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Sustainability Analysis and Determination Cultivation Agribusiness Strategy of Soka Crab (*Scylla Spp*.) in Aceh Singkil Regency

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Abstract

Soka crab or soft crab (*Scylla spp*.) is a seafood product that is increasingly popular among the public because it makes it easier for consumers to process and consume it. Soka crab cultivation is generally carried out in coastal areas and natural resources that are abundant and easily accessible. This research conducted in the soka crab king Gostel Jaya crab farming pond business in Kabupaten Aceh Singkil aims to find out and analyze the sustainability of soka crab cultivation and determine the right strategy in an effort to develop a soka crab aquaculture pond business so that this research can provide benefits for coastal communities, nalayan, and prospective business actors in cultivating soka crabs in aceh singkil. The analysis method used in this study is to use *Multidimensionall Scaling and Rapid Apprasial for Sustainability* (MDS-RAPS) or Rapfis analysis to analyze the status of sustainability and *Analytic Hierarchy Process* (AHP) as an analytical tool in determining soka crab cultivation strategies (*Scylla spp.*). The results of the analysis show that the first position on the sustainability status is what ecological dimension is on the Raspfih index of 99.83, with the highest attribute of environmental quality with a value of 0.004. In the Montecarlo analysis, the sustainability status is at an index of 99.29, meaning that the comparison of rapfish analysis with montecarlo analysis does not differ markedly. This study recommends the importance of the main strategy on environmental quality attributes as an effort by farmers in developing agribinis in the field of soka crab cultivation.

Keywords : sustainability analysis, strategy determination, soft crab

Introduction

Mangrove crab (*Scylla spp*.) is a type of crab that lives in mangrove ecosystems. This mangrove crab commodity has a very important economic value. Mangrove crab (Scylla spp.) is one of the fishery commodities that has important economic value. In the past, mangrove crabs were only considered pests in traditional ponds. But nowadays mangrove crabs have become one of the mainstay commodities. Crabs are in great demand because of the delicious and also healthy crab meat. Based on research, crab meat contains nutrients essential for human health. Although crab meat contains cholesterol, this food is low in saturated fat content and is a source of minerals niacin, folate and potassium. In addition, it is also a source of protein, vitamin B12, phosphorous, zinc, copper and selenium. Selenium is believed to play a role in preventing cancer and chromosomal destruction, as well as increasing resistance to viral and bacterial infections. The Fisheries research and develoment corporation in Australia reports that in 100 grams of mangrove crab meat (Scylla spp.) contains 22 mg of omega-3 (EPA), 58 mg of omega-3 (DHA) and 15 mg of omega-6 (AA) which are important for a child's growth and intelligence. (muskar. 2007 in Heppi. et al 2021).

According to Desriansyah et al (2016), Aceh Singkil Regency has an area of 2,185 km2 and is in the position of 2020'-2027'30" LU and 97045'00" BT which has a very large mangrove

forest (mangrove) and has the potential to become a living habitat for mangrove crabs. Mangrove crabs scattered on the coast of Aceh Singkil mangrove forests are very abundant, especially in two districts, namely North Singkil District and Singkil District, this can be an opportunity for mangrove crab business actors who will be cultivated into soka crabs or soft crabs. Soka crab or soft crab has a much higher price than hard shell crabs of the same size. According to Muhammad Nurdin and Rochim (2010), the high cost of soka crabs is caused by the soft crab shells that will make it easier for fans to eat them. Since the establishment of soka crab cultivation carried out by Crab King Gostel Jaya In 2020, the demand for soka crab products is increasing both from inside and outside the city. Regarding the problems faced by CKGJ, the owner of the soka crab business has become a problem in receiving orders. Seeing the potential for brilliant business opportunities Crab King Gostel Jaya and supported by local stakeholders will open new pond land that will be used as soka crab cultivation so that it requires the right strategy in its development. The economic aspect of the amount of capital to build a new pond becomes a serious problem so that in order to be able to stand up takes a long time. In addition, the environment that will become a new pond is far enough from the river that contains brackish water or good salinity so that it requires dredging using heavy equipment by opening new trenches. The creation of a new pond or expansion is not only a place for soka crab cultivation but is able to become a strategy in making a container for mangrove crab breeders to do. Sustainability analysis really needs to be done to be a reference in formulating strategies and business development soka crab cultivation in the future so that the strategy that has been formulated can be implemented properly.

Based on the introduction above, the following problem can be formulated: what is the sustainability of soka crab cultivation agribusiness in Crab King Gostel Jaya Aceh Singkil? and what strategies can be formulated to analyze and develop the agribusiness sustainability of soka crab farming in Crab King Gostel Jaya?

The purpose of this study is to find out and analyze the condition of the ecological dimension along with other attributes and analyze and determine the right strategy in an effort to develop a sustainable soka crab farming business. It is hoped that this research will be able to provide benefits and sources of information for the community, especially coastal village communities who have the potential to develop crab cultivation and in particular provide benefits for Crab King Gostel Jaya which is a forum for researchers in conducting sustainability analysis research.

Materials and Method

Material

Types of mangrove crabs in mangrove forests include violin crabs (Uca spp) (Natania et al., 2017; Putriningtias et al., 2019) and mangrove crabs (*Scylla spp*) (Alfira et al., 2018). Mangrove crab is included in the Portunidae group which is one of the very important commodities in Indonesia and has a very wide distribution almost throughout Indonesian waters (Pratiwi, 2011; Putriningtias et al., 2019). Mangrove crab (*Scylla spp*) in the world, especially in Indonesia, consists of three main types and one variety, namely Scylla spp, Scylla tranquebarica, Scylla olivacea and Scylla spp variatas paramamosain (Kholifah at al., 2014; Pratiwi, 2011; Sulistiono et al,. 2016). Soka crab is another name for soft shell crab. The softness of the crab shell is not due to the type of crab but the softness of the crab shell is caused by the crab just passing through the stage of changing the shell or moulting. The hard crab shell was abandoned and a new shell appeared that was still soft. This new, still soft shell will also harden some time after the moulting (Muhammad nurdin and Rochim, 2010). It is better so that the crab shell does not harden immediately lifted from the water or cultivation site, because if the crab shell hardens, it will wait for another time to change the skin again. This condition of crabs with soft shells is in great demand among consumers.

In previous research conducted by Khotimah et,al., 2017 and Wiranto, 2020 that the demand for soka crabs in every area that has a soka crab cultivation business has increased product demand. This is an attraction for coastal communities to carry out soka crab farming businesses to create business opportunities that can increase financial income for fishermen and soka crab farmers.

Method

This study uses two analytical methods, namely Multi Dimensional Scalling – Rapid

Appraisal for Sustainability (MDS-RAPS) as a sustainability analysis method and the Analytic Hierarchy Process (AHP) as an analytical method for determining soka crab cultivation strategies (*Scylla spp*.). The research was conducted at the Soka Crab Cultivation Pond in Gosong Telaga Village, North Singkil District, Aceh Singkil Regency, Aceh Province. The research implementation time was carried out in March – June 2022. This Sustainability Analysis research was conducted at Crab King Gostel Jaya which is the only soka crab agribusiness business located in the West – South region of Aceh with the aim of determining priority attributes to determine sustainability status and formulate a soka crab business strategy in Aceh Singkil Regency.

This research is a case study or qualitative research that does not recognize the terms population and sample. Populations or samples in a qualitative approach are more appropriately called data sources in certain social situations (Djam'an Satori, 2007). In this study, there are several ways of collecting data, namely interviews, triangulation, document studies and questionnaires. the data source uses purposive samples that focus on selected informants who know the technicalities of soka crab cultivation and the importance of soka crab cultivation business in Aceh Singkil Regency. Here are seven (7) categories of informants or expert responders selected in this study:

1. Fisheries Service of Aceh Singkil Regency
2. Soka Crab Cultivation Stakeholders
3. Lecturer of Agribusiness
4. Social Services – PKH Companion
5. Government Officials
6. Soka Crab Manager
7. Fishermen Catch Mangrove Crabs

Variable Operational Definition

Operational definitions are limitations of understanding or understanding that are used as guidelines for the meaning of variables or dimensions that are measured to determine variables or dimensions used in data acquisition. There are five (5) dimensions used in this study, each dimension there are several attributes that have been determined with assessment criteria sourced from institutions, research and experts that can be accounted for (Firmansyah. 2016). The dimensions and attributes that have been compiled in this study are as see Table 1.

Data Processing

Multi Dimensional Scalling – Rapid Appraisal for Sustainability (MDS-RAPS)

Data processing and analysis in this study used Multi Dimensional Scalling – Rapid Appraisal for Sustainability (MDS-RAPS)

Table 1. Ecological dimension scoring table

Ecological Dimension Attribute	Score	Bad	Good	Description
Quality of the cultivation environment	0,1,2,3	0	3	0 is very broken; 1 slightly decreased; 2 good; 3 excellent.
Number of crab catches in the last 3 years	0,1,2,3	0	3	0 is greatly decreased; 1 declining; 2 increased; 3 is greatly improved.
Soka crab cultivation pond conditions	0,1,2,3	0	3	0 is very far away; 1 is close enough; 2 near; 3 is very close.
Crab fishing quotas and locations	0,1,2,3	0	3	0 is unlimited; 1 is quite restricted; 2 restricted; very restricted.
The size of the catch weight per head	0,1,2,3	0	3	0 <60 gr/head; 1 60-80 gr/head; 2 80-100 gr/ head; 3 100-200 gr/head
Fishing gear used (Static and Passive)	0,1,2,3	0	3	0 is not environmentally friendly; 1 is quite environmentally friendly; 2 environmentally friendly; 3 very environmentally friendly
Mangrove ecosystem conditions (density level)	0,1,2,3	0	3	0 rarely; 1 medium; 2 meetings; 3 very tight
Suitability of seed origin	0,1,2,3	0	3	0 there is no standard; 1 is not yet standard; 2 is pretty standard; 3 as per standards
Types of feed	0,1,2,3	0	3	0 chemically made; 1 artificial chemical + natural; 2 artificial natural ingredients; 3 succulent fish feed
Types of crabs that are released back	0,1,2,3	0	3	0 nothing is removed; 1 crab weighs <80grams; 2 female crabs lay eggs; 3 female crabs lay eggs and weigh <80grams.

analysis. Technical MDS-RAPS analysis was used in this study to help researchers find out and analyze the level of sustainability in soka crab cultivation in Crab King Gostel Jaya, North Singkil District, Aceh Singkil Regency. MDS/ RAPS stands for Multidimensionall Scaling and Rapid Apprasial for Sustainability is one of the sustainability evaluation analysis methods first introduced by Tony J. Pitcher in 1999 who is a scientist in the field of fisheries as well as the UBC Fisheries Center, University of British Columbis, Canada. The MDS-Rapfish method was first applied to the field of fisheries, especially to evaluate capture fisheries related to the Code of Condust for Responsible Fisheries by FAO in 1995. Referring to Picther (1999), that there are basic insertions in raps analysis are as follows:1) Unit analysis, in research is a certain unit that is taken into account as the subject of the study (Arikunto, 2010); 2) Variables/Attributes are concepts that have variations in values. According to Kerlinger (1989) in Joseph (2019), that in general there are three main characteristics of variables: 1) Variables have variations in value, 2) variables distinguish one object from another in one population, and 3) variables must be measurable; 3) Scoring (Scaling), becomes very important considering the possibility of killer attributes caused by the scoring carried out, where the scaling has a range that is too narrow or vice versa too wide. The assessment scale can be done with the principle of favorable or unfavorable. The principle of favorable is the principle of scaling with a direction between its qualitative nature and its quantitative value. In a sense, the better something is assessed, the higher its value, such as the case of a product or item. The principle of favorable indicates that the smaller/lower the quantitative value, the worse the conditions described (qualitative nature). 4) Data and Assessment, the type of data used in RAPS (Rapfish Modification) analysis refers to the types of data commonly used by MDS, namely metric-scale data (intervals and ratios) and non-metric scale data (nominal and ordinal) see Table 2.

According to Fauzi (2013), revealing Multi Dimensional Scalling (MDS) analysis is used to perform an assessment of each attribute on an ordinal scale based on the sustainability criteria of each dimension. Ordination analysis based on "Multi Dimensional Scalling" (MDS), is used to compile existing indexes and sustainability status conditions, both in general

Table 2. Principles of grading scales

Principle *Favorable*		Principle *Unfavorable*	
Quantitative Value	Qualitative Properties (product quality)	Quantitative Value	Qualitative Properties (tainted category)
0	Very Bad	0	Not Tainted/ good
1	A Little Bad	1	Polluted a little
2	Keep	2	Moderately polluted
3	Good	3	Heavily polluted
4	Excellent	-	-

Figure 1. Two Points of Reference of Bad and Good.

Table 3. Sustainability Index Values

Index Value	Category
0,00 – 25,00	Bad (unsustainable)
25,00 – 50,00	Less (less sustainability)
50,00 – 75,00	Enough (enough sustainability)
75,00 – 100,00	Good (very sustainable)

and on each dimension. According to Firmansyah (2016) conducted a study that explained that the score value of each attribute was analyzed multi-dimensionally to determine one or several points that describe the sustainability position studied relative to the two reference points, namely the good "good" and bad "bad" points. ordination analysis will be depicted in the Figure 1.

In the figure 1, it is visualized on the horizontal axis with the sustainability index given a score of 0% (bad) and 100% (good). If the system analyzed has a sustainability index value greater than or equal to 50% (>50%), then the system is said to be sustainability and is said to be non-sustainability if the index value is less than 50% (<50%). The value of the sustainability index has an interval between 0%-100% using a scale that developed by the University of Colombia, Canada, as in Table 3.

2. *Analysis Methods Analytic Hierarchy Process* (AHP)

Analytic Hierarchy Process (AHP) used in this study as an analytical tool for decision

making in determining the Agribusiness strategy of Soka Crab Cultivation in Crab King Gostel Jaya, Aceh Singkil Regency. AHP analysis performed:

1) *Decomposition*
2) *comparative Judgment*
3) *Syntesis of Priority*
4) *Consistency*

The AHP method used is the expert choice (EC) method which is an application program that can be used as a tool to help decision makers in making decisions. AHP's steps in determining decisions:

- Creating a structure, AHP structure in asymmetric mitigation information on determining strategies consists of three levels, namely, goals, criteria and alternatives. Multiply each first column with the relative priority of the first element, the value with the second column with the relative priority of the second element and so on.
- Then proceed with an assessment of criteria and alternatives by experts, where experts conduct an assessment of the level of importance between elements based on definitions and functions. As well as add up each row.
- The result of the summation of rows is divided by the corresponding realtive priority element.
- Sum up the quotient with the number of existing elements, then the result is called λ maks.
- Calculate Consistency Index (CI) with formula:
  CI =(λ maks-n) – (n-1)
  Where n = the multiplicity of elements
- Calculate Consistency Ratio (CR) with formula : CR = CI/RI
  Where, CR = *Consistency Ratio*
  CI = *Consistency Index*
  RI = *Random Consistency Index*

If the value is more than 10% then the judgement assessment must be corrected, but if the consistency ratio (CI / RI) is less or equal to 0.1 then the calculation results can be declared correct.

Results and Discussion

Ansis sustainability of soka crab cultivation (*Scylla spp*.)

Research conducted on businesses in the agribusiness of soka crab cultivation in Aceh Singkil Regency aims to be analyzed and The sustainability status of soka crab cultivation (*Scylla spp*.) in Aceh Singkil Regency can be seen from the following ecological dimensions:out the sustainability status of soka crab cultivation and determine the right strategy for soka crab cultivation in Aceh Singkil Regency. The Ecological Dimension has attributes or variables that already have the basis of provisions both from Government Or Ministry Regulations, previous research, and provisions based on the results of interview activities in the field with soka crab cultivation pond managers. The sustainability status of soka crab cultivation (Scylla spp.) can be known using the analysis method Multi Dimensional Scalling – Rapid Appraisal for Sustainability (MDS-RAPS).

The sustainability status of soka crab cultivation (Scylla spp.) in Aceh Singkil Regency can be seen from the following ecological dimensions see figure 2.

Based on the Rapfish results presented in figure 3, the ecological dimensions of soka crab cultivation in Aceh Singkil Regency are at a value of 99.83. Judging from the value of the sustainability index, the ecological dimension of soka crab cultivation is included in the category of 75.00 – 100.00 or "Good (Very Sustainable)". Environmental quality explains the environmental conditions in the field or around the soka crab cultivation pond area is very supportive for the survival of aquaculture crabs including water salinitation conditions, water pH, weather factors, and environmental conditions that are good and not polluted. The sustainability analysis of soka crab cultivation is known to have ten (10) attributes and produces two (2) attributes that have an influence, including one very influential attribute and one small attribute on the sustainability status of soka crab cultivation. The results of the leverage of atribute analysis in figure 4.2 the dominant attribute is the top priority to provide benefits or influences are environmental quality attributes with a value of 0.004.

Based on the Law of the Republic of Indonesia Number 32 of 2014 concerning Marine Affairs Article 22 paragraphs 1 and 2 (a). Paragraph 1 "The government and local governments in accordance with their authority are responsible for managing and utilizing coastal resources and small islands. Paragraph 2 of the management and utilization as referred to in paragraph 1 aims to (a) protect, conserve,

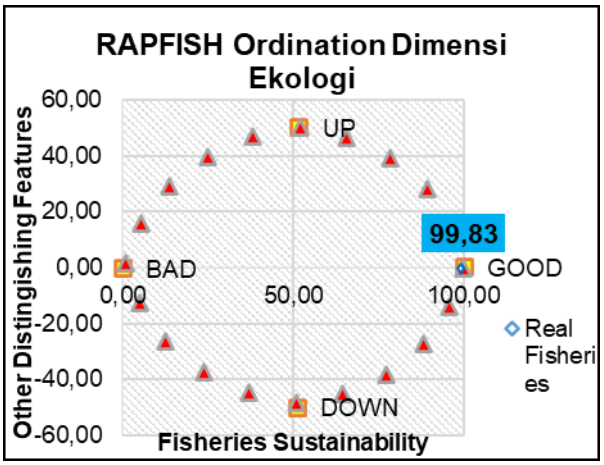

Figure 2. The sustainability status of the ecological dimensions of soka crab cultivation based on Rapfish anlysis.

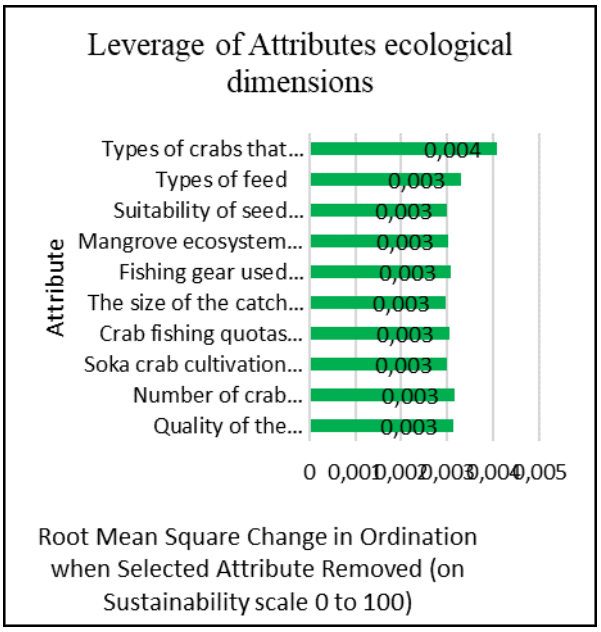

Figure 3. Leverage of atribute ecological dimensions of soka crab cultivation.

rehabilitate, utilize and enrich coastal resources and small islands and systems ecologically sustainable". The article above is a support for this research and the results of Rapfish analysis and leverage that is produced that ecology or the environment is very important in supporting the sustainability of soka crab cultivation in Aceh Singkil Regency.

The ecological or environmental dimension can be interpreted that activities within the environment must be able to maintain the integrity of the ecosystem, maintain the carrying capacity of the environment, and conserve natural resources including biodiversity (Eddy Elminsyah, 2020). Based on this sentence, as a farmer, it is not enough to carry out business activities, but also to pay attention to the environment, provide motivation to employees and fishing communities about awareness of maintaining and preserving and maintaining the integrity of the mangrove forest ecosystem in Aceh Singkil Regency. If the environmental and ecosystem conditions are good, it can support the cultivation of soka crabs in a sustainable manner.

The attribute of a small influence on the cultivation of soka crabs with a value of 0.002 is fishing gear. The tools used by fishermen in looking for soka crabs are still very simple and still fairly traditional. PERMEN-KP Article 7 paragraph 3e of 2020 "Crab fishing (*scylla spp*.) must be carried out using fishing gear of a static or passive nature". The tools used by fishermen of Aceh Singkil Regency have met the requirements and are made of waring nets designed to entangle crabs into the net. The advantage is that it is in accordance with the procedure, which is very environmentally friendly, but the disadvantage is considered less efficient because when used there are still many crabs that are not entangled or do not enter the net because they only have one door. The efforts made by fishermen must have a lot of nets and be distributed on the margins or in mangrove forests so that the crabs produced are optimal and meet the needs of soka crab seedlings every day. Another consequence caused by the net is that it is damaged more quickly and hollowed out due to being annexed by crabs and it is necessary to have regular checks and repairs so that entangled crabs cannot get out. Fishermen need to design fishing gear using a more efficient design so that it can be profitable for fishermen and soka crab pond managers.

Analysis of *Montecarlo*

Rapfish analysis and leverage analysis were carried out to determine the dimensions and attributes that are very influential in the agribusiness of soka crab cultivation (*Scylla spp*). The purpose of using montecarlo analysis is to look at the Error rate in Rapfish analysis.

Table 4 shows the difference between the results of the two MDS-Rapfish analyses and the Monte carlo analysis of the confidence level <95%. Based on the results of monte carlo analysis with the difference value less than 1 i.e. ecological dimension 0.65. The results of the analysis of MDS-Rapfish with

Table 4. Sustainability Index MDS-RAPFISH analysis with Monte Carlo analysis 95% confidence level.

Sustainability Dimensions	Sustainability Index Value		Differences – Differences
	MDS-RAPFISH	Monte Carlo	
Ecology	99,83	99,29	0,65

Source: researcher's data, processed (2022).

Table 5. AHP analysis of soka crab cultivation using Expert Choice.

Dimension	Attribute	Value	(%)	inconsistency
Ecology	Quality of Cultivation Environment	0,497	49,7	0,00382

Source: researcher's data, processed (2022).

monte carlo can be concluded that the degree of scaling or scoring errors in each attribute is very small or does not differ markedly.

Soka Crab Cultivation Agribusiness Strategy (*Scylla spp.*)

Analytic Hierarchy Process (AHP) used as a tool to strategize in this study. The preparation of the AHP hierarchy was promulgated from the MDS-Rapfish analysis by procuring priority attributes of the ecological dimension. The priority attribute has not been made in decision making so it requires decision making in order to produce the priority attribute which is a strategy in the cultivation of soka crabs in Aceh Singkil Regency. The Analytic Hierarchy Process (AHP) is a decision support system developed by comparing the degree of importance between criteria (Imam muslim R, 2014). Show on table 5.

Analytic Hierarchy Process (AHP) in this study it is used to find and determine the priority attributes of the structure that has been compiled and formulated using AHP analysis with Expert Choice. The environmental quality attribute of soka crab cultivation is a very dominant attribute compared to other attributes with a value of 0.497. This means that environmental quality attributes are a very important top priority in the cultivation of soka crabs in Aceh Singkil Regency. The inconsistency result of 0.003 means that the data from the field meets the requirements of that is 0.1 and is very consistent.

Law of the Republic of Indonesia Number 32 of 2014 concerning Marine Affairs chapter 8 concerning marine space management and marine environment protection Article 42 paragraph (a) which reads "protecting resources and the environment based on the carrying capacity of the environment and local wisdom". The linkage with this research is about the importance of environmental quality attributes and the article aims to call on pond cultivators to maintain and maintain qualityin the environment of soka crab cultivation. The quality of the environment is considered very important because it can affect many factors. One of them is that the water source used in the cultivation of soka crabs should not be polluted so that it does not affect the cultivation of crabs. This attribute is highly recommended to soka crab farmers and other pond commodity farmers in the coastal environment of Aceh Singkil Regency.

Managerial Implications

Based on the results of research on the cultivation of soka crabs (*Scylla spp*.) in Aceh Singkil Regency, it can be seen that the soka crab agribusiness ecological dimension has a very sustainable category. It is necessary to make efforts or actions that can support and support the sustainability and success of soka crab cultivation. The ecological dimension on the quality attributes of the cultivation environment is in the category of highly sustainable and becomes the attribute with the first highest level of importance in determining strategies. The efforts that need to be made by soka crab farmers are to maintain the quality of the environment around the cultivation pond by not throwing any type of waste along the river flow so that the water is not polluted by garbage or waste because the river is the main (brackish) source of water in the pond pond where mangrove crabs are cultivated into soka crabs. Maintaining and preserving mangrove forests by not cutting down mangrove trees that are the home or habitat of mangrove crabs. Carrying out the capture of mangrove crabs or soka crab seedlings in accordance with the applicable rules, using environmentally friendly tools and releasing female crabs laying eggs.

Conclusion

Based on the results and discussion on the Status of Sustainability and Determination of Soka Crab Cultivation Strategy in Aceh Singkil Regency on the ecological dimension are as follows:

1) As a result of the *rap-analysis* of the sus-

tainability index of soka crab cultivation, the first position with the category of highly sustainability is the ecological dimension and *leverage of environmental quality attributes*. *.Analytic Hierarchy Process* (AHP) is an analytical tool in finding and determining the right strategy in the development of soka crab cultivation in Aceh Singkil Regency. The result of the Analytic Hierarchy Process (AHP) is the attribute of the environmental quality of soka crab cultivation on the ecological dimension as an attribute that has the highest level of importance.

2) The two analisis above are consistent produces the environmental quality of soka crab cultivation from the ecological dimension that has the highest sustainability status and the highest level of importance attributes. Farmers must maintain this status because it is considered very important in the sustainability of business in the field of soka crab agribusiness and other coastal fishery businesses.

Suggestion

The fishery business in the field of soka crab agribusiness (Scylla spp) in Aceh Singkil Regency has only one farmer who was established in 2020. To maintain the existence, farmers should update their cultivation strategies and postharvest handling using appropriate technology in product marketing. So that soka crab products can serve shipments outside Aceh Province. This research is a case study research and can be used as a basis for cultivators who will do business in the field of agribusiness soka crab cultivation in the Aceh Singkil Regency area.

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