

SPATIAL DIRECTION OF MINOR RICE LAND BASED ON LAND SUITABILITY AND SWOT ANALYSIS IN TANASITOLO DISTRICT, WAJO DISTRICT

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ABSTRACT

This study aimed to determine the potential and strategies for mina paddy land management based on land suitability and SWOT analysis in Tanasitolo District, Wajo Regency. The analytical tools used are land suitability analysis and swot analysis. The results of the study show that the potential for managing the mina paddy pattern of aquaculture in Tansitolo District, Wajo Regency, can be developed in the western region of irrigated rice fields. The potential for fisheries management with the Mina paddy pattern can be increased if the availability of irrigation networks increases. The strategy for managing the aquaculture fisheries of the Mina paddy pattern is that the government and the community work together Increase the coordination of all parties to make cheap/economical feed, create cooperation between cultivators and groups and open up easy access to capital, Carry out water quality management and use fish that have a high tolerance for decline water quality, providing quality seeds/parents.

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Keywords: Mina paddy, land suitability, SWOT.

INTRODUCTION

Indonesia's fishery resources are one of the natural resources owned by the Indonesian people (Halim et al., 2020). Along with the increasing population of Indonesia and the need for better food and nutrition, the demand for fish continues to increase from year to year. In the fisheries sector, freshwater fish is a fishery commodity that currently generates much foreign exchange. Calculations by the Indonesian Central Bureau of Statistics (BPS) show that the demand for fresh fish in Indonesia increased to 247, 369 tons in 2010, positively impacting fisheries development (Badan Pusat Statistik, 2010). The potential of pond cultivation land that can be used for fish cultivation in ponds

is recorded at 375,800 ha, and the potential for mina paddy cultivation is possible for fish cultivation with rice (mina paddy), reaching 240,000 ha (Nurhayati et al., 2016). Based on data from the Officer, (2016), in 2012, Indonesia was ranked 2nd for capture fisheries production and 4th for aquaculture production worldwide. This fact can illustrate that Indonesia's fishery potential is very large, so if it is managed properly and responsibly and its activities can be sustainable, it can become one of the main sources of capital for development in the present and the future.

The latest breakthrough launched by the government in optimizing the potential of waters in Indonesia is the development of the mina paddy area. The development of the

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Mina Paddy area aims to increase rice and fish production, encourage the acceleration of regional development with agricultural and fishery activities as the main activities in increasing the income and welfare of the community by encouraging village and city linkages and the development of competitive, community-based, sustainable mina-business systems and businesses (does not damage the environment) and decentralized (authority is in the local government and the community) in the Mina Paddy area (Aziz, 2020).

In utilizing the potential of existing natural resources related to the development of fisheries in a broad sense, an approach through products is sought, namely planning for the development of aquaculture areas (mina paddy) (Arif et al., 2021). Planning for the development of aquaculture areas (mina paddy) is an effort to utilize existing land/potentials in overcoming problems faced in the management and spatial planning of fisheries in rural areas. The management of aquaculture fisheries is a spatial utilization policy directive designated for fishery activities and other fishery-based businesses on a national scale. Meanwhile, managing spatial areas of national and regional fisheries production centers is a policy direction and strategy for spatial utilization for fisheries designation in general. Currently, efforts are needed to develop rice cultivation technology that can positively contribute to farmer welfare and food security. Various concepts of improvement in rice farming have been carried out so that rice productivity remains high, environmentally friendly, and sustainable. Efforts to increase farmers' income that have been carried out include the prima farmer program, integrated crop management (PTT), mina paddy, and its development.

Fish farming through the mina paddy system is one of the efforts to optimize the potential of irrigated paddy fields and increase farmers' income (Nurhayati et al., 2016). In principle, the condition of the rice fields, which are always flooded, makes it possible for fish cultivation. However, in reality, rice fields designed only for rice cultivation are in less optimum conditions for fish cultivation. The application of pesticides

to kill pests in rice cultivation can also kill fish. Therefore, to be suitable for fish farming in the mina paddy system, the design, and management of paddy fields must be made to support the growth of both fish and rice (Aziz, 2020; Syaikat & Julistia, 2019; Triyanti et al., 2021). Information on potential areas for cultivation is an important factor in fisheries development. Information and data on land potential will assist decision-makers in utilizing and minimizing conflicts of interest, avoiding environmental degradation for business continuity, and reducing land and water use conflicts. Site selection is an activity to decide the rational use of land (Arif et al., 2021; Aziz, 2020). Rational land use means placing a piece of land according to its potential. In addition, site selection is a form of control and management in fisheries development.

Tanasitolo sub-district is one of the sub-districts directly adjacent to Lake Tempe and one of the centers of fishery production, which is quite small (Lineton, 1975, p. 49). Tanasitolo District is one of the sub-districts in Wajo Regency which has enormous potential for the development of mina paddy aquaculture because, administratively, it is directly adjacent to Lake Tempe, so the availability of irrigation water to support the aquaculture process through mina paddy is not an obstacle, and supporting an area to become a source of income, especially for farming communities and opening up new jobs for the community. Based on this background, the author raised a title, "Spatial Direction Of Minor Rice Land Based On Land Suitability And Swot Analysis In Tanasitolo District, Wajo District."

LITERATURE REVIEW

Management of Fishery Resources

Management of fishery resources, according to FAO (Food and Agriculture Organization) in Clarke, (2004), is an integrated process between gathering information, conducting analysis, making plans, conducting consultations, making decisions, determining resource allocation, as well as formulation and implementation, if necessary using law enforcement of the rules and regulations that control fishing activities

intending to ensure the sustainability of the production of resources and the achievement of other fishing objectives. Fisheries management involves various complex tasks that ensure optimal returns from natural resources for local communities, regions, and countries derived from the sustainable use of fish resources (Clarke, 2004).

Furthermore, according to Tacon et al., (2006, p. 45), fisheries management in the framework of developing fisheries aims to:

1. Maintaining the sustainability of fish resources and continuing fish production activities through utilizing coastal resources as the livelihood of the community concerned. Without fish resources, there is no longer any need for management because the availability of fish resources is the main reason for a country to develop its fisheries (resource-based development).
2. Improving the economic and social welfare of the community.
3. Ensure efforts to meet the needs of society and industry for food sources from fisheries.

Mina paddy

The Mina paddy cultivation system is a way of raising fish between rice plants in paddy fields as an interval between the two seasons of rice crops and or the maintenance of fish as a substitute for crops in the rice fields (Nurhayati et al., 2016). Because it can enrich the planting medium with organic fertilizer and increase the production of plankton, a food source for fish, and that is the contribution of fish to this integrated farming business (Nuryasri et al., 2015). In fact, according Ahmadian, (2021), mina paddy is one of the agricultural land technologies to improve environmental quality in anticipation of climate anomalies because this mina paddy is integrated cultivation that can increase the productivity of paddy fields, namely: increasing farmers' income through increasing rice production by 10%; increasing the diversity of agricultural products because it produces fish; increase soil and water fertility (reduce 30% fertilizer); can also reduce the brown planthopper disease pests in rice plants (Mahmudiyah & Soedradjad, 2018; Nurhayati et al., 2016; Rahman et al., 2018).

The farming system of raising fish with rice in paddy fields, or Mina Paddy, was developed in Indonesia a century ago and is a type of fish farming in paddy fields, where fish and rice are grown together (Irian Agricultural Information Center) (Aziz, 2020). Meanwhile, rice fields suitable for farming are those with technical or semi-technical irrigation.

Land suitability

Land suitability is the level of suitability of a piece of land for a particular use. The suitability of the land can be assessed for current conditions (actual land suitability) or after improvements have been made (potential land suitability). Actual land suitability is based on data on the biophysical properties of the soil or land resources before the land is given the necessary inputs to overcome the constraints. The biophysical data is in the form of soil and climate characteristics related to the growing requirements of the plants being evaluated. Potential land suitability describes the land suitability that will be achieved if improvement efforts are made (Layomi Jayasinghe et al., 2019).

According to the FAO Officer, (2016), the structure of land suitability classification can be differentiated according to the level of Order, Class, Subclass, and Unit. Order is the state of global land suitability. At the level of land suitability order, it is distinguished between land that is classified as suitable (S=Suitable) and land that is not suitable (N=Not Suitable). Nurda et al., (2020) Class is a state of conformity level in the order level. Based on the level of detail data available at each mapping scale, land suitability classes are divided into: (1) For semi-detailed level mapping (scale 1: 25,000-1: 50,000) at the class level, land belonging to the appropriate order (S) is distinguished into three classes, namely: very suitable land (S1), moderately suitable (S2), and marginally suitable (S3). Meanwhile, land belonging to the unsuitable order (N) is not differentiated into classes. (2) For mapping the level of review (scale 1: 100,000-1: 250,000) at the class level, it is divided into appropriate (S), conditionally appropriate (CS), and non-compliant (N) classes (Arab & Ahamed, 2022).

Class S1 Very suitable: The land has no significant or significant limiting factors for sustainable use, or the limiting factors are minor and will not significantly affect land productivity. Class S2 Sufficiently suitable: Land has a limiting factor that will affect its productivity, requiring additional input. Farmers themselves can overcome these barriers. Class S3 According to marginal: Land has a severely limiting factor, and this limiting factor will greatly affect its productivity, requiring more additional input than land classified as S2. Overcoming the limiting factors in S3 requires high capital, so it needs

help or intervention (intervention) from the government or the private sector. Class N Land is unsuitable because it has very severe limiting factors and is difficult to overcome.

METHODS

The primary data used is data from field checks for land suitability analysis for mina paddy. The secondary data used for this research is the land use map of the Wajo Regency and the RT/RW map of the Wajo Regency. For more details, see **Figure 1**.

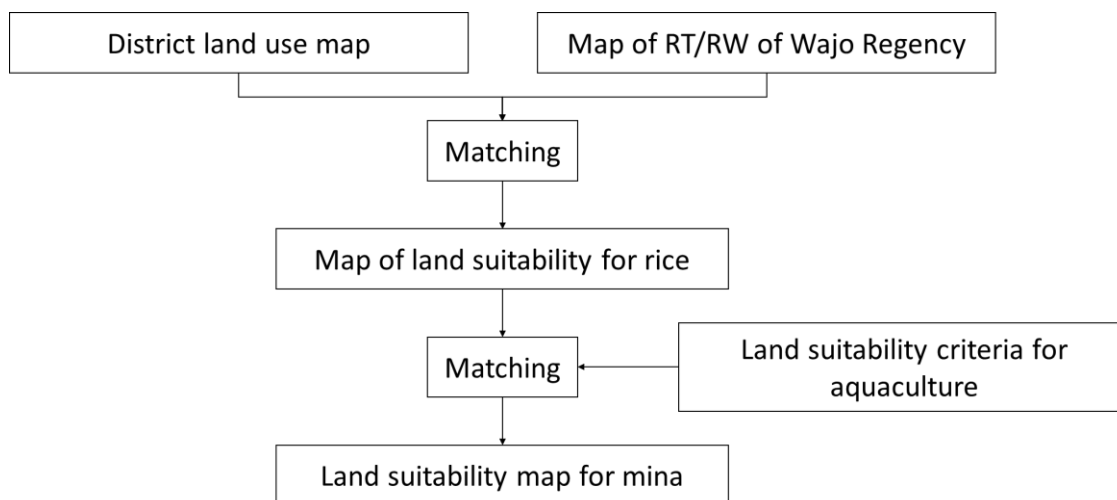


Figure 1. Flow chart of land suitability and availability analysis for mina paddy

Analysis of Land Suitability for Mina Paddy uses references from research by [Agus et al., \(2021\)](#). This analysis aims to produce a land suitability map for the mina paddy pattern. The potential for managing mina paddy can be seen from the suitability of the land for lowland rice plus the availability of irrigation networks. Irrigation networks are used to accommodate the need for water available for mina paddy. Land suitability analysis was carried out in stages, namely land suitability based on paddy field criteria and overall suitability for freshwater ponds (mina paddy) ([Nursandi & Verdian, 2022](#)). Land suitability based on ecological criteria is obtained with the overlay function, namely the intersection of four factors (slope, soil texture, rainfall, and distance from the river). Land suitability classes are divided into sub-classifications based on the most dominant/severe limiting factors ([Velmurugan et al., 2018](#)). The results of the land suitability

analysis produce land suitability which can be grouped into three class categories, namely:

- S1: very suitable. The land does not have large limitations and does not significantly reduce productivity;
- S2: quite suitable, the land has a rather large limiting factor that affects productivity and increases the required input;
- N: not suitable. The land has difficulties that can prevent land use for cultivation. The land is not suitable because of physical factors (very steep slopes, etc.) and economically (the benefits are less than the costs incurred).

SWOT Analysis

To determine the management strategy for mina paddy land in Tanasitolo District, Wajo Regency, Strength-Weakness-Opportunity-Threat (SWOT) analysis was used ([Rangkuti, 1998](#)). The instrument used to carry

out strategic analysis, SWOT analysis, is an effective tool in helping to structure problems, especially in analyzing the strategic environment, commonly referred to as the internal and external environments. Internally has some strengths and weaknesses, and externally will be faced with opportunities

and threats (Glinka, 2022). In this case, the mina paddy fishery management strategy can increase the income of the farming community in Tanasitolo District, Wajo Regency. The SWOT Analysis Matrix Model is presented in **Table 1**.

Table 1. SWOT Analysis Matrix Model

EFAS \ IFAS	Strength (S)	Weakness (W)
Opportunity (O)	SO strategy (strategy that uses strengths and takes advantage of opportunities)	WO strategy (strategy that minimizes weaknesses and takes advantage of opportunities)
Threat	ST strategy (strategy that uses strengths and overcomes threats)	WT strategy (strategy that minimizes weaknesses and avoids threats)

Source: (Zima et al., 2020)

Explanation of table 1 There are 4 (four) sets of possible alternative strategies, namely:

1. S-O Strategy: strategy in using the strengths possessed to take advantage of opportunities as much as possible;
2. S-T Strategy: strategy in using the strengths possessed to overcome threats that may arise;
3. W-O strategy: a strategy to take advantage of opportunities and minimize weaknesses;

4. W-T strategy is based on defensive activities that minimize weaknesses and avoid threats.

Analyzing the external environment (EFAS) to discover possible opportunities and threats. Strategic issues to be monitored must be determined because these problems may affect the mina paddy fields in the future. The Internal Strategy factor analysis model table (IFAS) can be seen in **Table 2**.

Table 2. Model Analisis Faktor Strategi Internal (IFAS)

Strategic factors	Weight	Score	Weight x Value
Strength: (factor that becomes strength)	(Professional Judgment)	(Professional Judgment)	(The number of times the weight multiplied by the value on each factor of strength)
Amount	(Total power weight)	(Total power rating)	(Total weight x strength)
Weaknesses: (factors that become weaknesses)	(Professional Judgment)	(Professional Judgment)	(The number of times the weight multiplied by the value on each factor of weakness)
Amount	(Total weight of weakness)	(Total weakness value)	(Total weight x weakness)

Source: (Zima et al., 2020)

RESULTS AND DISCUSSION

Land Suitability Analysis for Mina paddy

Land suitability analysis is carried out for freshwater aquaculture activities by considering land characteristics as supporting and limiting factors. Assessment of land suitability for fish farming is carried out to avoid mistakes in the early stages of selecting

cultivation sites which will lead to increased construction costs, aquaculture operations, and environmental problems. Glinka, (2022) state that damage to the aquatic environment can cause crop failure (Isikdag & Zlatanova, 2009). The suitability of land for mina paddy in Tanasitolo Subdistrict resulted from an analysis of the following parameters: (1) water

source, (2) rainfall, (3) land use, (4) soil type (5) roads.

The water source is the most important parameter in determining the potential land for fish farming. In this study, what is used as a source of irrigation for aquaculture land is irrigation. Based on data from the Central Statistics Agency for Tanasitolo District, Wajo Regency has 14 Irrigation Areas (DI) spread across 20 districts. The use of irrigation for fishing activities requires coordination with the authorized agency because the construction of irrigation facilities is intended to develop paddy farming. The use of paddy fields for rice and fish cultivation through the mina paddy system is one of the integrated efforts to optimize the potential of irrigated paddy fields. The application of mina paddy can create diversification of agricultural businesses, thereby increasing the diversity of agricultural products.

The presence of fresh water and average rainfall/year are also important factors because fresh water is not only one of the basic human needs but also an indicator of water quality for aquaculture activities. The average rainfall per year in Tanasitolo District reaches 93.3 millimeters. The highest rainfall occurred in June at 315 millimeters, and the lowest in February at 27 millimeters. In this case, a source of fresh water is the existence of rivers. The choice of location for fresh water should be close to the river, and this is to make it easier for farmers to pump water into the mina paddy fields.

Soil texture is a geological factor (physical condition of the area) that needs to be shown in the management of freshwater fisheries (mina paddy). In the research results of [Nurhayati et al., \(2016\)](#) Very good soil for potential fish farming is soil with a slightly sandy loam texture, such as glei and alluvial soil types. This type of soil also has the property of being able to hold water so that it can prevent erosion. This condition follows the texture of the soil in the Tanasitolo District, which is dominated by alluvial soil types. It is also necessary to pay attention to the land status of the location of freshwater waters that will be used, such as not being located in a location prone to disasters and erosion and not belonging to the state. The research area is an

area that belongs to the community and is not prone to disasters and erosion.

Most of the irrigation areas built in the Tanasitolo Subdistrict are located in the western part of Tanasitolo, so the subdistricts that have the potential for the mina paddy system of fish farming are the subdistricts in that area. The land not available for mina paddy is because the land has been used for other activities or is not following the land allocation stipulated in the RTRW (Regional Spatial Planning) of Wajo Regency.

According to the analysis results, the potential for managing mina paddy in Tanasitolo District, Wajo Regency, can be directed to the existing land for irrigated rice fields and land. This is because the existing irrigated rice fields still need to reflect land use for mina paddy but only show potential land for mina paddy. Apart from originating from existing land and analysis results, potential land for mina paddy can come from land suitable for lowland rice ([Nuryasri et al., 2015](#)). Lowland rice has the potential for mina paddy if irrigation networks are available. The land area for lowland rice is very high, especially in the western region.

The land not available for mina paddy is because the land has been used for other activities or is not following the land allocation stipulated in the RT/RW (Regional Spatial Planning) of Wajo Regency. Land with suitability class N (not suitable) cannot be improved because it has permanent boundaries in the form of soil texture that cannot be repaired. Improvements were only made to drainage by making drainage channels, but this input did not increase its suitability class. The improvements will affect the land area suitable for lowland rice and mina paddy. For more details, see **Figure 2**.

Based on **Table 3** and **Figure 2**, the results of the land suitability analysis show that the western part of the Tanasitolo region shows a larger area of suitable and available land for mina paddy compared to other areas. The area is quite large in the class, suitable for S1 (very suitable) in Mappadaelo, Pincengpute, and Tanjung Villages. The accessibility of production facilities and products in this region is very high. The prospect for the development of Mina Paddy can also be seen

from the community's interest in the exploitation of Mina Paddy. The number of fishing households (RTP) in the mina paddy business sector in the seven sub-districts is

quite high. Therefore, the government's role in mobilizing public interest in the mina paddy business is necessary.

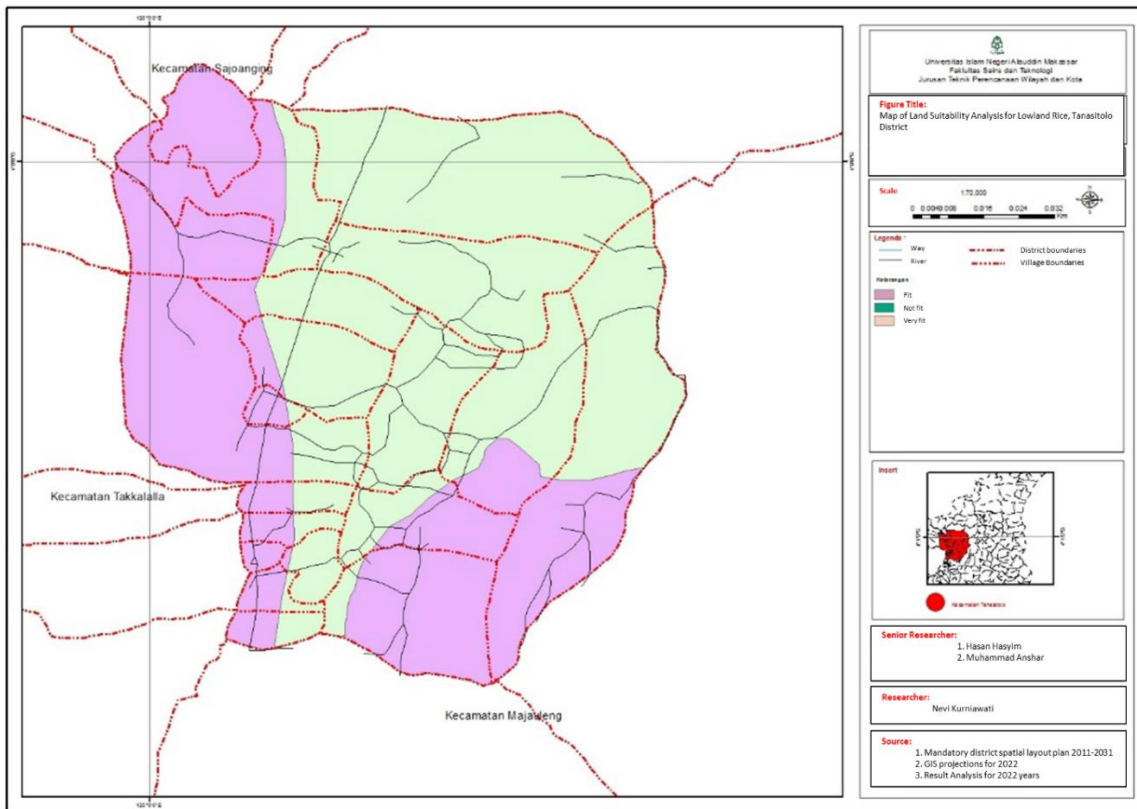


Figure 2. Map of Land Suitability Analysis for Lowland Rice, Tanasitolo District

Table 3. Land suitability area for Mina paddy in Tanasitolo District, Wajo Regency

Land suitability for mina paddy	Wide	
	ha	%
S1 (Very Suitable)	4	1,34
S2 (Suitable)	2	0,88
N (Not suitable)	7	3,01
Total	13	4,77
Not rated	139,60	90
The area of Tanasitolo District	154,60	100,00

Source: 2022 Analysis Results

Strategy for the Management of Aquaculture with the Mina Paddy Pattern

Based on the formulation of the second problem regarding the strategy for managing the Mina Paddy fishery pattern, the management process uses the SWOT analysis method. This analysis is used in order to be able to take advantage of existing strengths and opportunities while also trying to reduce weaknesses and minimize threats that will disrupt and hinder the implementation of the

management of mina paddy aquaculture management. For this reason, it is necessary to study the strengths and weaknesses as internal factors and opportunities and threats as external factors.

1. Regional Internal Factor Analysis (IFAS)

The Internal Strategic Factors Analysis Summary (IFAS) matrix shows the level of importance in determining the potential strategy for mina paddy land in Tanasitolo

District. IFAS can be used to determine the position of mina paddy land in Tanasitolo District. These positions can be grouped in quadrants I, II, III, or IV. [Das et al., \(2022\)](#) states that placement in a quadrant following current external and internal conditions will influence decision-making and the most appropriate strategy. Based on some of the things that have been mentioned in the development of land for mina paddy and some research supporting data obtained, strengths in the form of potential natural resources or suitability of cultivation

locations, cultivation techniques that are known to be hereditary, always available workforce, policy support (central or regional), as well as the availability of fishery production facilities and infrastructure. Meanwhile, the Weaknesses are the diversification of the fishery product processing business, the quality of human resources (HR) and groups, the quality of broodstock and seeds, coaching and supporting apparatus, and the interest of the younger generation is reduced. The details of the IFAS Matrix are presented in **Table 4**.

Table 4. Internal Strategic Factor Analysis Summary (IFAS)

Internal strategic factors	weight	Value	Weight x value
Strength (S)			
1. Potential of natural resources/ suitability of location for cultivation	20	4	80
2. Cultivation techniques known from generation to generation	20	4	80
3. Labor is always available	20	3	60
4. Policy support (central/regional)	20	3	60
5. Availability of fishery production facilities and infrastructure	20	3	60
Total Score	100		340
Weakness (W)			
1. Diversification of fishery product processing business	20	3	60
2. Quality of human resources (HR) and groups	20	2	40
3. Parent and seed quality	20	3	60
4. Fostering and supporting apparatus	20	2	40
5. The interest of the younger generation is waning	20	2	40
Total Score	100		240

Description of the value: 4 = Very good 3 = Good 2 = Fairly good 1 = Not good; Source: Researcher Analysis Results for 2022

1. Regional External Factor Analysis (EFAS)

External Strategic Factors Analysis Summary (EFAS) is an analysis tool that presents the company's external conditions to determine the opportunities and threats that a company has. The EFAS matrix also shows the level of importance in determining the potential strategy for mina paddy land in the Tanasitolo District. In addition, EFAS can also be used to determine the position of mina paddy land in the Tanasitolo District. These positions can be grouped in quadrants I, II, III, or IV. In the SWOT analysis, EFAS that has a positive impact on business can be classified as opportunities, and EFAS that has a negative

impact can be classified as threats ([Aziz, 2020](#)). Based on some of the things mentioned in the land development for mina paddy and some research supporting data, opportunities are obtained in the form of community awareness of nutrition, demand for fish needs, food production, wide price ranges, and open non-formal education. Meanwhile, the threats are access to capital, declining water quality, land and water use conflicts, low capacity for cultivation capital, and business competition with other regions. The details of the IFAS Matrix are presented in **Table 5**.

Table 5. External Strategic Factor Analysis Summary (EFAS)

External strategic factors	Weight	Value	Weight x Value
Opportunity (O)			
1. Public awareness of nutrition	20	3	60
2. Demand for fish needs	20	4	80
3. Food producer	20	3	60
4. Wide price range	20	3	60
5. Open non-formal education	20	2	40
Total Score	100		300
Threat (T)			
1. Access to capital	20	3	60
2. Water quality is decreasing	20	3	60
3. Land and water use conflicts	20	2	40
4. The ability of cultivation capital is low	20	2	40
5. Business competition with other regions	20	1	20
Total Score	100		220

Description of the value: 4 = Very good 3 = Good 2 = Fairly good 1 = Not good; Source: Researcher Analysis Results for 2022

To find out the location of the strategic quadrants that are considered to have high priority to be implemented immediately, the X and Y axis formulations are used, where the X axis is EFAS (Opportunities and Threats) and the Y axis is IFAS (Strengths and Weaknesses) which are expressed in values according to the scoring results (Table and Table). Based on the calculation results with the IFAS score (Strengths and Weaknesses), namely = $340 - 240 = 100$, while the EFAS score (Opportunities and Threats) is $300 - 220 = 80$. Then the IFAS - EFAS score each shows a positive value (+) so that the strategy the management of aquaculture under the mina

paddy pattern, namely among the strengths and opportunities (SO) strategy, namely in Quadrant 1.

Conclusion :

- (IFAS) = Strengths - Weaknesses = $340 - 240 = 100$ (y)
- (EFAS) = Opportunity - Threat = $300 - 220 = 80$ (x)

Furthermore, the results of the conclusions of the IFAS and EFAS matrices are then known to be the quadrant position of the mina paddy land in the Tanasitolo sub-district which is presented in **Figure 3**.

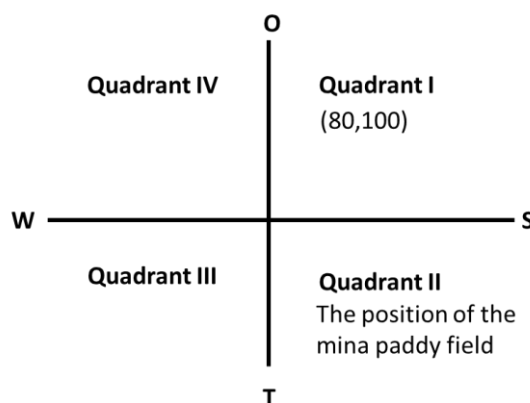


Figure 3. Graph of Mina Paddy Land Position in Tanasitolo District

Based on the IFAS matrix, the total strength-weakness factor score is positive at 0.13, while in the EFAS matrix, the total opportunity-threat factor score is negative at -

0.03. The position of mina paddy land in Tanasitolo District is thus in quadrant II. This position faces various threats but still has internal strength. The strategy must be carried

out to suppress threats and use strength to take advantage of long-term opportunities through a diversification strategy. Therefore,

this condition must be faced by making alternative strategies through the SWOT matrix presented in Table 6.

Table 6. SWOT Matrix Analysis of Mina Paddy Aquaculture

Internal Factors	Strength	Weaknesses
External Factors	<ol style="list-style-type: none"> 1. Potential of natural resources/suitability of cultivation location 2. Cultivation techniques known from generation to generation 3. Labor is always available 4. Policy support (central/ regional) 5. Availability of fishery production facilities and infrastructure 	<ol style="list-style-type: none"> 1. Diversification of fishery product processing business 2. Quality of human resources (HR) and groups 3. Parent and seed quality 4. Fostering and supporting apparatus 5. The interest of the younger generation is waning
Opportunities	SO	WO
<ol style="list-style-type: none"> 1. Public awareness of nutrition 2. Demand for fish needs 3. Food producer 4. Wide price range 5. Open non-formal education 	<ol style="list-style-type: none"> 1. Optimizing the utilization of existing resources to increase production (S1-4; O1-5) 2. Encouraging and utilizing central and regional government policies (S4; O1-5) 3. Improving the quality of groups/institutions through seminars, training and others (S5; O1-5) 	<ol style="list-style-type: none"> 1. Improving broodstock and seed quality by using certified broodstock (W1; O1-5) 2. Carry out facilitation and introduction of fish processing businesses through training and demonstrations by utilizing young workers (W2-5; O1-5) 3. Fixing the limited resources (W3-4; O1-5)
Threats	ST	WT
<ol style="list-style-type: none"> 1. Access to capital 2. Water quality is decreasing 3. Land and water use conflicts 4. The ability of cultivation capital is low 5. Business competition with other regions 	<ol style="list-style-type: none"> 1. Creating farmer and group cooperation and opening easy access to capital (S5-6; T4-5) 2. Implement a consistent spatial pattern utilization policy (S5; T3) 3. Carry out water quality management and use fish that have a high tolerance for decreasing water quality (S1-5; T2) 4. Improving the coordination of all parties to make cheap/economical feed and improve the quality of seeds/mothers (S1-6; T1,6) 	<ol style="list-style-type: none"> 1. Using available resources to increase production (W1-5; T5) 2. Using quality broodstock and seeds (W1; T2-5)

Source: Researcher Analysis Results 2022

The main alternative strategies formulated based on the results of the SWOT analysis are: (1) Creating partnerships with cultivators and groups and opening up easy access to capital. Inter-group cooperation is carried out to increase bargaining position and better competitiveness. This cooperation is expected to reduce the practice of intermediaries in fishery production. This is inseparable from the low capital capabilities of cultivators. The aspect of capital is often an obstacle for cultivators. Capital assistance in Tanasitolo District, Wajo Regency, still needs

to be improved, and the mechanism for channeling capital loans is still an obstacle for some cultivators.

Access to capital needs to be made easier for cultivators; (2) Implement a consistent spatial pattern utilization policy. The spatial pattern utilization policy aims to avoid land use conflicts. Land for mina paddies that are already producing will need to be maintained by implementing policies that support fishing business activities, such as setting industrial locations that can reduce water quality; (3) Carry out water quality

management and use fish with a high tolerance for water quality degradation. Water pollution must be overcome by implementing water management that enters the cultivation site and using commodities resistant to decreasing water quality.

Apart from industry, community activities also have the potential to reduce water quality. The results of the analysis of water quality do show that the conditions are suitable for cultivation, but it is feared that the quality will continue to decline in the future; (4) Improving the coordination of various parties to make cheap/economical feed and provide quality seeds/broodstock. Expensive feed is a threat to fish farming activities. Therefore, an alternative to factory feed is needed so that the costs incurred for feed can be reduced. Farmers need to be equipped with the knowledge to make feed independently using local raw materials. High feed allocation can also be suppressed by using quality broodstock and seeds.

Parent and seed quality is considered the weakest factor in the development of freshwater fish farming in Tanasitolo District, Wajo Regency. Farmers generally do not use certified sires. If certified parents and seeds cannot be used, efforts are made to use parents with different offspring so that inbreeding does not occur. The impact of using broodstock and seeds of poor quality will be felt during rearing because the fish grow slowly and require higher feed costs. For more details, see **Table 6**.

CONCLUSION

Based on the description of the results and discussion, the results of the land suitability analysis in the western part of the Tanasitolo region show that the area of land suitable and available for mina paddy is larger than the other areas. The strategy needed in managing the mina paddy pattern aquaculture fishery is based on internal and external factors analyzed by SWOT, namely the government and the community work together to improve the coordination of all parties to make cheap/economical feed, create cooperation between cultivators and groups and open up easy access to capital, implement managing water quality and using fish that

have a high tolerance for water quality degradation, providing quality seeds/parents.

Author's declaration

Authors' contributions and responsibilities

The authors made substantial contributions to the conception and design of the study. The authors took responsibility for data analysis, interpretation and discussion of results. The authors read and approved the final manuscript.

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Availability of data and materials

All data are available from the authors.

Competing interests

The authors declare no competing interest.

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