

Strategic Framework for Enhancing Food Security and Economic Growth in Tomini Bay's Agricultural Sector

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Abstract

Food security ensures consistent access to nutritious food for all people. This study examines the agricultural potential of Tomini Bay, encompassing North Sulawesi, Gorontalo, and Central Sulawesi, with the goal of strengthening regional food security and promoting economic growth. Despite its natural wealth and strategic location, Tomini Bay faces challenges such as limited technological access, inadequate infrastructure, and weak market connectivity. This research applies descriptive quantitative and qualitative approaches, gathering data from key stakeholders, including farmers and officials, from July to December 2023. SWOT, IFAS, EFAS, and QSPM analyses were used to identify the region's strengths, weaknesses, opportunities, and threats. The findings highlight Tomini Bay's significant assets, such as abundant resources, diverse ecosystems, and governmental support, though infrastructure and technology limitations hinder development. Recommended strategies focus on improving infrastructure, enhancing human resource skills, and leveraging Special Economic Zones and ASEAN market opportunities. These results underscore the importance of collaboration among government, private sectors, and local communities to achieve sustainable agricultural development. This study contributes to Indonesia's food security framework by offering a region-specific model for integrating agricultural potential with sustainable development goals. Further research should examine climate impacts and explore technology adoption among small-scale farmers.

Keywords: *Strategic, Food Security, Economic, Tomini Bay*

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INTRODUCTION

Food security is a critical global concern, representing a state in which all individuals have consistent physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and preferences for a healthy, active life. This concept encompasses four key dimensions: availability, accessibility, utilization, and stability, each of

which must be ensured for food security to be achieved comprehensively (Peng & Berry, 2019). As emphasized by Greenville et al. (2020), the definition formulated during the 1996 World Food Summit underscores the necessity for uninterrupted access to adequate food at all times. Without this security, nations face heightened risks of malnutrition, poor health outcomes, and socio-economic instability.

Agricultural activities are central to global food security, encompassing the production, processing, and distribution of food products. The agricultural sector ensures food availability through crop cultivation, while food accessibility is enhanced by efficient distribution networks. Utilization involves processing and consumption, ensuring that food meets nutritional needs, while stability addresses the need for consistent food access over time, particularly during crises (Pawlak & Kołodziejczak, 2020). At the individual level, consumption is the final step, where people meet their dietary needs through prepared food products (Govindan, 2018). These interconnected activities collectively uphold the foundations of food security, as each step in the food value chain is crucial for meeting nutritional demands and stabilizing economies.

The Indonesian government has recently initiated ambitious agricultural programs to bolster food security, focusing on specific regions such as Pulang Pisau Regency and Kapuas Regency in Central Kalimantan Province. These efforts form part of Indonesia's broader Food Estate Program, aimed at revitalizing agricultural productivity. Historically, Indonesia achieved self-sufficiency in rice production in 1984, marking a significant milestone. However, declining agricultural yields in recent years have threatened this achievement, forcing Indonesia to reconsider its strategies. In light of this, the government recently reintroduced rice imports after a hiatus of more than a decade (Tirtalistyani et al., 2022). This development underlines the urgency of identifying sustainable agricultural solutions to maintain national food security.

The National Economic Recovery Program (PEN) represents Indonesia's primary response to the economic challenges exacerbated by the COVID-19 pandemic. Within the framework of Government Regulation Number 23 of 2020, the PEN initiative promotes the development of food estates as a means to revitalize the economy and stabilize the national food supply (Fadillah et al., 2021). The pandemic has disrupted agricultural supply chains, exposing vulnerabilities within the sector and driving demand for enhanced food quality and production standards (Lasminingrat & Efriza, 2020). The agricultural sector, being a vital component of the nation's economy and food supply system, has been under significant strain. Addressing these challenges requires the implementation of robust policies to ensure sustainable agricultural practices and food availability (Okolie & Ogundeji, 2022). Within this national context, Tomini Bay emerges as a region of strategic importance due to its rich natural resources and biodiversity. This large marine area serves as a geographic bridge between the Asian and Australian continents, offering abundant agricultural potential (Miller et al., 2016). Tomini Bay spans three Indonesian provinces—North Sulawesi, Gorontalo, and Central Sulawesi—incorporating over fifteen regencies and cities (Muzakir & Suparman, 2016). Its diverse agricultural ecosystems position it as a key area for food production, with the capacity to contribute significantly to regional food security. However, realizing this potential requires aligning agricultural growth with the demands of a growing population and increasing global economic competition.

The central research problem addressed in this study focuses on how to effectively harness the agricultural potential of Tomini Bay to promote social welfare and regional economic growth. Despite its considerable natural endowments, Tomini Bay faces challenges such as limited agricultural infrastructure, uneven policy implementation, and the negative impacts of the COVID-19 pandemic on food systems. Thus, a thorough analysis is required to identify practical strategies for optimizing agricultural production and positioning Tomini Bay as a leading hub for food production and processing within the provinces of North Sulawesi, Gorontalo, and Central Sulawesi.

Existing literature has offered general solutions to food security challenges in similar contexts, often emphasizing agricultural diversification, infrastructure development, and capacity-building programs. Studies have underscored the importance of supporting smallholder farmers, investing in agricultural research, and improving market access to enhance food production and distribution networks (Pawlak & Kołodziejczak, 2020). Furthermore, addressing the socio-economic impacts of the COVID-19 pandemic requires specific policy interventions, such as economic recovery programs targeting vulnerable agricultural sectors (Fadillah et al., 2021). However, while these solutions are valuable, they often focus on broader national contexts without addressing the unique characteristics of sub-regional food systems, such as those in Tomini Bay.

This study aims to fill this gap by focusing on the specific challenges and opportunities presented by Tomini Bay's agricultural sector. Although existing research has highlighted the region's biodiversity and agricultural potential, few studies have examined how these resources can be leveraged to improve food security and drive economic growth across multiple provinces. The novelty of this research lies in its attempt to integrate regional agricultural strategies with national economic recovery efforts, thereby offering a localized solution to a national problem. By addressing the specific dynamics of Tomini Bay, this study provides actionable insights for policymakers, farmers, and stakeholders within the region.

In summary, this study aims to explore effective strategies for utilizing the agricultural potential of Tomini Bay to enhance food production, promote economic growth, and ensure social welfare in North Sulawesi, Gorontalo, and Central Sulawesi. The research will focus on identifying sustainable agricultural practices, assessing the impacts of the COVID-19 pandemic on the region's food systems, and proposing policy recommendations to position Tomini Bay as a pivotal center for food production and processing. The findings of this study are expected to contribute to Indonesia's long-term food security strategy by providing region-specific insights that align with national development goals.

METHODOLOGY

This research used descriptive methods with qualitative and quantitative approaches to the food security based agricultural potential in Tomini Bay. The chosen research location was conducted at Province of Central Sulawesi in the Central Sulawesi Province (the regencies of Parigi Moutong, Poso, Tojo Una Una, and Banggai), Province of Gorontalo (the regencies of Gorontalo, Boalemo, Pohuwato, Bone Bolango and Kota Gorontalo), Province of North Sulawesi (the regencies of South Bolaang Mongondow, East Bolaang Mongondow, Southeast Minahasa, Minahasa, and Kota Bitung). The study was conducted in July-December 2023. The selection of respondents was intentionally with consideration of the respondents' criteria were able to provide information relating to the agricultural potential in Tomini Bay. Selected respondents used key informants consisting of: academicians, farmers, local society and parties from the agricultural department.

The formulation of the agricultural potential in Tomini Bay development strategy used a SWOT analysis using the approach of internal factors analysis strategy (IFAS) and external factors analysis strategy (EFAS) as well as the QSPM (Quantitative Strategic Planning Matrix) analysis. Analysis SWOT is a tool for analyzing factors and forming a management strategy. This analysis is based on a logic that can maximize strengths and opportunities while minimizing weaknesses and threats (Puy t et al., 2023). The Quantitative Strategic Planning Matrix (QSPM) is a technique that allows for determining which alternative strategic goals will be prioritized (M. David et al., 2016). The QSPM matrix is the author's choice to see results that

are carried out objectively based on several internal and external success problems that have been studied previously (F. R. David, 1986).

RESULT AND DISCUSSION

The area around Tomini Bay in Indonesia spans several regencies across three provinces, each with its own unique features (Wunarlan & Idji, 2023). It offers cultural and natural attractions and is bordered by the Sulawesi Sea to the north (Pusparini et al., 2023). To the east lies the Maluku Province, and to the south are West Sulawesi Province and Southeast Sulawesi Province, each adding to the region's diversity. To the west, the area is bordered by the Makassar Strait, offering its own unique blend of natural beauty and geographical significance.

Tomini Bay in Indonesia experiences a rainy season from October to March and a dry season from May to September. In 2021, the coolest months were July and September, with an average air temperature of 26.90°C. March was the warmest month, reaching 28.80°C. April had the highest average rainfall at approximately 62.45 mm, while September had the least at 10.35 mm. The wind speed ranged from 4.0 to 6.0 knots, with the maximum speed in September and the minimum in July. The air humidity stands at 76.40%. Altitude affects temperature, with a decrease of approximately 0.6°C for every 100 meters increase (Mistry et al., 2022).

The Agricultural Sector in Gorontalo

Sitting astride the equator, Gorontalo Province occupies a prime position along the coastal expanse of Tomini Bay and the Sulawesi Sea. This unique geographical setting bestows upon the province a rich tapestry of agricultural potential, encompassing diverse opportunities in agriculture, capture fisheries, aquaculture, and animal husbandry. The agricultural landscape of Gorontalo Province is marked by a broad spectrum of commodities, encompassing food crops, horticulture, and plantation crops (Putri et al., 2021). These agricultural contributions permeate the various districts and cities, underpinning a significant portion of the province's GDP.

Among the food crop commodities, rice, corn, and soybeans stand as the dominant cultivars, while the horticultural bounty includes a vibrant array of vegetables such as shallots, leeks, spinach, green beans, kale, cucumber, hot and bell peppers, mustard greens, eggplant, long beans, cabbage, squash, and tomatoes. The province also boasts a colorful assortment of fruits, including durian, mango, jackfruit, pineapple, papaya, banana, and rambutan, further enriching its agricultural profile. Gorontalo Province is home to a substantial population of 251,003 cows and 102,585 goats as of 2019 (BPS Gorontalo, 2023). The nurturing of this sector hinges on pivotal factors such as land availability and the accessibility of high-quality animal feed. Beyond cattle and goats, the province holds promise for the expansion of other poultry varieties, including kampung chicken and ducks, a prospect that heralds potential economic advancement for the region.

In 2019, the Gorontalo Province Department of Maritime Affairs and Fisheries provided detailed insights into the region's thriving fishery sector. The data revealed that the majority of fishery products stemmed from aquaculture, with a total of 15,477.39 tons accounting for 54.36% of the overall production (BPS, 2023). This significant contribution was complemented by 212,427.50 tons of marine fishery products and 95,991 tons of fishery

products sourced from 8,413 fishing households (BPS, 2023). Notably, the seaweed cultivation area covered approximately 14,250 ha and yielded 99,454.4 tons, while the Capture Fisheries area spanned around 50,500 km² with a potential annual yield of 92,171 tons (BPS Gorontalo, 2023).

Delving into the specifics, the capture fishery commodities in Gorontalo Province encompassed an assortment of species, including large pelagic, medium/small pelagic, demersal, shrimp penaeid, reef fish, lobster, crabs, and squid. Furthermore, the potential for aquaculture showed promising diversity, with distinct categories such as freshwater aquaculture, brackish water aquaculture, and aquaculture in seawater fisheries (Naylor et al., 2021). Moreover, the integration of post-capture technologies was evident, covering essential processes such as refrigeration/cold storage for freezing, advanced packaging, and canning. Noteworthy industries operating in tandem with capture fisheries and aquaculture included fish canning/packaging, fish meal production, animal feed derived from fish waste, procurement of Fish Aggregating Devices (FADs), pearl cultivation, shrimp/lobster pond cultivation, and the burgeoning seaweed industry.

The Agricultural Sector in North Sulawesi

In the verdant expanse of North Sulawesi, a symphony of agriculture, animal husbandry, plantation cultivation, and robust fisheries forms the lifeblood of the region, nurturing its populace while significantly contributing to its economic prosperity. The landscape teems with a fertile promise, evidenced by the striking boom in paddy field productivity from 2011 to 2014. By the year 2019, the rice yields soared to an impressive 596,223 tons, further escalating to an extraordinary 673,712 tons by 2021 (BPS, 2023). Such a bounty accounted for a noteworthy 0.90% of the entire nation's rice production, illustrating the region's crucial role in Indonesia's food security. However, 2021 brought a stark contrast in the tale of corn, with production tumbling down to 331,005 tons – a sharp drop of 32.22% from the bountiful harvest of 488,362 tons in 2020, primarily due to a punishing dry season (BPS, 2023). Yet, in the realm of soybeans, North Sulawesi painted a picture of resilience and growth, increasing its contribution to national production from 0.74% in 2019 to 0.84% in 2021, showcasing its adaptable agricultural prowess (BPS, 2023).

Moreover, the region is a horticultural haven, boasting vast potential for cultivating an array of vegetables such as cabbage, carrots, potatoes, beans, and onions. The generous and varied physical geography of North Sulawesi provides a perfect canvas for the cultivation of a diverse portfolio of fruits including rambutan, salak, mangoes, duku, langsung, durian, banana, watermelon, and pineapple. Each variety flourishes, tailored to the unique environmental characteristics bestowed upon different districts, illustrating a perfect blend of nature's bounty and agricultural acumen.

Complementing this verdant agricultural mosaic are substantial plantation crops that weave more diversity into the region's agricultural fabric. Esteemed among these are the aromatic coffee, exquisite vanilla, nutritious cashew, staple cassava, piquant pepper, versatile candlenut, lucrative palm oil, sustainable jatropha, and the sturdy abaca. Each of these commodities adds a distinctive thread to North Sulawesi's rich tapestry of agricultural diversity, serving not only to feed and employ the local populace but also to fortify the economic backbone of the region. This lush agricultural heritage stands as a testament to North Sulawesi's vibrant, dynamic, and sustainable approach to farming, underpinning both its cultural identity and economic vitality.

North Sulawesi meat production is dominated by pork production value tends to increase each year. Much pork is produced from Minahasa, with a total pig population in 2021 of 28.10% of the pig population in North Sulawesi at 505,968 (BPS, 2023). Beef is mostly produced in Bolaang Mongondow, Minahasa, South Minahasa, and North Minahasa Regencies. On the other hand, the production of poultry farms in North Sulawesi tended to increase in 2019-2021, including meat, duck eggs, eggs free-range chicken and broiler chicken eggs (BPS, 2023). Poultry farming in North Sulawesi is well known by the community and has become the foundation of life for some people who live in wet agroecosystem areas (rice fields, lake shores, and watersheds). The poultry livestock population tends to increase, with the largest being kampung chickens. The total kampung chicken population in 2014 was 2.3 million, higher than the 2019 population of 2.1 million (BPS, 2023). The broiler population in 2020 and 2021 has increased, so the number exceeds the kampung chicken population (BPS, 2023). This evolution underscores the intricate relationship between agricultural practices, economic vitality, and cultural identity in North Sulawesi.

Perched at the Pacific Ocean's edge, North Sulawesi Province commands a uniquely strategic position that bridges it with the dynamic East Asian and Pacific markets. This prime location is further enhanced by its proximity to the vital Indonesian Archipelagic Sea Lanes II and III, cementing its role as a pivotal maritime hub. Within this rich marine milieu, North Sulawesi thrives on its vibrant capture fisheries, boasting an estimated sustainable potential of fish resources at a staggering 1,839,665 tons per year, complemented by a generous total allowable catch of 1,471,732 tons per year (BPS, 2023). Tuna and skipjack emerge as the stars of the catch, underscoring the region's contribution to the global seafood market.

Beyond the bounty of the ocean, the province is enveloped by an abundance of maritime resources along its picturesque coasts and in the depths of its seas. This bounty facilitates the cultivation and export of an array of premium marine products, from succulent shrimp and nutritious sea cucumbers to versatile seaweed. These marine treasures play a foundational role in the livelihoods of coastal communities, serving as key economic stalwarts. Spearheading North Sulawesi's economy, the fisheries and maritime sectors stand out as crucial pillars, with marine capture fisheries marking a significant source of production. In 2020 alone, the province reported a substantial haul of 282,980 tons, highlighting its pivotal position in the fisheries and broader maritime landscape of the region. This rich tapestry of resources, strategic location, and thriving marine sectors paints a vivid picture of North Sulawesi's vital role in both the local and global maritime economies.

The Agricultural Sector in Central Sulawesi

The fertile agricultural lands of Central Sulawesi Province stretch across 942,206 ha, offering promising potential for various plantations. BPS, 2023 explained about the diverse plantation potential covers an expanse of 289,805 hectares, with distinctive areas dedicated to coconut (61,999 ha), cocoa (120,085 ha), clove (33,361 ha), rubber (6,250 ha), cashew (9,815 ha), nutmeg (11,434 ha), and smallholder oil palm (23,115 ha). Additionally, the province's livestock industry maximizes 120,955.5 hectares of land potential. Moreover, the marine fisheries potential in Central Sulawesi Province spans an impressive 193,923.75 km², encompassing the Makassar Strait, the Sulawesi Sea, Tomini Bay, and Tolo Bay (BPS, 2023). The bountiful fish resources in the province's waters are estimated to reach approximately 330,000 tons per year across these marine expanses (BPS, 2023).

In Central Sulawesi Province, the food crops sub-sector is rich in diversity, encompassing a variety of essential commodities such as rice, corn, soybeans, peanuts, green beans, cassava, and sweet potatoes. Analysis of data from the Regional Government of Central Sulawesi Province in 2019 reveals a noteworthy upward trajectory in the production of food crops from 2019 to 2021. Among the food crops, rice, corn, and cassava emerged as the leading commodities in terms of increased production. Moving on to the province's plantation commodities, the landscape is equally diverse, featuring cocoa, coconut, coffee, cloves, pepper, nutmeg, cashew, rubber, vanilla, and palm oil. Notably, coconut, oil palm, cocoa, and cloves took precedence as the primary plantation commodities in 2019. The details are fascinating, with coconut production reaching an impressive 187,404.30 tons, oil palm at 243,340.00 tons, cocoa at 168,733.90 tons, and cloves at 5,314.10 tons (BPS, 2023).

SWOT Matrix based on IFAS and EFAS Analysis for Agricultural Development in Tomini Bay

The following Table 1 and 2 provides a detailed breakdown of the SWOT analysis using the Internal Factors Analysis Strategic (IFAS) and External Factors Analysis Strategic (EFAS) frameworks. This approach allows for a structured evaluation of internal strengths and weaknesses as well as external opportunities and threats, supporting strategic planning to optimize the agricultural potential of Tomini Bay.

Table 1. SWOT Matrix Based on IFAS

Factors	Descriptions	Weights	Ratings	Weighted Scores
Internal Factors (IFAS)				
Strengths (S)				
1. Abundant agricultural and fishery resources	0.15	4	0.60	
2. Diverse agroecosystems for crops and fisheries	0.10	3	0.30	
3. Strategic location linking local and global markets	0.10	4	0.40	
4. Local government support for agriculture program	0.05	3	0.15	
Total Strengths		0.40		1.45
Weakness (W)				
1. Limited access to technology and mechanization	0.10	2	0.20	
2. Inadequate post-harvest	0.10	2	0.20	

infrastructure and facilities			
3. Low capacity of human resources in farming	0.15	3	0.45
4. Weak market networks and poor control over market information	0.05	2	0.10
Total Weakness		0.40	0.95
Net IFAS Score		1.00	0.50

Source: Primary Data Analysis, 2023

Based on the IFAS Analysis in Table 1 showed that agricultural development in Tomini Bay has 4 strengths which were: (1) Abundant agricultural and fishery resources (BPS, 2023), (2) Diverse agroecosystems for crops and fisheries (Muzakir & Suparman, 2016), (3) Strategic location linking local and global markets (Naylor et al., 2021), and (4) Local government support for agriculture program (Sahami et al., 2024). Also the 4 weaknesses including: (1) Limited access to technology and mechanization (Khan et al., 2024), (2) Inadequate post-harvest infrastructure and facilities (BPS, 2023), (3) Low capacity of human resources in farming (Lasminingrat & Efriza, 2020), and (4) Weak market networks and poor control over market information (Mumtaz et al., 2023). The net IFAS score of 0.50 indicates that the strengths of Tomini Bay's agricultural sector slightly outweigh its internal weaknesses. This suggests that the region has the necessary resources and infrastructure to support agricultural development, though efforts are required to address gaps in human resources, post-harvest facilities, and market connectivity.

Table 2. SWOT Matrix Based on EFAS

Factors	Descriptions	Weights	Ratings	Weighted Scores
External Factors (EFAS)				
Opportunities (O)				
1. ASEAN Economic Community expanding market access	0.15	4	0.60	
2. Demand for sustainable agriculture and organic food	0.10	3	0.30	
3. Post-pandemic economic recovery initiatives	0.10	3	0.30	
4. Special Economic Zones	0.05	4	0.20	

(SEZs)			
promoting agricultural processing			
Total		0.40	1.40
Opportunities			
Threats (T)			
1. Environmental degradation from unsustainable practices	0.15	3	0.45
2. Increased competition from other agricultural hubs	0.10	3	0.30
3. Climate variability impacting agricultural outputs	0.10	2	0.20
4. Risk of illegal fishing and resource depletion	0.05	2	0.10
Total Threats		0.40	1.05
Net EFAS Score		1.00	0.35

Source: Primary Data Analysis, 2023

The result of EFAS analysis in Table 2 showed that showed that agricultural development in tomini bay has 4 opportunities, which were: (1) ASEAN Economic Community expanding market acces (Vitálišová et al., 2021), (2) Demand for sustainable agriculture and organic food (Govindan, 2018), (3) Post-pandemic economic recovery initiatives (Fadillah et al., 2021), and (4) Special Economic Zones (SEZs) promoting agricultural processing (Kipnis et al., 2020). The 4 threats including: (1) Environmental degradation from unsustainable practices (Tudi et al., 2021), (2) Increased competition from other agricultural hubs (Nasikh et al., 2021), (3) Climate variability impacting agricultural outputs (Mistry et al., 2022), and (4) Risk of illegal fishing and resource depletion (Sahami et al., 2024). The EFAS score of 0.35 highlights that Tomini Bay can leverage external opportunities, such as SEZ development and post-pandemic recovery programs, to mitigate external threats. However, challenges related to environmental degradation and competition from other regions remain significant, underscoring the need for proactive and sustainable strategies. The SWOT analysis result was performed to determine the formulation of agricultural development in tomini bay strategy as illustrated in Table 3 below.

Table 3. Strategy Determination and SWOT Assesment Result

Internal	Strenght = 1.45	Weakness = 0.95
	S1. Abundant agricultural and fishery resources S2. Diverse agroecosystems for crops and fisheries S3. Strategic location linking local and global markets S4. Local government support for agriculture program	W1. Limited access to technology and mechanization W2. Inadequate post-harvest infrastructure and facilities W3. Low capacity of human resources in farming Weak market networks and poor control over market information
External		
Opportunities = 1.40	STRATEGY SO = 2.85	STRATEGY WO = 2.35
O1. ASEAN Economic Community expanding market access O2. Demand for sustainable agriculture and organic food O3. Post-pandemic economic recovery initiatives O4. Special Economic Zones (SEZs) promoting agricultural processing	1. Opening the product marketing network of capture agriculture and fisheries 2. Establishing the agricultural processing industry 3. Establishing the fishery processing industry 4. Creating the Special Economic Zone, particularly	1. Increasing the capacity of human resources in agriculture 2. Increasing the number of milling factories to meet the needs of consument paddy and corn in Tomini Bay area 3. Performing the maintenance and rehabilitation of agricultural processing industry 4. Conducting the law enforcement against the illegal fishing 5. Providing the working capital facilities and the access to the capital 6. Improving the partnership cooperation between the local government and the farmer and fishermen
Threats = 1.05	STRATEGY ST = 2.45	STRATEGY WT = 2.0
T1. Environmental degradation from unsustainable practices T2. Increased competition from other agricultural hubs T3. Climate variability impacting agricultural outputs	1. Performing the quality control of the agricultural products 2. Creating the local regulations on farmers and fisherman for structuring Tomini Bay	1. Making the quality standard of the agriculture and fishery product 2. Creating the network of agriculture and fishery product marketing in domestic areas and foreign countries

T4. Risk of illegal fishing and resource depletion	3. Controlling the waste and the use of agriculture and fishing device that may damage the environment	3. Increasing the public awareness of the importance of the sustainability of the ecosystem or friendly to environment
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Source: Primary Data Analysis, 2023

From table 3, the determination of development strategy based on the SWOT analysis showed that there were 4 kinds of strategies including; SO strategy produced 4 alternatif strategies, WO strategy produced 6 alternatif strategies, ST strategy produced 3 alternatif strategies and WT strategy produced 3 alternatif to determine the formulation of agricultural development in tomuni bay strategy. Then based on the table, the next step was to formulate the strategy priority by order from the highest to slowest value as showed in the table below:

Table 4. Strategy Assesment Sequences of SWOT Analysis Results

Sequence	Strategy	Value
1	<i>Strength - Opportunity (SO)</i>	2.85
2	<i>Strength - Threat (ST)</i>	2.45
3	<i>Weakness - Opportunity (WO)</i>	2.35
4	<i>Weakness - Threat (WT)</i>	2.0

Source: Primary Data Analysis, 2023

The conclusion in the table 4 showed that the highest value was the strength opportunity (SO) strategy, which means that the directed strategy to be implemented was a strategy to strategies of using the strengths to utilize the opportunities. Other research results related to determine the formulation of agricultural development in tomuni bay with the SWOT method produced ST strategies as a type of directed strategy. While, the research results of BPS (2023) used SWOT with the results of the type of ST strategy as the chosen strategy.

Development Strategy Based on QSPM Analysis

After performed SWOT analysis and the results of alternative strategies were obtained which will be directed to the agricultural development in tomuni bay, then a QSPM analysis was conducted. This QSPM analysis was used to determine the main priority of alternative strategies (Aji et al., 2014) . The alternative WO strategy consisted of: Strategy I. Maximize agricultural and fishery resources for ASEAN market expansion. Strategy II. Improve infrastructure and technology to enhance competitiveness and reduce environmental impact. Strategy III. Strengthen partnerships and human resource capabilities to utilize SEZ benefits and support sustainable practices. The stages of determining the strategic decisions that will be directed the agricultural development in tomuni bay were described in the QSPM matrix formulation as follows:

Table 5. QSPM Internal External Matrix

No	Quality	Strategy I	Strategy II	Strategy III
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	Critical Success Factors		Maximize agricultural and fishery resources for ASEAN market expansion		Improve infrastructure and technology to enhance competitiveness and reduce environmental impact		Strengthen partnerships and human resource capabilities to utilize SEZ benefits and support sustainable practices	
			AS	TAS Value	AS	TAS Value	AS	TAS Value
Strengths								
1.	Abundant agricultural and fishery resources	0.15	4	0.60	3	0.45	2	0.30
2.	Diverse agroecosystems	0.10	3	0.30	3	0.30	2	0.20
3.	Strategic Location	0.10	4	0.40	2	0.20	3	0.30
4.	Local government support	0.05	3	0.15	3	0.15	4	0.20
Total		0.40	1.45		1.10		1.00	
Weaknesses								
1.	Limited access to technology	0.10	2	0.20	4	0.40	3	0.30
2.	Inadequate post-harvest infrastructure	0.10	2	0.20	4	0.40	2	0.20
3.	Low capacity of human resources	0.15	2	0.30	3	0.45	4	0.60
4.	Weak market networks	0.05	3	0.15	2	0.10	3	0.15
Total		0.40	0.85		1.35		1.25	
Opportunities								
1.	ASEAN market expansion	0.15	4	0.60	2	0.30	3	0.45
2.	Demand for sustainable agriculture	0.10	3	0.30	4	0.40	3	0.30
3.	Post-pandemic economic recovery	0.10	3	0.30	3	0.30	3	0.30
4.	SEZs promoting agricultural processing	0.05	3	0.15	3	0.15	4	0.20

Total Opportunities		0.40	1.35	1.15	1.25			
Threats								
1.	Environmental degradation	0.15	3	0.45	4	0.60	4	0.60
2.	Increased competition	0.10	3	0.30	3	0.30	3	0.30
3.	Climate variability	0.10	2	0.20	4	0.40	3	0.30
4.	Illegal fishing risks	0.05	3	0.15	5	0.15	3	0.15
Total Threats		0.40		1.10		1.45		1.35
Total of Internal External TAS				4.75		5.05		4.85
				Priority III		Priority I		Priority II

Source: Primary Data Analysis, 2023

Quantitative Strategic Planning Matrix (QSPM) analysis was performed to determine the main priority of the strategy from the highest Total Attractiveness Score (TAS) from several alternative SO strategies. To get the highest Total Attractiveness Score (TAS) from several alternative SO strategies was determined based on the attractiveness score (AS) multiplied by the quality of internal and external factors. The results of the calculation of Total Attractiveness Score (TAS) from internal and external factors of the agricultural development in Tomini Bay can be illustrated in Table 5.

Table 6. Strategy Priority based on the Total Attractiveness Score (TAS) Calculation

Strategy	TAS	Priority
Improve infrastructure and technology to enhance competitiveness and reduce environmental impact	5.05	1
Strengthen partnerships and human resource capabilities to utilize SEZ benefits and support sustainable practices	4.85	2
Maximize agricultural and fishery resources for ASEAN market expansion	4.75	3

Source: Primary Data Analysis, 2023

The results of the Total Attractiveness Score (TAS) calculation from internal and external factors can be arranged priority strategies based on the highest value to the lowest value as described in Table 6. The table concluded that the priority strategy II was Improve infrastructure and technology to enhance competitiveness and reduce environmental impact with the highest TAS value of 5.05.

CONCLUSION

This study aims to assess the agricultural potential of Tomini Bay across the provinces of Gorontalo, North Sulawesi, and Central Sulawesi, with the goal of developing strategies that enhance regional food security and economic growth. The results indicate that Tomini Bay possesses considerable strengths, including abundant natural resources, favorable

agroecosystems, and government support. However, challenges such as limited technological access and inadequate infrastructure highlight areas for improvement. The SWOT and QSPM analyses prioritize strategies that enhance infrastructure, improve human resource capacity, and foster sustainable agricultural practices. The practical implications of these findings suggest that coordinated efforts between government agencies, private sectors, and local communities are essential to optimize Tomini Bay's agricultural potential. Special Economic Zones (SEZs) and ASEAN market opportunities present avenues for economic expansion, provided that environmental sustainability measures are implemented to address potential threats. Future studies should focus on understanding the impact of climate variability on agricultural productivity in Tomini Bay. Additionally, investigating the adoption of advanced agricultural technologies in small-scale farms could further support sustainable growth. Such insights can strengthen Tomini Bay's contributions to Indonesia's food security and resilience in the face of economic and environmental challenges.

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