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MULTI-ASPECT SUSTAINABILITY ANALYSIS OF FRESHWATER FISH AQUACULTURE IN KUPANG CITY OF EAST NUSA TENGGARA PROVINCE, INDONESIA

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ABSTRACT
Freshwater fish aquaculture has long been a part of the community business in Kupang City. The problems of freshwater fish aquaculture are becoming increasingly complex. At least five aspects are involved: ecological, economic, social and cultural, institutional, and infrastructure and technology. A brief assessment of freshwater fish aquaculture was conducted to see the interrelationship of the 5 aspects consisting of 45 factors. This study aims to assess the index and sustainability status of freshwater fish aquaculture based on the five aspects of sustainability. Research method stages: 1) preparation of locations and respondents, 2) data collection using survey methods with interview techniques used to obtain related data, 3) data analysis using multi-aspect Sustainability Analysis which will describe the level of sustainability of freshwater fish aquaculture based on aspects and attributes developed, 4) The results of the analysis of the sustainability of freshwater fish aquaculture which is in a fairly sustainable condition (tends not to continue) need to be done business management strategies through two scenarios (realistic and ideal) of sensitive factors of freshwater fish aquaculture. The results obtained showed that the sustainability status of freshwater fish aquaculture in Kupang City is sustainable with an index of 67.22%. In order to increase the sustainability status to be very sustainable, scenario 1 was selected, namely the realistic scenario with improvements in 10 sensitive factors to increase the sustainability index to 76.51%.

KEY WORDS
Multi-aspect sustainability analysis, freshwater fish, aquaculture, Kupang City.

The potential development of the Kupang City region in East Nusa Tenggara Province is one of the mainstay areas with the main activities being the industrial, tourism, and fisheries sectors. As stipulated in regional regulation No.11/2011 on the spatial plan of Kupang City 2011-2031, areas with protection functions and areas with aquaculture functions have been established. The aquaculture areas are developed for the allocation of aquaculture development activities. Kupang City's aquaculture is dominated by inland (freshwater) fisheries such as catfish, tilapia, catfish, pomfret, and goldfish. Catfish (*Clarias sp.*) and Tilapia (*Oreochromis niloticus*) are the freshwater consumption fish cultivated in Kupang City, almost all business groups cultivate these commodities, the advantages of choosing these organisms are that they can be cultivated on narrow land and limited water sources, aquaculture technology is relatively accessible to all communities, fast growth and enlargement, easy marketing, low business capital, and relatively short aquaculture time.

Freshwater aquaculture is also accompanied by the latest technological innovations in 2017 as well as technologies adopted as many as approximately 34 technologies of which 90% of the presentation of learning sources are CCD-IFAD cooperation projects (CCD-IFAD PIU Kupang City, 2017). Aquaculture production also continued to increase in 2016, totaling 324 inland aquaculture units in Kupang City (Kupang Municipality in Figures 2017), then decreased in 2018 to 155 units (Kupang Municipality in Figures 2018) until it became drastic in 2020 with only 58 aquaculture units (Kupang Municipality in Figures 2020). The problem in urban areas is how to ensure the sustainability of freshwater fish aquaculture in Kupang City from the declining trend of freshwater fish aquaculture production as described earlier. This study aims to assess the sustainability status of freshwater fish aquaculture in Kupang City.

METHODS OF RESEARCH

This research was conducted from May to July 2023, which is located in Kupang City, East Nusa Tenggara Province.

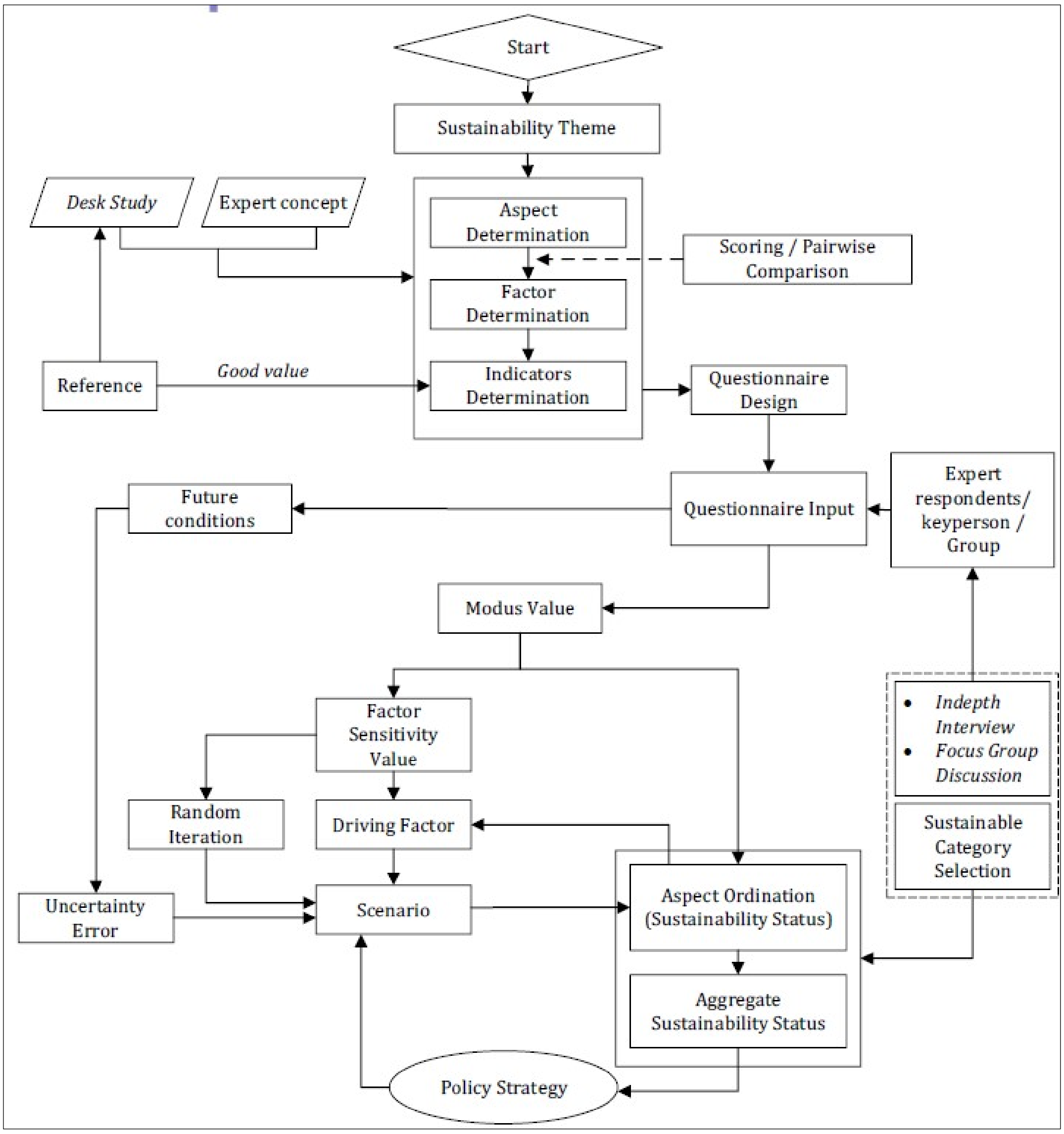


Figure 1 – Conceptual framework of the multi-aspect sustainability analysis approach (Firmansyah, 2022)

The type of data used in this research is secondary data obtained through literature searches and reports of various agencies related to freshwater fish aquaculture in Kupang City, while primary data is obtained from filling out questionnaires by conducting direct interviews with groups of farmers and key stakeholders such as agency leaders and fisheries extension groups. Respondents in this study amounted to 35 people who were taken purposively with the criteria that respondents have the main job as freshwater fish farmers and leaders of agencies and fisheries extension groups.

One of the modeling techniques developed to measure the sustainability of fisheries businesses is the sustainability assessment technique using the multi-aspect sustainability analysis (MSA) technique from Exsimpro software; this software is a development of previous tools, namely RAPFISH (Firmansyah, 2022). The principle used is the rapid appraisal process, where respondents are not a sample size but rather key stakeholders/key persons who can be discussed with in-depth interviews or through observation and focus group discussions (Paulus *et al*., 2018). Some of the stages in applying MSA sustainability analysis are the analysis stages, namely aggregate status value, aspect status value, future condition value, status value ordination, aspect leverage factor, uncertainty error, validation by random iteration, and policy priority scenario.

Scenario selection can be made in the MSA Sustainability Analysis based on the status value that appears. In addition to the scenario value, the leverage factor is also the basis for the scenario analysis that appears. If the researcher wants to conduct a tiered scenario analysis (moderate scenario, optimistic scenario, and progressive scenario), the researcher can determine it by selecting the number of scenarios and driving factors to be analyzed. In this study, researchers used a tiered scenario analysis, namely realistic scenarios and idealistic scenarios. MSA Sustainability Analysis is used to find the sustainability status value, performance index, or performance index of activities, places, activities, institutions, or companies in the context of self-assessment or assessing conditions and descriptions to find out strategies that must be carried out in the future. This assessment is also called a rapid assessment because it uses an existing database submitted through experts or selected respondents who meet the criteria. Then this assessment can be improved at any time if there are new data or conditions without having to re-analyze with the latest formulation or build a new model. The conceptual framework for the MSA approach is shown in Figure 1.

RESULTS AND DISCUSSION

Multi-aspect sustainability analysis of the five aspects of sustainability can identify sensitivity leverage variables for the ecological aspect, economic aspect, social and cultural aspects, institutional aspect, and technology and infrastructure aspects that affect the sustainability of freshwater fish farming in Kupang City. The results of the MSA analysis on each aspect are described as follows.

The sustainability index of freshwater fish farming in Kupang City in the ecological aspect is 64.63% with a sustainable category, where in the future this value can increase but not so significantly because it has a future condition value of 53.13%. In comparison with the sustainability index value of multi-aspect freshwater fish aquaculture, the sustainability index value of the ecological aspect of freshwater fish aquaculture is below the sustainability index value of multi-aspect freshwater fish aquaculture. From the results of the ecological aspect leverage analysis shown in Figure 2, it is known that of the 8 factors analyzed, 4 factors sensitively affect the sustainability of freshwater fish aquaculture, namely: (1) appropriate and suitable land, (2) control of the aquaculture environment, (3) control of waste, and (4) availability of water reservoirs.

The most sensitive factor affecting the sustainability of freshwater fish aquaculture from an ecological aspect is waste control. This is in accordance with Coldebella *et al*. (2017); Azhari and Tomasoa (2018); Gunadi and Hafsaridewi (2008) that controlling waste can improve water quality which greatly affects the growth and survival of cultured fish. The production of freshwater fish aquaculture produces wastewater as a by-product. Wastewater production in this activity comes from several sources, such as used water from fish rearing and washing of production equipment. Waste from aquaculture production contains organic matter from feces, urine, and fish feed residues, while water contains chemicals such as drugs for fish health treatment and water quality; so waste control is an important attribute in the ecological aspect because it has a large average amount and is harmful to the environment.

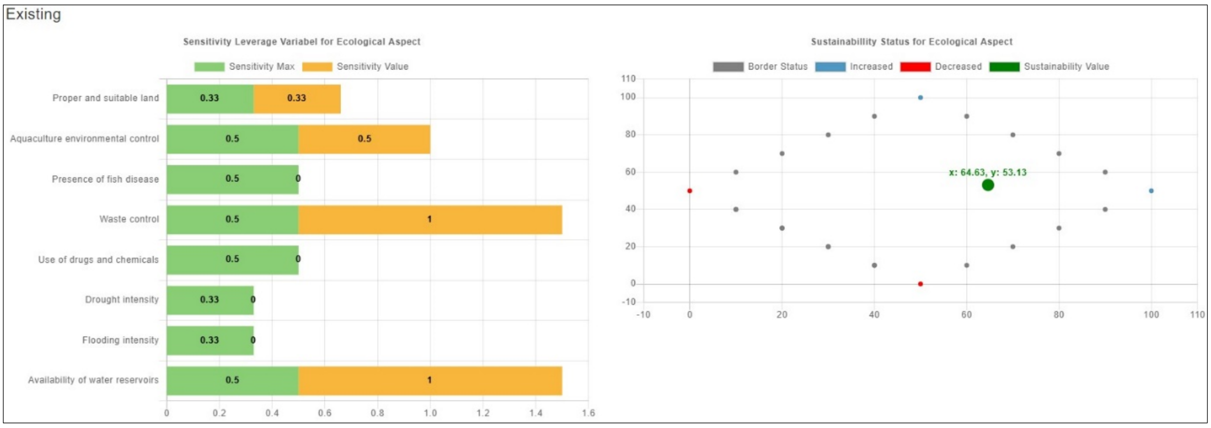


Figure 2 – The sensitivity leverage variables and sustainability status for the ecological aspect

Interviews with aquaculture farmers in Kota Raja subdistrict revealed that waste storage and control are traditional, with storage tanks and direct disposal pits in the ground. JRE (business initials) in Kota Raja subdistrict has a temporary storage pond measuring 1 meter x 2 meters with a drain or pit directly into the ground 7 meters deep. Some owners, such as YH (business initials), do not have temporary storage, but instead drain directly into the soil where they have planted crops (vegetables, flowers, or trees). Then there are those in Alak subdistrict with a flowing water system, from the inlet to the outlet. This type of system uses an in-ground pond, which is close to a spring so that the waste is not retained, but flows continuously into the sewers. In field observations, some sites also control or treat by growing water hyacinth (*Eichhornia crassipes*) in the waste storage area, before it is flowed to the sewage or recycled for reuse.

The following sensitive attribute is the availability of water storage. Land that can be utilized for aquaculture is usually productive land that has a water source from irrigation and/or directly from rivers or tributaries and water-poor marginal land that relies on water sources from wells or groundwater and peat marginal land that relies on water sources from surface water. Freshwater fish farming containers in Kupang City are in-ground ponds, cement ponds (swift water ponds), and tarpaulin ponds. Respondents from Kota Raja subdistrict make water storage from concrete ponds located in their yards and the distance of the water source is not far, in this case, the farmer has a well that is directly adjacent to the pond so that it is easier to collect water more quickly. In addition, respondents in the Alak subdistrict also have springs that flow directly into the ground and semi-concrete ponds that are built not far from the springs. There are also temporary water storage ponds, but only a few, beyond that the spring water is channeled from the government irrigation system. Some farmers who do not have a spring water source buy private and government tank water to supply water for aquaculture, thus some of these farmers have proper storage tanks. According to the farmers, it is important to collect the water first so that the inorganic materials dissolve and the total dissolved content in the form of soil, mud, and other fine sediments will settle. This is in line with Sifa and Senlin (1995); Dugan *et al*. (2006); Endaryanta, *et al*. (2013); Syamsunarno and Sunarno (2016) who state that the utilization of clean water from water reservoirs is very important in maintaining the quality of water used for freshwater fish aquaculture.

The sustainability index of freshwater fish aquaculture in Kupang City in the economic aspect is 62.09% with a sustainable category, where in the future this value can increase significantly because it has a future condition value of 72.73%. Compared to the sustainability index value of multi-aspect freshwater fish aquaculture, the sustainability index value of freshwater fish aquaculture in the economic aspect is below the sustainability index value of multi-aspect freshwater fish aquaculture. From the results of the economic aspect leverage analysis shown in Figure 3, it is known that of the 11 factors analyzed, 6 factors sensitively affect the sustainability of freshwater fish farming, namely: (1) marketing methods, (2) marketing efficiency, (3) product storage, (4) access to capital, (5) contribution to family income, and (6) price fluctuations.

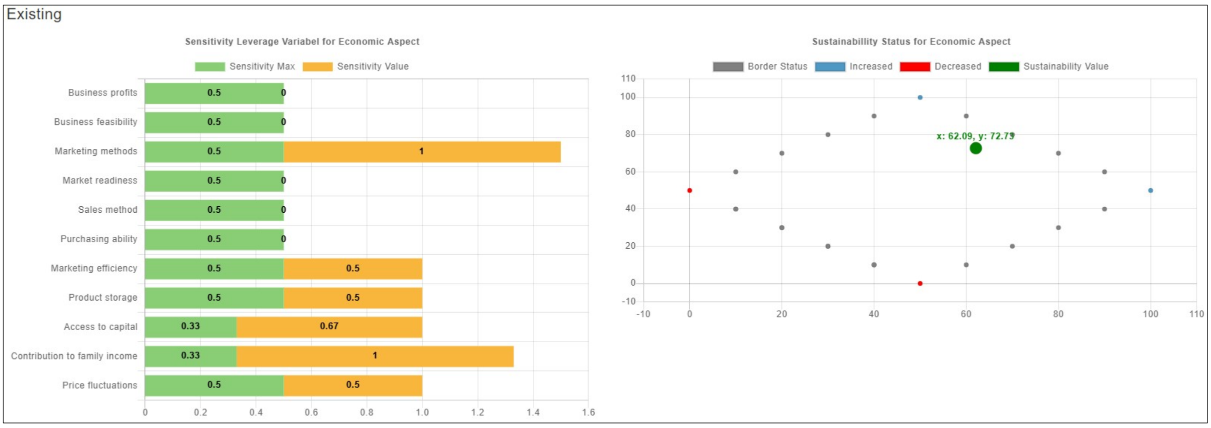


Figure 3 – The sensitivity leverage variables and sustainability status for the economic aspect

The most sensitive factor affecting the sustainability of freshwater fish aquaculture from an economic aspect is marketing. Marketing has an important role in conveying production from producers to end consumers. Improving the marketing system will encourage increased production either directly or indirectly. Marketing is done by farmers by offering directly to stalls, restaurants, processors, and retailers through face-to-face communication. Over time, farmers have adapted to information technology, such as social media. However, some interviewees said that this was due to a lack of market information and that cultivators thought it was more efficient and easier to sell their crops to middlemen or collecting traders because they did not need to incur transportation costs. Middlemen/collecting traders have various market connections or networks, so the easy way to market according to them is through middlemen, although the contribution to income is sometimes inversely proportional. The variables that determine this are the selling price of fish and the price of feed. The marketing method determines the success/profitability of the farmers in their business. Regarding the market level, the average farmer in Kota Raja subdistrict and Alak subdistrict is still at the regional market level (between cities/districts). This is following the findings of Rabilla, *et al*. (2018); Syarafina (2019); Ameliany, *et al*. (2022) which in terms of marketing freshwater fish farming products require several marketing strategies that can meet consumer demand in the market.

The next sensitive attribute is the contribution of freshwater fish aquaculture to family income. All societies are bound by a network of family obligations and rights called role relations. Where, a person is made aware of the existence of these role relations because of the socialization relationship process that has been instilled since childhood, namely a process where he learns to know what is desired by other family members which ultimately raises the awareness of the desired truth. From the research results, 90% of respondents have a main livelihood as a farmer, while the remaining 10% of respondents choose freshwater fish aquaculture as a side livelihood. One of the heads of an aquaculture group, JRE, a respondent in Kota Raja subdistrict, said that he was a full-time farmer and that the proceeds from the freshwater fish farming business contributed fully to the family income, especially since the farmer himself was the head of the family; so the main source of income in the family came from freshwater fish farming activities, especially in the fish hatchery and fish enlargement business.

In addition, in the Alak subdistrict with the initials RN, the freshwater fish farming business has fully contributed to the Saung Tani business owner. The business owner RN has been doing business from upstream to downstream, so this activity has been a family business to support the family since the 90s and is now handled by his son. Unlike JRE and RN, YH chose freshwater aquaculture as a side business in addition to his main job. This is consistent with Kambuaya (2013); Mulyana and Hamzah (2014); Hidayati (2017); Oktavianna and Pratama (2019) that the income contribution of fisheries businesses such as freshwater fish aquaculture is greater than non-fisheries businesses run in the family.

The sustainability index of freshwater fish aquaculture in Kupang City in the socio-cultural aspect is 88.89% with a sustainable category, where in the future this value can increase but not so significantly because it has a future condition value of 58.33%. Compared to the sustainability index value of multi-aspect freshwater fish farming, the sustainability index value of freshwater fish aquaculture in the social and cultural aspect is above the sustainability index value of multi-aspect freshwater fish aquaculture. From the results of the socio-cultural aspect leverage analysis shown in Figure 4, it is known that of the 9 factors analyzed, 2 factors sensitively affect the sustainability of freshwater fish aquaculture, namely: (1) family participation, and (2) understanding of aquaculture.

The most sensitive factor affecting the sustainability of freshwater fish aquaculture from the socio-cultural aspect is family participation. From the results of observations and interviews, the participation indicator is low. Each respondent presents family members as part of the business actors as many as 2 to 3 people, then these family members will have their ponds. On the other hand, family members only help during the harvesting process as many as 3 to 5 people, and cleaning the pond or aquaculture business location is only 1 to 2 people.

The next sensitive attribute is farmers understanding. Based on field observations, technology in aquaculture is still traditional, only some have innovated and followed the development of renewable technology. Problems such as the lack of knowledge of farmers on the application of environmentally friendly alternative technologies in freshwater fish aquaculture are still encountered by 95% of farmers. Prasetya (2015) stated that several strategies that can improve farmers' understanding of environmentally friendly aquaculture technology can be carried out such as cooperation activities with various parties, including other aquaculture groups through comparative study activities, feed providers, and fisheries extension workers in providing important information such as environmentally friendly technology and the market world and so on.

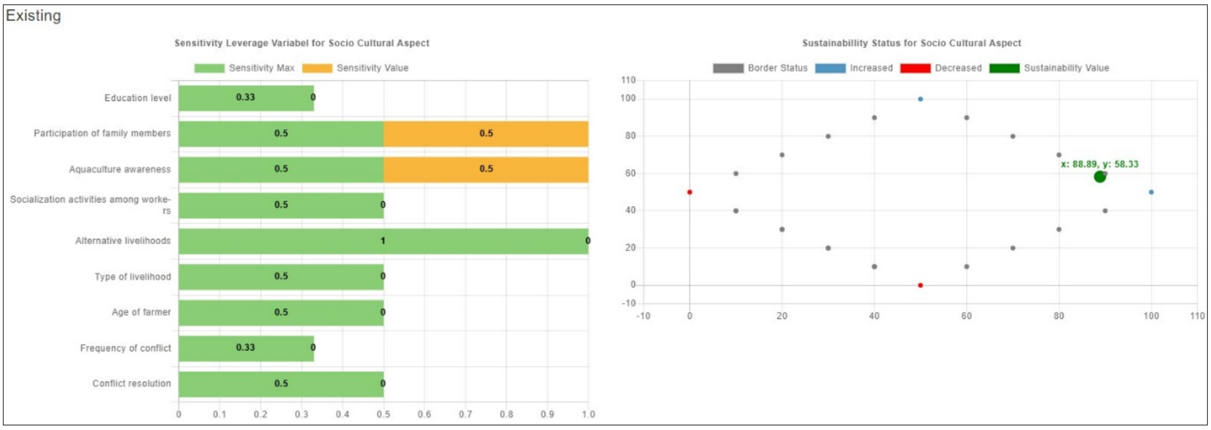


Figure 4 – The sensitivity leverage variables and sustainability status for the social and cultural aspects

The sustainability index of freshwater fish aquaculture in Kupang City in the institutional aspect is 54.71% with a sustainable category, where in the future this value can increase very significantly because it has a future condition value of 75%. Compared to the sustainability index value of multi-aspect freshwater fish aquaculture, the sustainability index value of freshwater fish aquaculture in the institutional aspect is below the sustainability index value of multi-aspect freshwater fish aquaculture. The results of the institutional aspect leverage analysis shown in Figure 5 indicate that of the 7 factors analyzed, 5 factors sensitively affect the sustainability of freshwater fish farming, namely: (1) extension activities, (2) regulations/laws, (3) aquaculture effectiveness, (4) business development, and (5) quality assurance.

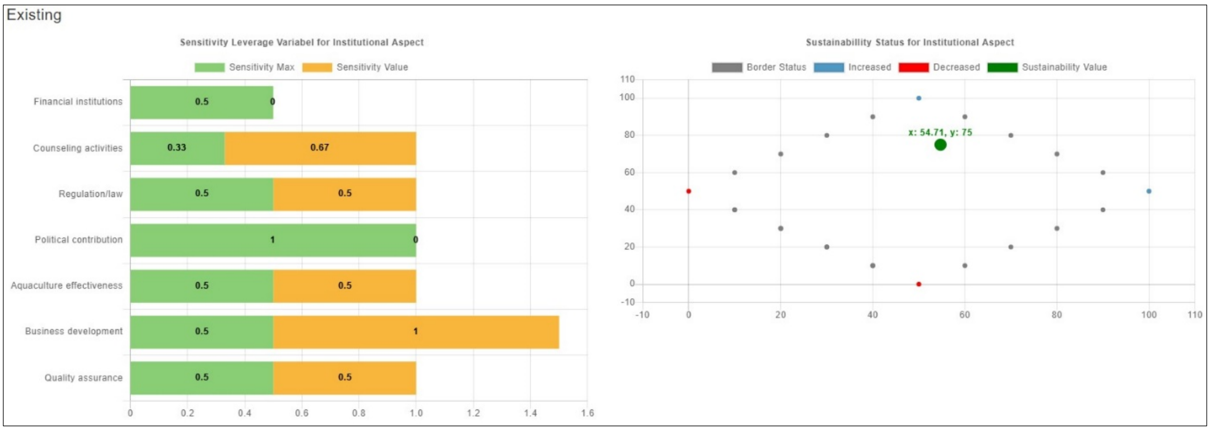


Figure 5 – The sensitivity leverage variables and sustainability status for the institutional aspect

The most sensitive factor affecting the sustainability of freshwater fish aquaculture from the institutional aspect is extension activities. There are 5 fisheries extension workers in Kupang City, spread across 5 subdistricts, with 1 fisheries extension worker for each of the 2 research locations in Kota Raja and Alak subdistricts. Extension is an effort made to encourage behavior change in individuals, groups, communities, or societies so that they know, want, and can solve the problems faced (Amanah, 2007). Therefore, extension activities are not limited to disseminating information and providing information, but until the community can solve the problems at hand. The frequency of extension activities conducted by fisheries extension workers was 12 times per month.

The outcome of counseling activities is an increase in aquaculture production and better performance of business actors. Currently, the role of fisheries advisers is to distribute the aspirations of cultivators to the local and central government, such as the need for aquaculture facilities and infrastructure, as well as the need for technology and production information (from enlargement activities to hatchery development). Moreover, the role of fisheries extension workers as evaluators of aquaculture activities. When associated with sensitive social factors, the understanding of farmers as feedback from the output of extension activities was considered less effective. Effective counseling methods such as fisheries counseling methods and techniques with group demonstrations are steps so that the counseling material is easily understood by the target farmers through demonstrations by presenting the counseling material in a real way and can be seen directly by the target farmers (Roberto, 2019). Further, it is stated that fisheries counseling methods and techniques with demonstrations are learning strategies in counseling aimed to attract the interest, attention, desire, and trust of target farmers.

The next sensitive attribute is the development of freshwater fish aquaculture. In line with Nuryasari, *et al*. (2015), important factors in the development of freshwater fish farming are production, income, and marketing. From the results of observations and interviews, 2 out of 30 respondents were found to have developed freshwater fish aquaculture businesses. From the aspects of production and income, the development of aquaculture in the Kota Raja subdistrict is in the form of developing fish commodities, from catfish and tilapia commodities, and further catfish and cork fish commodities will be developed in the future. From the aspects of production, marketing, and income; Alak subdistrict has developed freshwater fish farming into a fishing and culinary tourism site. The success of the 2 groups of farmers in developing freshwater fish businesses can be used as an example for other groups of farmers but must be accompanied by other important factors such as aspects of capital, facilities/infrastructure, land, technology, and institutions.

The sustainability index of freshwater fish aquaculture in Kupang City in the aspect of technology and infrastructure is 65.80% with a sustainable category, where in the future this value can increase significantly because it has a future condition value of 70%. Compared to the sustainability index value of multi-aspect freshwater fish aquaculture, the sustainability index value of freshwater fish aquaculture in technology and infrastructure aspects is below the sustainability index value of multi-aspect freshwater fish aquaculture. From the leverage analysis of technology and infrastructure aspects shown in Figure 6, it appears that of the 10 factors analyzed, 6 factors sensitively affect the sustainability of freshwater fish farming, which are: (1) implementation of good fish farming practices, (2) technology mastery, (3) technology implementation, (4) facility support, (5) infrastructure support, and (6) seed availability.

The most sensitive factor affecting the sustainability of freshwater fish aquaculture from the aspect of technology and infrastructure is the application of good fish farming methods. The application of good fish farming practices in Kupang City is not yet optimal, thus leading to the sensitive factor of good fish farming practices. According to Ariyati, *et al*. (2015), integrated technological improvements in good fish farming methods include a series of improvements in spawning quality: (a) quality improvement in broodstock spawning developed through the application of hypophysation techniques on broodstock, (b) training activities (transfer of skills) as well as direct practice in the field with instructors, (c) management of the hatchery environment with the use of probiotics, (d) setting up biofilters with practice in the field with instructors, (e) physical improvements such as improving the construction of broodstock ponds, spawning ponds, and hatchery ponds to become more ideal and by good fish farming methods, and (f) improvement of supporting facilities for aquaculture activities including making biofilters, repairing water and electricity installations.

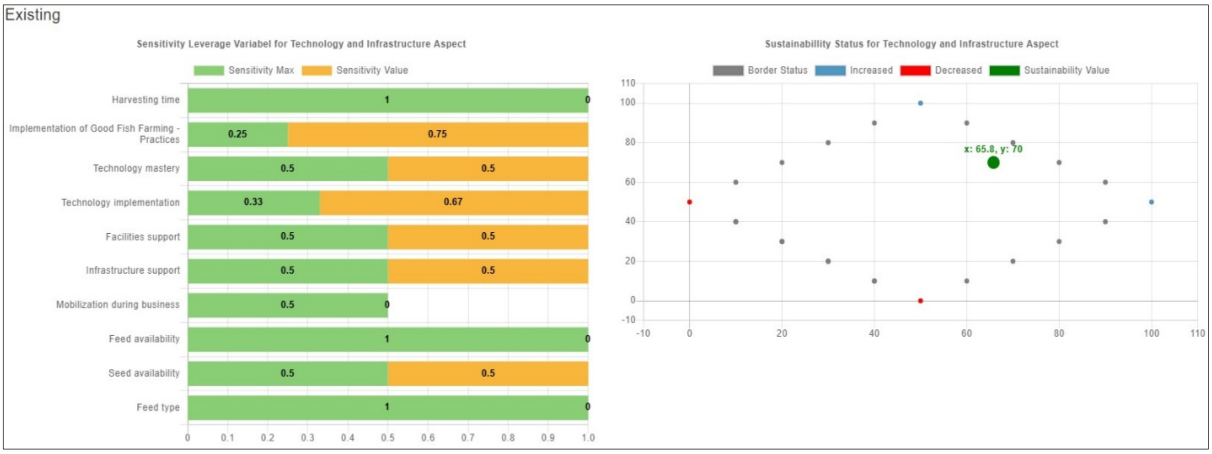


Figure 6 – The sensitivity leverage variables and sustainability status for the technology and infrastructure aspect

The next sensitive attribute is the application of technology. According to the observation, three aquaculture technologies have been applied by farmers, namely the Biofloc system, the running water system, and the traditional system. The implemented Biofloc system was unsuccessful and caused this system to be no longer used due to problems with electricity and water installations. Conversely, aquaculture with the application of running water system technology has been successfully implemented to date in the Alak subdistrict. The successful implementation of the running water system technology is supported by the maintained water quality and the proximity of the spring to the aquaculture ponds. The application of the stagnant water pond system, also known as the traditional system, is the most popular and successful aquaculture system since most farmers are located far from springs.

Some fish hatcheries implement an intensive system, as an effort to optimize water quality and fish health. The success rate of intensive aquaculture is strongly influenced by the ability of farmers to overcome water quality, one of which is a decrease in dissolved oxygen. Dissolved oxygen is the main limiting factor in intensive aquaculture systems. Lack of oxygen can endanger aquatic animals because it can cause stress, easily contract diseases, inhibit growth, and can even cause death so it can decrease productivity (Bahri, 2014 in Fuadi, *et al*., 2020). In intensive aquaculture systems, oxygen demand cannot be met by natural diffusion alone; thus an artificial aeration system is necessary (Shiyang, 2014).

The variable leverage sensitivity value shows the difference value between the real status (based on the modus value) and the status value of the random iteration result (based on the mean opinion), where the difference between the two should not be more than 5%. The respondent's estimation error value illustrates the range of confidence between factors where the more close together the real status value and the status value based on random iteration, the more it has a small or good error rate, while the greater the range between the two values (or more than 0.5), the higher the error rate. Therefore, it is necessary to review the respondents' opinions to verify the gap between respondents' opinions (Firmansyah, 2022).

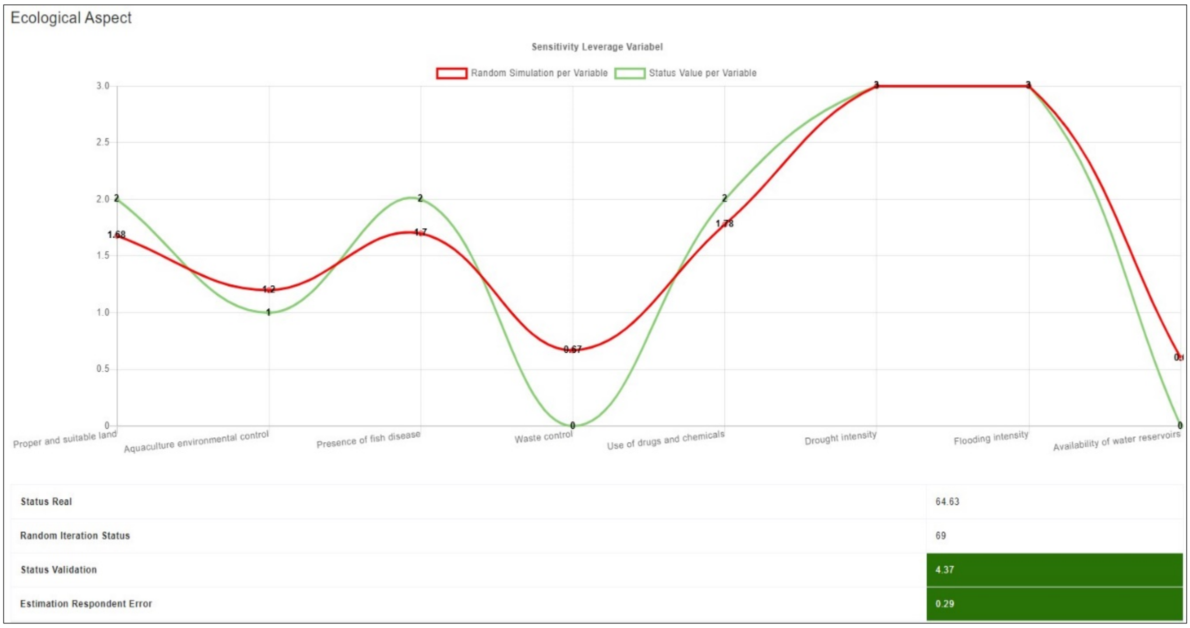
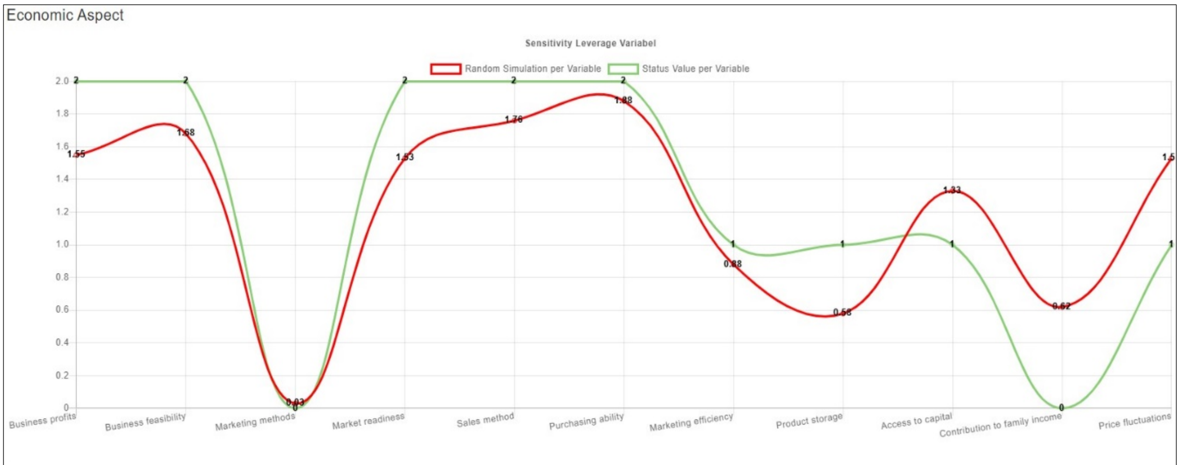


Figure 7 – Sensitivity of leverage variables, random iteration validation status, and respondent error estimates to ecological aspect

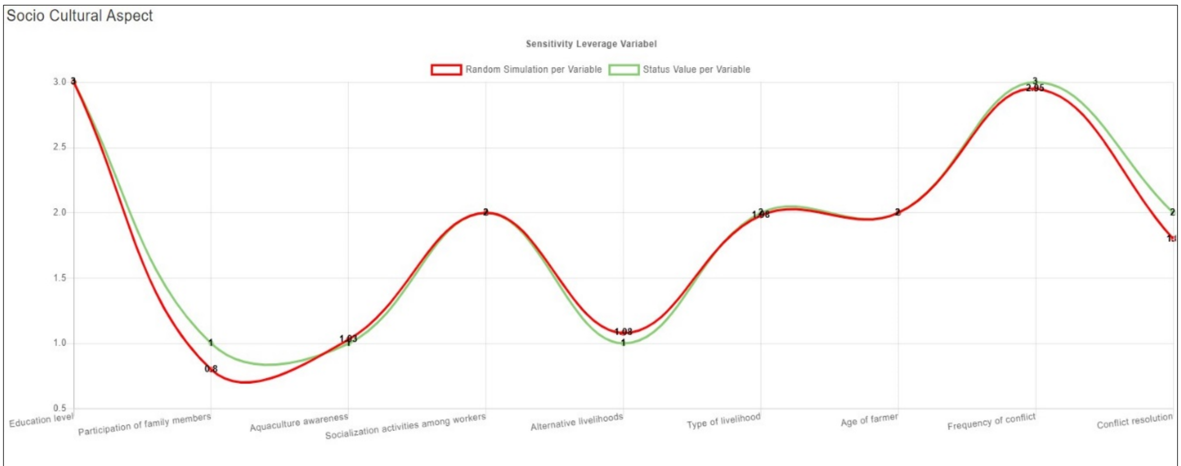
According to the sensitivity value of variable leverage, the ecological aspect has a good status value because the range between real and random iteration status is 4.37% or below 5%, where the real status is 64.63% and the random iteration status is 69%. Meanwhile, the value of the respondent's estimation error is 0.29%, where this value shows a very small error rate, this also shows that the level of consistency of respondents with their answers is very good because it is still below 5%.

According to the variable leverage sensitivity value, the economic aspect has a good status value because the range between the real status and random iteration is 4.09% or below 5%, where the real status is 62.09% and the random iteration status is 58%. Meanwhile, the respondent's estimation error value is 0.33%, where this value shows a very small error rate, this also shows that the respondent's level of consistency with his answer is very good because it is still below 5%.



Status Real	62.09
Random Iteration Status	58
Status Validation	4.09
Estimation Respondent Error	0.33

Figure 8 – Sensitivity of leverage variables, random iteration validation status, and respondent error estimates to economic aspects

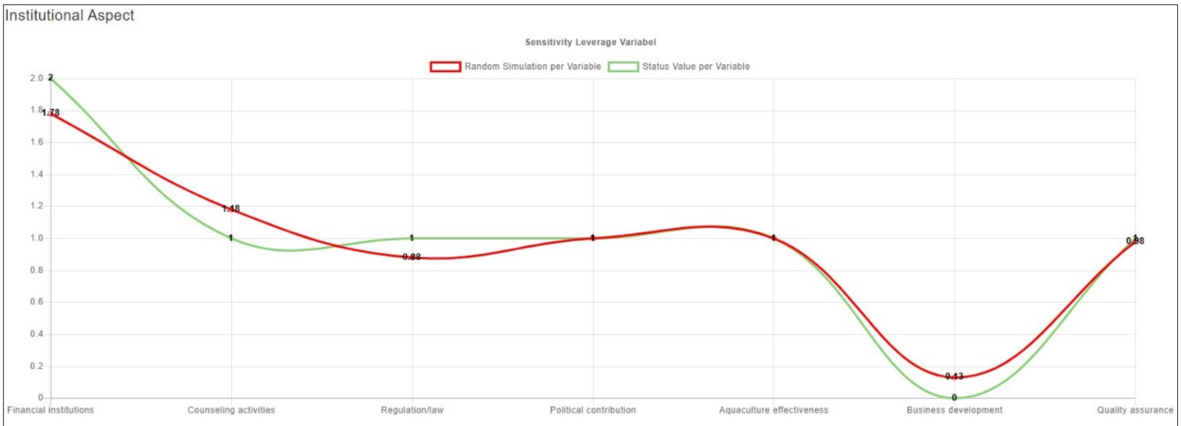


Status Real	88.89
Random Iteration Status	87
Status Validation	1.89
Estimation Respondent Error	0.06

Figure 9 – Sensitivity of leverage variables, random iteration validation status, and respondent error estimates to social and cultural aspects

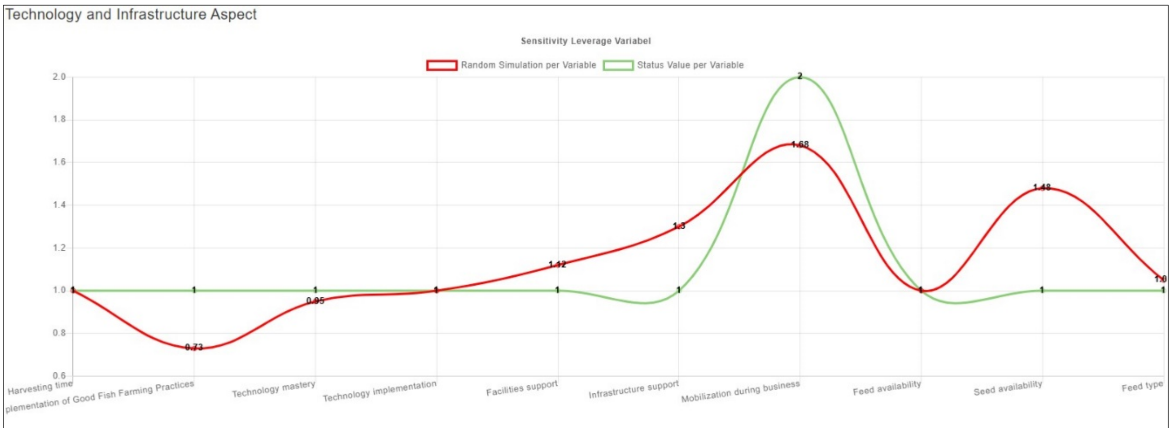
According to the sensitivity value of variable leverage, the social and cultural aspects of aquaculture have a good status value because the range between real status and random iteration is 1.89% or below 5%, where the real status is 88.89% and the random iteration status is 87%. Meanwhile, the value of the respondent's estimation error is 0.06%, where this value shows a very small error rate, this also shows that the level of consistency of respondents in their answers is very good because it is still below 5%.

According to the sensitivity value of variable leverage, the institutional aspect has a good status value because the range between real status and random iteration is 0.71% or below 5%, where the real status is 54.71% and the random iteration status is 54%. Meanwhile, the value of the respondent's estimation error is 0.1%, where this value shows a very small error rate, this also shows that the level of consistency of respondents with their answers is very good because it is still below 5%.



Status Real	54.71
Random Iteration Status	54
Status Validation	0.71
Estimation Respondent Error	0.1

Figure 10 – Sensitivity of leverage variables, random iteration validation status, and respondent error estimates to institutional aspect



Status Real	65.8
Random Iteration Status	68
Status Validation	2.2
Estimation Respondent Error	0.16

Figure 11 – Sensitivity of leverage variables, random iteration validation status, and respondent error estimates to technology and infrastructure aspects

According to the sensitivity value of variable leverage, the technology and infrastructure aspects of aquaculture have a good status value because the range between real status and random iteration is 2.2% or below 5%, where the real status is 65.8% and the random iteration status is 68%. Meanwhile, the value of the respondent's estimation error is 0.16%, where this value shows a very small error rate, this also shows that the level of consistency of respondents with their answers is very good because it is still below 5%.

The sustainability index value of freshwater fish aquaculture for each aspect can be depicted in the form of a pie chart as shown in Figure 12. The diagram shows that various aspects have a sustainable status category indicated by the red line. The improvement of all aspects needs to be done so that the sustainability value can be increased through improvement scenarios. The orange line indicates a realistic improvement scenario (scenario 1) for each aspect, while the blue line is an idealistic improvement scenario (scenario 2) for each aspect. The two most sensitive factors affecting each aspect assessed for sustainability in this scenario were selected, which have been explained previously.

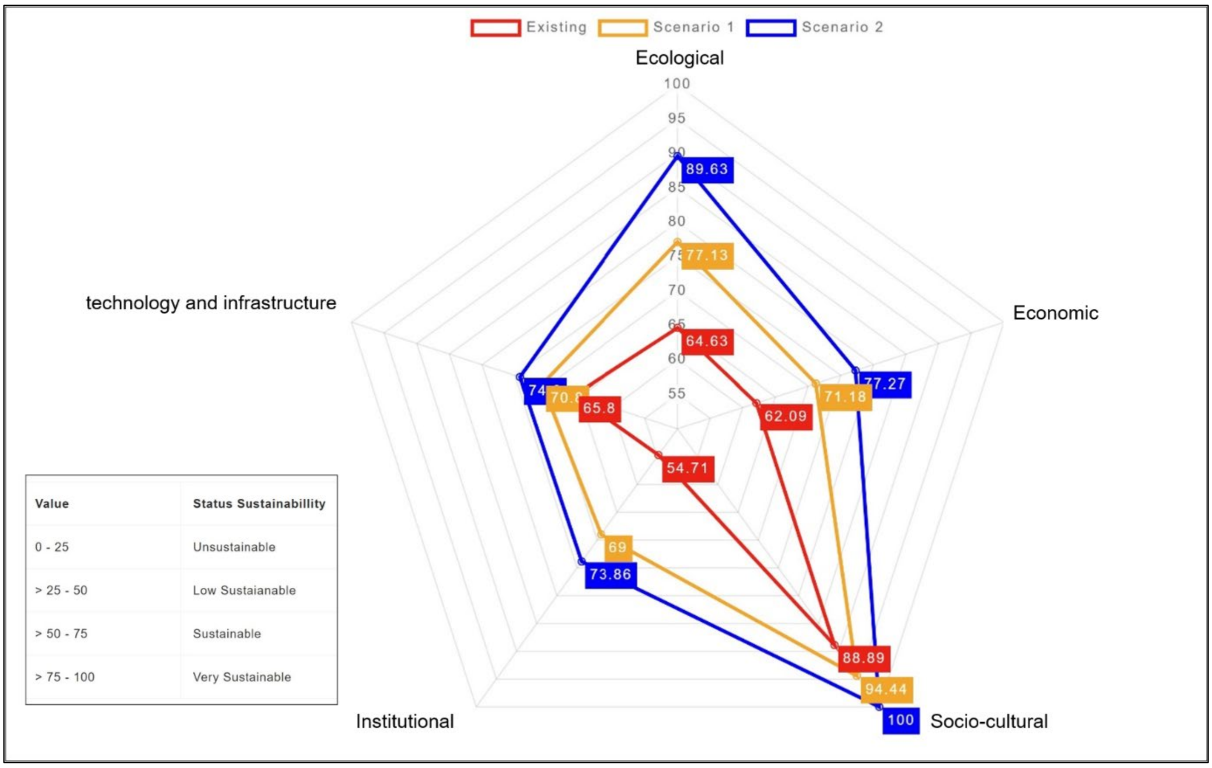


Figure 12 – The kite diagram of index and sustainability status freshwater fish aquaculture in Kupang City

The sustainability value in the existing conditions in the aggregate was 67.22 with a sustainable category where the highest aspect was the social and cultural aspect with a status value of 88.89. Lever factors are carried out in scenario simulations by taking as many as 1 lever factor in each aspect so that the value of sustainability status in scenario 1 (realistic) in the aggregate increases to 76.51 or falls into the very sustainable category. In scenario 2 (idealistic), the simulation of leverage factors was carried out by adding 1 factor to each aspect so that the aggregate value of sustainability increased to 82.99 or entered the very sustainable category. In detail, the changes in status values between scenarios can be seen in Table 1.

Table 1 – Status and sustainability value of existing conditions and scenarios

No.	Aspect	Existing	Scenario 1 (Realistic)	Scenario 2 (Idealistic)
1	Ecology	64.63	77.13	89.63
2	Economy	62.09	71.18	77.27
3	Social Cultural	88.89	94.44	100
4	Institutional	54.71	69.00	73.86
5	Technology and Infrastructure	65.80	70.80	74.20
Total Average		67.22	76.51	82.99
Status Sustainability		Sustainable	Very Sustainable	Very Sustainable

Table 2 – Scenario priority of freshwater fish aquaculture

No.	Aspect	ΔS1S	ΔS2S	ΔS2S/ΔS1S
1	Ecology	12.5	25	2
2	Economy	9.09	15.18	1.67
3	Social and Cultural	5.55	11.11	2
4	Institutional	14.29	19.15	1.34
5	Technology and Infrastructure	5	8.4	1.68
Average Scenario Priority				1.74

Table 2 presents the selection of the selected scenarios, which shows the ease of improvement efforts on the driving factors in each aspect. The selection of scenarios is seen from the changes between scenario 1 against the existing and scenario 2 against the existing, where scenario 2 must have a minimum value of 2 or twice the value of scenario 1, this shows the ease of changing the driving factors to improve the value of its status (Firmansyah, 2022). According to the results of the scenario simulation, the value of scenario 2 against scenario 1 is 1.74, thus the priority of scenario 1 is a policy option that is more sensitive to policy improvements than scenario 2.

CONCLUSION

Freshwater fish aquaculture in Kupang City is still sustainable, with the social and cultural aspects having the highest sustainability score. The future condition will automatically improve if the existing condition can be maintained because it has a very good future condition value or low uncertainty. The priority scenario was selected in the realistic scenario because it has more ease in driving policy than scenario 2. The social and cultural drivers for achieving highly sustainable status are farmers' understanding and family participation.

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