, or 2, or 1
	5. Facilities and infrastructure (Kurniati & Jumanto 2017);	4, or 3, or 2, or 1
	6. Sanitation (Kurniati & Jumanto 2017);	4, or 3, or 2, or 1
	7. Availability of water (Kurniati & Jumanto 2017).	4, or 3, or 2, or 1
Economy	1. Agribusiness motivation (Kurniati & Jumanto 2017);	4, or 3, or 2, or 1
	2. Entrepreneurial character (Kurniati & Jumanto 2017);	4, or 3, or 2, or 1
	3. Long term planning (Kurniati & Jumanto 2017);	4, or 3, or 2, or 1
	4. Know the market price (Kurniati & Jumanto 2017);	4, or 3, or 2, or 1
	5. Side business (Ningsih & Asriani 2016);	4, or 3, or 2, or 1
	6. The desire to save (Kurniati & Jumanto 2017);	4, or 3, or 2, or 1
	7. Source of capital (Ningsih & Asriani 2016);	4, or 3, or 2, or 1
	8. Quality improvement (Kurniati & Jumanto 2017).	4, or 3, or 2, or 1
Institutional	1. Institutional roles (Hikmah & Purnomo 2012);	4, or 3, or 2, or 1
	2. Group assistance (Yagus et al 2015);	4, or 3, or 2, or 1
	3. Personal assistance (Yagus et al 2015);	4, or 3, or 2, or 1
	4. Useful training (Alatas 2018);	4, or 3, or 2, or 1
	5. Number of group members (Pertiwi et al 2018);	4, or 3, or 2, or 1
	6. Member activeness (Pertiwi et al 2018);	4, or 3, or 2, or 1
	7. Instructor role (Kamuli 2014).	4, or 3, or 2, or 1
Technology	1. Access to technology (Cahya & Mareza 2013);	4, or 3, or 2, or 1
	2. Technology media (Pertiwi et al 2018);	4, or 3, or 2, or 1
	3. Network availability (Cahya & Mareza 2013);	4, or 3, or 2, or 1
	4. Utilization of technology (Cahya & Mareza 2013);	4, or 3, or 2, or 1
	5. Application of technology (Cahya & Mareza 2013);	4, or 3, or 2, or 1
	6. Availability of tools (Wibowo et al 2015).	4, or 3, or 2, or 1

Statistical analysis. Data were analyzed using Rapfish software (Pitcher & Preikshot 2001; Pitcher et al 2013). The data that has been inputted into the Rapfish software will be analyzed by multidimensional scaling (MDS) and leverage analysis. MDS analysis is used to determine the status of the sustainability of aquaculture development in the minapolitan area of Merangin Regency. The assumption is that the higher the index value obtained, it shows that fish farmer households have a better portfolio. The index is visualized in the form of scatterplots for each aspect with each fish farmer household represented by plot points spread across MDS. In reading these scatterplots, the x-axis displays the position of each fish farmer household on a scale of 0 (unsustainable) to 100 (very sustainable) then the y-axis displays the differences between fish farmer households at the same status but with a combination of scores that are different in each attribute. The farther to the right of the fish farmer household position, the better the index value and status will be obtained. Then the index that has been generated by the MDS of all the aspects that have been obtained by fish farmer households is displayed in the form of a radar diagram. The determination of the sustainability status uses a predetermined scale, where the index value in the range 0.00-25.00 is categorized as unsustainable, the range 25.10-50.00 is categorized as less sustainable, the range 50.10-75.00 is categorized as fairly sustainable, and the range 75.10-100.00 is categorized as very sustainable (Pitcher & Preikshot 2001). Leverage analysis will display sensitive attributes that can be levers to increase the index value of the measured aspects (Pitcher et al 2013; Vatria et al 2019). Sensitive attributes are inhibiting or driving factors that can be taken into consideration to increase the sustainability status of

the aquaculture development. The results of the leverage analysis are displayed in the form of a bar chart. In the bar chart, there will be attributes that make up each of the analyzed aspects. To determine sensitive attributes, it is done by sorting out attributes that have a root mean square (RMS) change of more than half the value scale on the x-axis.

Results

Evaluation on physical aspects. The evaluation results on the development of aquaculture in the minapolitan area of Merangin Regency through MDS analysis on the physical aspect show that there is a diversity of sustainability indices obtained by each fish farmer household. Catfish farmer households obtained the highest index, namely; 64.06, pangas catfish farmer households obtained the lowest index, namely; 57.89, tilapia farmer households obtained an index of 58.49, and gourami farmer households obtained an index of 59.13. Based on the results of the analysis, all fish farmer households are in the range of 50.10-75.00 with a fairly sustainable status (Figure 1).

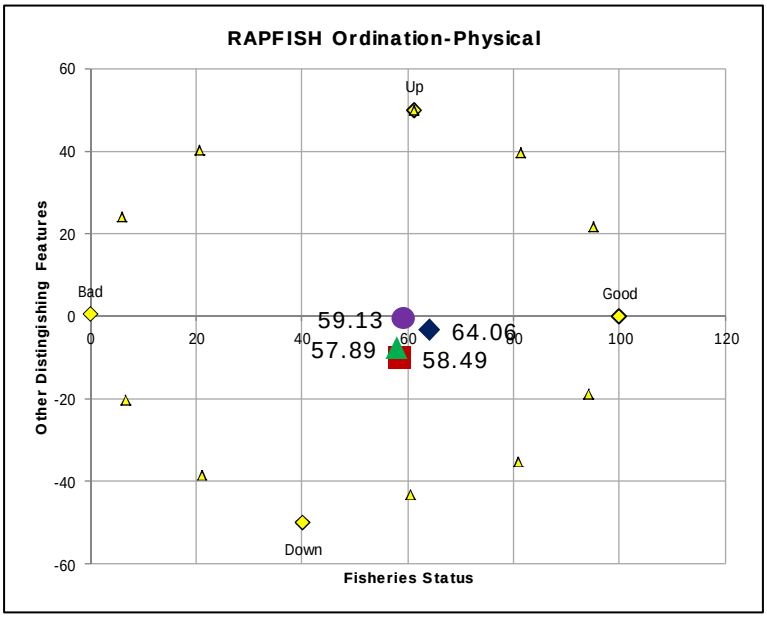

Figure 1. The score of each fish farmer from MDS projected on a bad (0) to good (100) x-axis for the analysis of the physical aspect. The y-axis shows the similarity/dissimilarity scores. Catfish farmer's scores are displayed as blue diamonds, tilapia farmers are red squares, pangas catfish farmers are green triangles, and gourami farmers are purple circles.

Evaluation on economic aspects. The results of the MDS analysis in the economic aspect in Figure 2 describe that all fish farmer households obtain an index that is not too different. Catfish farmer households obtained the highest index, namely; 53.36, pangas catfish farmer households obtained the lowest index, namely 50.83, tilapia farmer households obtained an index of 53.30, and gourami farmer households obtained an index of 51.05. The index obtained by all fish farmer households is in the range 50.10-75.00 with a fairly sustainable status (Figure 2).

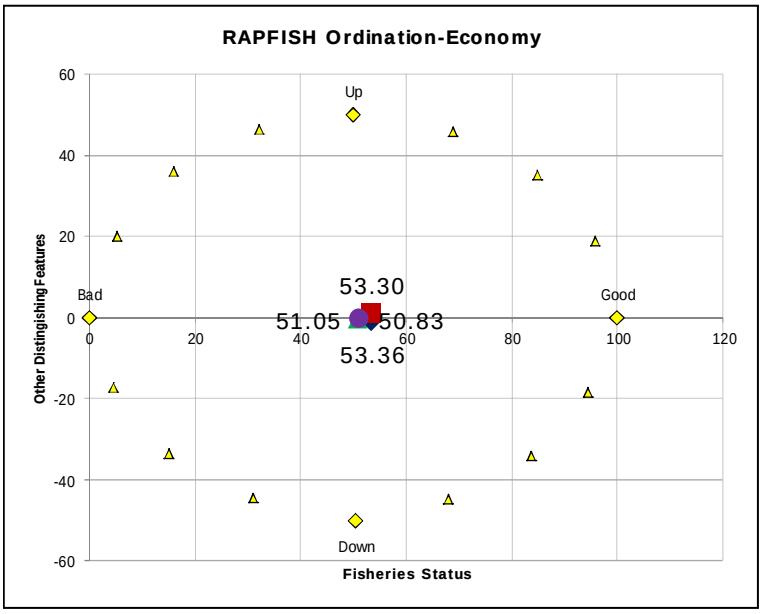

Figure 2. The score of each fish farmer from MDS projected on a bad (0) to good (100) x-axis for the analysis of the economic aspect. The y-axis shows the similarity/dissimilarity scores. Catfish farmer's scores are displayed as blue diamonds, tilapia farmers are red squares, pangas catfish farmers are green triangles, and gourami farmers are purple circles.

Evaluation on institutional aspects. The results of the MDS analysis on the institutional aspect in Figure 3 found that all fish farmer households obtained an index in the range 25.10-50.00 with a less sustainable status. Gourami farmer households obtained the highest index, namely; 46.09, pangas catfish farmer households obtained the lowest index, namely; 43.82, tilapia farmer households obtained an index of 44.40, and catfish farmer households obtained an index of 45.88 (Figure 3).

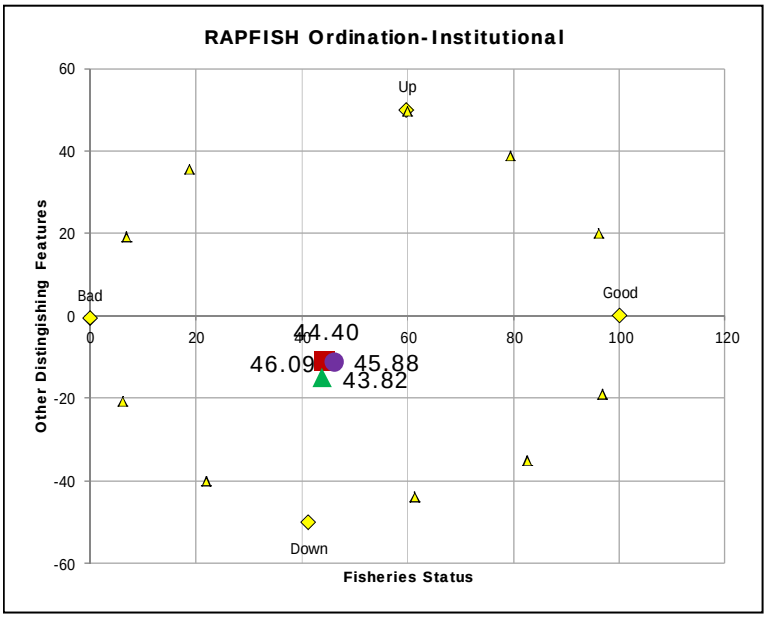

Figure 3. The score of each fish farmer from MDS projected on a bad (0) to good (100) x-axis for the analysis of the institutional aspect. The y-axis shows the similarity/dissimilarity scores. Catfish farmer's scores are displayed as blue diamonds, tilapia farmers are red squares, pangas catfish farmers are green triangles, and gourami farmers are purple circles.

Evaluation on technological aspects. The results of the MDS analysis of the technological aspects in Figure 4 illustrate that there is a diversity of sustainability indices obtained by each fish farmer household. Pangas catfish farmer households obtained the highest index, namely; 52.15, tilapia farmer households obtained an index of 51.82, gourami farmer households obtained an index of 50.95. The index obtained by pangas catfish farmer households, tilapia fish farmers, and gourami farmers is in the range of 50.10-75.00 with a fairly sustainable status. Meanwhile, catfish farmer households obtained the lowest index, namely; 50.02 which is in the range of 25.10-50.00 with a less sustainable status (Figure 4).

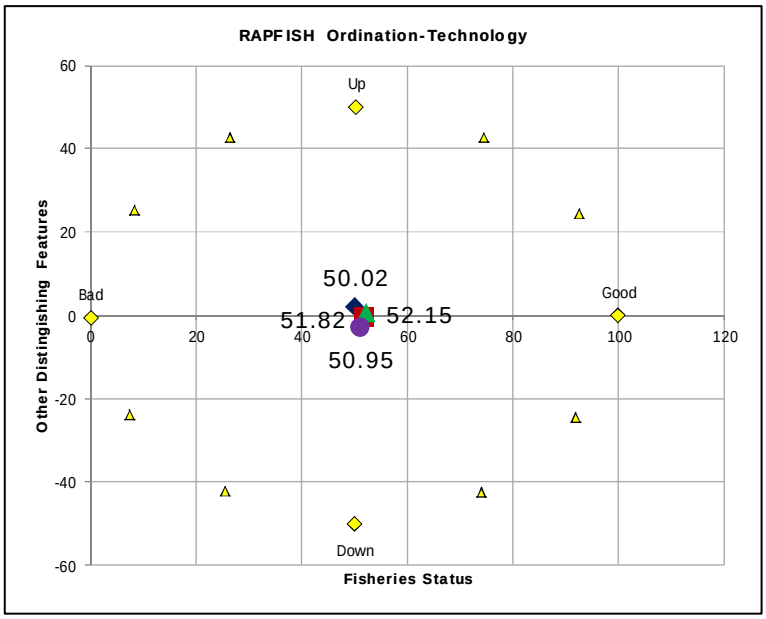

Figure 4. The score of each fish farmer from MDS projected on a bad (0) to good (100) x-axis for the analysis of the technology aspect. The y-axis shows the similarity/dissimilarity scores. Catfish farmer's scores are displayed as blue diamonds, tilapia farmers are red squares, pangas catfish farmers are green triangles, and gourami farmers are purple circles.

Evaluation on all aspects. There is a difference in the average index obtained by each fish farmer household from all assessed aspects. Catfish farmer households obtained the highest average index, namely; 53.33, pangas catfish farmer households obtained the lowest average index, namely; 51.17. This shows that the performance of catfish farming is the best compared to other aquaculture activities. Meanwhile, the performance of pangas catfish culture is the lowest. Tilapia farmer households obtain the average index, namely; 52.00, and gourami farmer households obtained the average index, namely; 51.80 (Table 2). The average index obtained by all fish farmer households is in the same range (50.10-75.00) with a fairly sustainable status.

Table 2

Sustainability index of fish farmers in the Minapolitan area of Merangin Regency for all aspects of sustainability

Aspects	*Fish farmers sustainability index*				*Average (aspects)*
	Catfish	*Tilapia*	*Pangas catfish*	*Gourami*	
Physical	64.06	58.49	57.89	59.13	59.89
Economy	53.36	53.30	50.83	51.05	52.13
Institutional	45.88	44.40	43.82	46.09	45.05
Technology	50.02	51.82	52.15	50.95	51.24
Average (fish farmers)	53.33	52.00	51.17	51.80	-

The results of the analysis found that the physical aspect tends to be the strongest aspect in encouraging the development of aquaculture in the Minapolitan area of Merangin Regency with an average value of 59.89. This is followed by the economic aspect with an average value of 51.13 and the technological aspect with an average value of 52.24. Meanwhile, the institutional aspect is the weakest aspect among other aspects with an average score of 45.05 (Table 2). The radar diagram in Figure 5 shows the trend of all aspects in inhibiting or encouraging the sustainability of aquaculture development in the minapolitan area of Merangin Regency.

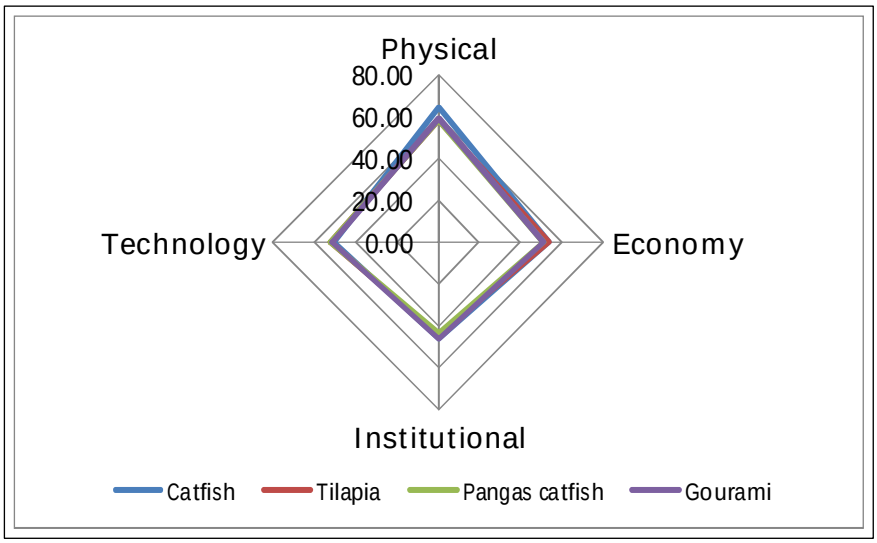

Figure 5. The sustainability index of catfish farmers, tilapia fish farmers, pangas catfish farmers, and gourami farmers from multidimensional scaling projected on an unsustainable (0) to very sustainable (100) axis for all aspects. Catfish farmers are displayed as blue lines, tilapia farmers are red lines, pangas catfish farmers are green lines, and gourami farmers are purple lines.

Discussion. Leverage analysis is carried out to show sensitive attributes that affect the sustainability index obtained by fish farmer households in each aspect. These sensitive attributes are the factors inhibiting or driving the sustainability of aquaculture. The results of the leverage analysis on the physical aspect show that of the 7 attributes assessed only the attributes of natural disaster threat are sensitive attributes because the RMS change value is more than half of the value scale on the x-axis, namely 5.40 (Figure 6A). The results of the study found that the sensitive attribute of natural disaster threats is an inhibiting factor for sustainability in the physical aspect. Most of the respondents stated that the condition of fish ponds, buildings, supporting facilities, and infrastructure cannot guarantee security if there is a threat of natural disasters such as floods and landslides. Natural disasters such as floods and landslides often occur in Indonesia (Adi 2013; Ulum 2013; Suleman & Apsari 2017; Ismail et al 2018; Sari et al 2020). According to Suleman & Apsari (2017), a natural disaster is an event, which is caused naturally or due to human activity, and occurs suddenly or slowly, causing the loss of human life, property, and environmental damage. Disasters that occur suddenly require people to always be prepared in the face of disasters that may occur at any time. Preparedness in the face of this disaster is included in the realm of flood disaster management (Adi 2013; Ulum 2013; Sari et al 2020). Many parties need to be involved in disaster management, namely; the government, the private sector, and the community itself (Adi 2013; Ulum 2013). The sensitive attributes of natural disaster threats in the minapolitan area of Merangin Regency can be improved through; increase in natural disaster management budget allocations in regional revenue and expenditure budgets, increase community participation in natural disaster prevention and management, the fulfillment of the rights of disaster-affected communities fairly and in accordance with minimum service standards, and rapid recovery of disaster-affected environmental conditions.

The results of the leverage analysis on the economic aspect illustrate that of the 8 attributes that have been assessed, only the attribute knowing market price is a sensitive attribute because the RMS change value is more than half of the value scale on the x-axis, namely 1.43 (Figure 6B). The results of the study found that the attribute of knowing the market price is a driving factor for sustainability in the economic aspect. Most of the respondents stated that they know the development of market prices well. This condition must be maintained because by knowing the market price, fish farmers can sell their cultivation products at a fair price. According to Renard (2003), a fair price will increase profits for sellers and satisfaction for customers. Furthermore, Simeoni et al (2020) revealed that fair trade also improves the quality of life and protects the environment. Market information is very important for fish farmers to increase their business independence. Through access to market information, they can find out what and how many consumer needs (Dewi 2011; Amalia 2013). They can also predict how much they have to produce and with what level of product quality so that the selling price they get is better (Dewi 2011). Apriliani et al (2011) recommend an active role from both central and regional governments to provide market information in the improvement of the minapolitan area. The existence of market information and marketing guarantees such as the auction market will reduce the monopoly price of fish by collectors. Good market information can improve trade value chains (Chaboud 2014; Nielsen et al 2017; Purcell et al 2017; Rosales et al 2017). Furthermore, economic sustainability can be seen from the baseline of the level of economic welfare that can be achieved and maintained (Chaboud 2014; Schuhbauer & Sumaila 2016; Emery et al 2017).

The results of the leverage analysis on the institutional aspect explained that of the 7 attributes assessed there were 4 sensitive attributes that could affect the sustainability status of aquaculture development in the minapolitan area of Merangin Regency because the change in RMS value was more than half the value scale on the x-axis. The sensitive attributes are the number of group members with a score of 7.21, useful training with a score of 5.79, personal assistance with a score of 5.84, and group assistance with a score of 4.33 (Figure 6C). The results of the study found that the attribute of the number of group members was a driving factor for sustainability in the institutional aspect. Most of the respondents stated that they have at least 3 members of the aquaculture group in their area. This is already close to the ideal conditions expected, namely 4 people. Thus they can help each other and work together in developing aquaculture activities in their area. Meanwhile, there are 3 other sensitive attributes that are inhibiting factors for sustainability in the institutional aspect, namely; useful training, personal assistance, and group assistance. Most of the respondents stated that they had received training from the government once a year, meanwhile the ideal condition expected was that they could receive training from the government twice a year. According to Kustiari et al (2012), the effectiveness of training for the community is determined by the role of the instructor, the communication model, and the benefits of the training. Local community social networks can also facilitate innovation, knowledge development, and knowledge sharing to support their businesses (Sowman et al 2014; Omar et al 2013). Weak institutional aspects can also be an obstacle in the implementation of community empowerment programs (Gutierrez-Montes et al 2009; Matera 2016). Respondents also stated that they rarely get personal assistance or group assistance from the government or other parties that can assist them in developing fishery cultivation in their area. The results of the study found that one of the reasons for the lack of government assistance was the lack of local institutions as guarantee agencies for the distribution of this assistance. According to Zulham (2013), community-based institutions are generally easier to form and implement. Therefore Suryawati et al (2013) suggest it is necessary to include coaching and mentoring programs that are directed at preparing recipients of aid programs from the Government. In addition, to support the success of the program, community participation is required from the preparatory stage to the end (Deswati & Triyanti 2015; Hikmah & Firdaus 2017). Things that need to be considered in the implementation of the assistance program, namely; simplification in program activity procedures, accuracy of selection of prospective recipients, training and assistance to potential beneficiaries, and evaluation of assistance programs for

beneficiary independence on an ongoing basis (Hikmayani et al 2013; Deswati & Triyanti 2015; Hikmah & Firdaus 2017). However, often government assistance tends to be ineffective because it does not pay attention to the different typologies in each region (Allison & Ellis 2001; Purcell & Pomeroy 2015). Therefore, institutional sustainability can be achieved when the existing structures and processes have a good capacity to continue to carry out their functions in the long term (Nielsen et al 2004). The institutional aspect is critical because it operates at all levels and effectively determines the access, terms of exchange between different types of capital, and possible livelihood strategies (Allison & Ellis 2001).

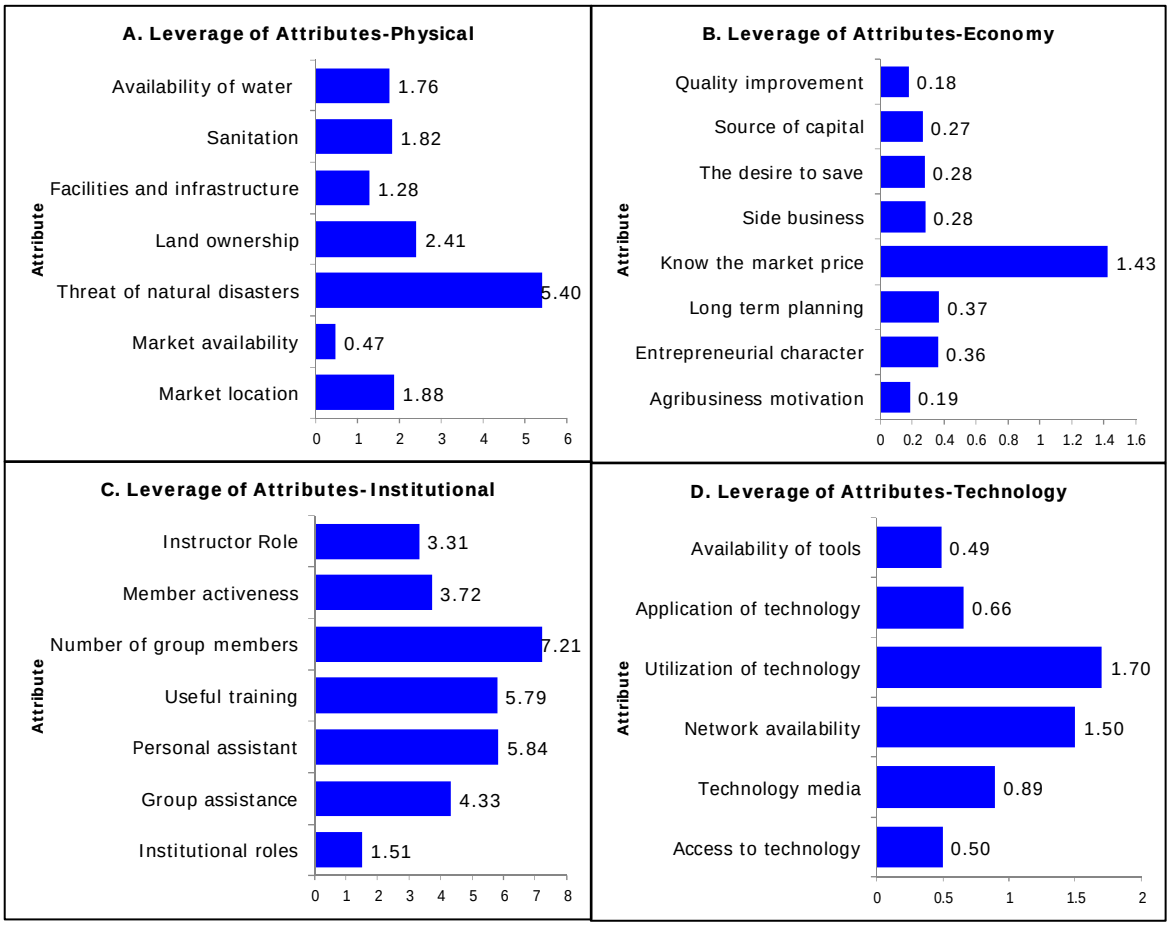

Figure 6. Leverage (%) exerted on the x-axis scores by each attribute for all aspect.

The results of the leverage analysis on the technological aspect describe that of the 6 attributes assessed there are 2 sensitive attributes that can affect the sustainability status of aquaculture development in the Minapolitan area of Merangin Regency because the change in RMS value is more than half the value scale on the x-axis. The sensitive attributes are technology utilization with a value of 1.70 and network availability with a value of 1.50 (Figure 6D). The results of the field interviews found that the sensitive attribute of technology use is a driving factor for sustainability in the technological aspect. Meanwhile, the sensitive attribute of network availability is an inhibiting factor for sustainability in the technological aspect. Most of the respondents stated that they made good use of the technology related to aquaculture development in their area. Meanwhile, most respondents stated that they rarely use the internet for aquaculture development in their area because it will incur higher additional operational costs. The ideal condition that is expected is that the aquaculture group can use at least 3 free-access internet networks provided by the Government. According to Aryania et al (2020) currently, information technology has changed the way people live in carrying out their daily activities. The role and existence of information technology have brought the world to the

gates of globalization without boundaries and knows no distance. Anyone can communicate and access all the information they need quickly and wherever they are. Information technology is very useful in society for personal, business, and government interests (Achjari 2000). The internet as a form of information technology has also been widely used to increase competitiveness (Achjari 2000; Subramani 2004; Gregor et al 2006; Aryania et al 2020). The current lack of ability to access information via the internet can lead to reduced productivity in aquaculture (Bush et al 2021). But on the other hand, sometimes technology that is built at a high cost can only be reached by a few people to prioritize their own interests (Scoones 2009; Emery et al 2017). Therefore, the Regional Government should be able to provide free internet access to fish farmers in the Minapolitan area of Merangin Regency to support their productivity and business development in the future.

The results of the evaluation of all fish farmer households in all aspects show that the physical aspect tends to be the strongest aspect in encouraging the development of aquaculture in the minapolitan area of Merangin Regency with an average value of 59.89. This is because of the 7 attributes only the attributes of natural disasters are an inhibiting factor, the rest are the driving force for sustainability. Most of the respondents gave a positive response stating that the location of the market is close to settlements, the market is well available to meet daily needs, the cultivated land used has clear legality, the facilities and infrastructure are sufficiently available and well maintained, the sanitary conditions are quite good and feasible, and the availability of water supply for fish farming activities is sufficient. Meanwhile, the institutional aspect is the weakest aspect among other aspects with an average score of 45.05. This is because of the 7 attributes, there are 3 sensitive attributes that are inhibiting factors for sustainability in the institutional aspect, namely; useful training, personal assistance, and group assistance. Most of the respondents stated that they rarely received useful training, personal assistance, or group assistance from both the government and the private sector. According to Joffre et al (2017), the government and private sector need to be further involved in the management of aquaculture to support the development of a resilient and sustainable aquaculture sector.

Conclusions. This research has succeeded in evaluating the development of aquaculture in the minapolitan area of Merangin Regency. The average index obtained by each fish farmer household from all considered aspects is in the range of 50.10-75.00 with a fairly sustainable status. Catfish farmer households obtained the highest average index of 53.33, pangas catfish farmer households obtained the lowest average index of 51.17, tilapia farmer households obtained an average index of 52.00, and farmer households gourami obtained an average index of 51.80. The physical aspect tends to be the strongest aspect in encouraging the development of aquaculture in the minapolitan area of Merangin Regency with an average value of 59.89. Meanwhile, the institutional aspect is the weakest aspect among other aspects with an average value of 45.05. There are 8 sensitive attributes from all aspects that can leverage the index of the sustainability of aquaculture in the minapolitan area of Merangin Regency, namely; the threat of natural disasters, knowing market prices, number of group members, useful training, personal assistance, group assistance, technology use, and network availability.

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