

# Elevating Aquaculture in the East Java Region Through Innovation Strategies Using the Tows Matrix Approach

Andri Rianawati\*, Noviaty Kresna Darmasetiawan, faizal Susilo Hadi, Lucan Feliciano D'surya, Bagas Andrihastama Bakhriansyah

Faculty of Business and Economics, University of Surabaya, Indonesia

\*Corresponding author, email: [andririanawati@staff.ubaya.ac.id](mailto:andririanawati@staff.ubaya.ac.id)

## ABSTRACT

This research investigates innovation strategies for aquaculture in East Java, employing SWOT analysis and the TOWS matrix. While East Java is among the three most significant contributors to Indonesia's aquaculture, ensuring its sustainability highly depends on a precise strategy based on environmental conditions. This research uses a qualitative method with data collection techniques involving in-depth interviews with informants of 7 experts from various backgrounds. The findings reveal East Java's strengths in community cohesion and adaptability towards limitations, but weaknesses stem from one-time cycle businesses due to limited capital and low domestic consumption rates. Some opportunities still arise, such as the high demand and capability of East Java's fisheries exports and government-backed programs called 'Gemarikan'. However, vulnerabilities, including susceptibility to weather, water, budget fluctuations, and subpar business practices, can still threaten aquaculturists. As a result, using the TOWS Matrix revealed several innovation strategies for East Java: enhancing aquaculture literacy and knowledge transfer, community-based improvements, and collaborative bottom-up coordination.

**Keywords:** Aquaculture, East Java Region, SWOT Analysis, TOWS Matrix

## 1. INTRODUCTION

Indonesia, a sea country with plenteous marine assets, prioritizes the change of fisheries and marine tourism divisions as portion of its Feasible Advancement Objectives (SDGs). The fisheries sector's commitment to Indonesia's Net Household Item (GDP) may be a key pointer of its execution. From 2021 to 2023, the fisheries division experienced a normal year-on-year GDP development of 3.46%, outperforming the horticulture segment but trailing behind the preparing industry segment. The fisheries division includes different callings, counting anglers, aquaculture, salt cultivating, processors, marketers, and item conveyance benefit suppliers. Aquaculture stands out as a critical player within the fisheries segment, positioning moment among these callings. (Source: BPS, 2022; Satu Information, 2018). The fisheries sector shows that aquaculture significantly contributes to the nation's fisheries production volume. From a provincial distribution perspective, the East Java province makes one of the most extensive contributions. When can we, South Sulawesi 4.082.792,15, East Nusa Tenggara 1.397.276,74, East Java, 1.279.954,23, West Java 1.233.563,97, Central Java 523.358,00, North Sulawesi 439.139,71.

Based on East Java's favorable topographical conditions, especially its ocean surface temperature and water quality, aquaculture development flourishes within the locale (Zikra et al., 2020; Anita & Dewi, 2020). The province's expansive populace of around 41 million inhabitants offers a significant advertise for aquaculture commodities and fisheries items (Sulistiyowati et al., 2019). Be that as it may, in spite of these preferences, the fisheries segment positions moo in terms of development and commitment to the Net Territorial Household Item (GRDP) of East Java. Thinks about recommend that small-scale anglers in coastal communities frequently live close the destitution line due to different socio-economic variables, counting constrained get to to monetary help and lacking government back (Stacey et al., 2021; Susilowati & Mafruhah, 2023).

To address these challenges, different thinks about have conducted SWOT examinations to survey the fisheries sector's conditions and create methodologies for enhancement (Hakim et al., 2022; Rizkita et al., 2023; Wasik &

Handriana, 2023). These investigations highlight the require for maintainable methodologies and government mediations to elevate the fisheries industry, particularly in easing destitution among small-scale anglers.

## 2. LITERATURE REVIEW

### 2.1. SWOT

SWOT investigation, a strategy broadly utilized to evaluate the current state and prospects of a segment, action, or company, offers important experiences through master assessment (Inayet & Akbulak, 2010). This procedure methodically distinguishes inside qualities and shortcomings, at the side outside openings and dangers Taktak (2018). Qualities and shortcomings relate to inside variables, whereas openings and dangers relate to outside circumstances (Fertel et al., 2013). In fisheries investigation, SWOT investigation has been instrumental in understanding wetland administration, fishery efficiency, and biosecurity hones on marine angle ranches (Chakraborty et al., 2023; Muniesa et al., 2022). For occurrence, Chakraborty's consider highlighted issues such as insufficient wetland administration and declining water quality, giving bits of knowledge for decision-making and arranging forms. Essentially, Muniesa et al. recognized dangers like disease transmission and shortcomings such as lacking communication between partners within the marine angle cultivate division, whereas moreover recognizing openings like anticipation measures and the mastery of wellbeing experts. Past fisheries, SWOT investigation amplifies to organizational angles such as asset appraisal, execution assessment, and vital arranging (De Angelis et al., 2021). This strategy helps in comprehensively analyzing inside and outside situations to define techniques for tending to future instabilities (Eskafi et al., 2021).

### 2.2. TOWS

The TOWS Network, an expansion of SWOT examination, encourages procedure definition by combining inside and outside components into four key categories: Strengths-Opportunities (SO), Strengths-Threats (ST), Weaknesses-Opportunities (WO), and Weaknesses-Threats (WT) (Yontar & Derse, 2023; Datta, 2020). Whereas SWOT is for arranging, TOWS is for activity arranging, empowering the improvement of methodologies that maximize qualities and openings whereas minimizing shortcomings and dangers (Alpar, 2007). This vital device, concocted by Heinz Weirich in 1982, helps businesses in evaluating, comparing, and choosing on techniques by centering on outside variables (Chowdhury, 2023; Cuofano, 2023). By leveraging the TOWS Lattice, organizations expect, strategize, and get ready for the exchange between dangers and shortcomings with qualities and openings, hence remaining ahead within the competitive scene (MBIZ, 2021).

The TOWS Network comprises four procedures typified in a 2x2 framework: SO, WO, ST, and WT, pointed at understanding, arranging, and planning for potential intelligent between inner and outside variables (Cuofano, 2023; Proficient Institute, 2021). For occurrence, Apple may utilize its solid brand picture (quality) to investigate unused markets (opportunity) (HARRAPA, 2021). Mulyati et al. (2022) utilized a portion of the TOWS system in their consider on trade improvement prospects in decorative angle in Southeast Sulawesi, Indonesia. They received the SO procedure to define development procedures in item improvement, highlighting the viable application of TOWS in key administration.

## 3. RESEARCH METHOD

This investigate, conducted in Indonesia from June to September 2023, utilized a subjective strategy including center gather discourses and in-depth interviews to assemble information from eight witnesses. These sources, counting government agents, aquaculture specialists, and fisheries specialists, were chosen based on their least 5 a long time of encounter within the aquaculture industry and residency in East Java. Supplementary data from auxiliary information was too joined for clear investigation, permitting for comprehensive conclusions.

Clear information investigation, taking after Martono (2010) and Loeb et al. (2017), encouraged the change of crude information into a more understandable arrange, helping within the delineation of the fisheries sector's current state in East Java. This investigation categorized results concurring to the SWOT system, empowering the development of a TOWS examination. The SWOT investigation strategy surveyed inner and outside conditions inside the aquaculture division in East Java, drawing on subjective and auxiliary information from pertinent offices. Hence, key definition utilizing the TOWS strategy tended to shortcomings and challenges by leveraging qualities and capitalizing on existing openings.

## 4. RESULT

### 4.1. Strength

East Javan aquaculturists use a creative approach to work around space constraints, combining old-world methods with cutting-edge technology to raise aquatic life. They employ creative techniques like pumping fresh water into ponds and regulating water levels, even though they are unable to access land or bodies of water close to cities. In addition, government-backed human resource development programs and "fishing villages" with community management are being implemented to support fisheries communities.

### 4.2. Weakness

Despite its small size, Mojokerto prioritizes aquaculture over the maritime industry. However, Mojokerto's fishing industry faces difficulties because of its small land area and the fact that many businesses view fishing as a side business. Since profits are frequently not reinvested for sustainability, the assistance given to them is typically of a temporary nature. Processors of fisheries also face challenges with raw material availability and stability because their supply is erratic and depends on fishermen and aquaculturists. East Java's fisheries industry is further impacted by low domestic fish consumption and a dearth of innovative promotional teams.

The East Javan government started the "Gemarikan" campaign in 2019 with the goal of encouraging people to eat more fish, especially in areas where stunting and malnutrition are common. The purpose of this campaign was to encourage the use of fish products. The Gemarikan program may have an effect on fish consumption because, according to a study by Rowena (2019), individual and environmental factors strongly influence Indonesians' intention to purchase fish products. According to a different study, cooking abilities and early experiences have an impact on an individual's propensity to buy and consume fish products, both indoors and outdoors (Maulana, 2021). These results highlight how crucial it is to gradually instill fish consumption habits, particularly in East Javan populations.

### 4.3. Opportunities

With 1.3 million tons of production, East Java became the Java Region's leading aquaculture producer in 2022. It also registered the highest level of national fisheries exports, bringing in \$2.6 million USD with 381,477 tons (Jatim Newsroom, 2023). This emphasizes how much potential East Java has in the fishing industry. Governor Khofifah Indar Parawansa approved the third-quarter 2022 sale of 25 tons of frozen processed shrimp to Japan and 25 tons of frozen red snapper to the Dominican Republic (Jatim Newsroom, 2022). East Java's long-term goal is to become more competitive by bolstering export initiatives and achieving supply stability by 2023. These changes show how important fisheries exports have been to East Java's post-COVID-19 economic recovery.

### 4.4. Threats

#### 4.4.1. Weather and Water Availability

Aquaculturists face significant challenges from global warming and unpredictable freshwater patterns, impacting their ability to manage water levels effectively. Limited financial resources hinder investments in advanced technologies to mitigate weather fluctuations. While introducing fresh water and using water pumps can help regulate water levels during heavy rainfall or floods, droughts pose a severe dilemma due to water scarcity. "The weather dictates our profits or losses. We can manage water levels during heavy rains, but the dry season is the biggest challenge. Without water access, maintaining pond circulation becomes impossible, leading to fish deaths."

Some aquaculturists have resorted to supplementary technologies like aerators and bubble machines to improve water circulation. However, these solutions have limitations and high costs. Aerators provide uneven oxygen distribution, particularly in large ponds, prompting aquaculturists to prioritize a steady flow of fresh water for better circulation. "In the past, we used aerators, but they proved insufficient. Dependence on machinery alone led to water quality issues. Hence, we emphasize the importance of natural circulation over aerators."

#### 4.4.2. Budget Tightening

Despite the promising track record of East Java's fisheries industry, its budgetary allocation does not reflect its potential. Officials from the Marine and Fisheries Agency note limited funding available to support aquaculturists, restricting assistance to select groups. While East Java has initiated programs to achieve food self-sufficiency by 2023,

inadequate promotion of aquaculture may result in other sectors receiving a larger share of budget allocations, potentially diverting resources from essential fisheries and aquaculture needs.

“The government faces budget constraints, hindering the continuation of many projects. There's hope for increased funding to support the community.” - (Jatim Newsroom, 2023)

4.4.3. Innovation Strategies

The innovation strategy for the aquaculture sector can be divided into three aspects: education, marketing, and collaborative coordination. Here are the strategies created within the SO, ST, WO, and WT scope, produced by crossing internal and external factors in the TOWS Matrix.

4.4.4. Educational Aspects

Certain aquaculturists in East Java have demonstrated remarkable problem-solving abilities and resourcefulness, utilizing cost-effective yet efficient approaches to enhance fisheries production and increase profitability, such as using pumps and machineries or producing their type of fish feeds. However, this knowledge may not be widely spread or accessible within specific communities or locations. To increase aquaculturist’s fisheries literacy is to increase productivity and business resilience (Benard et al., 2020)

	<p><b>Strength</b></p> <ul style="list-style-type: none"> <li>- High level of understanding &amp; problem solving accompanied with adaptivity towards technology</li> <li>- Strong bond within local aquaculturist communities</li> </ul>	<p><b>Weakness</b></p> <ul style="list-style-type: none"> <li>- Not enough working capital leads to one-time cycle production</li> <li>- Low domestic consumption rate</li> <li>- Availability and stability of production</li> </ul>
<p><b>Opportunity</b></p> <ul style="list-style-type: none"> <li>- High demand for export</li> <li>- Existing government projects (Gemarikan, 2023 food self-sufficiency program)</li> </ul>	<p><b>SO Strategy</b></p> <ul style="list-style-type: none"> <li>- Share/distribute information or technologies that have proven to be rewarding and applicable for aquaculturists</li> <li>- Increase fish production</li> </ul>	<p><b>WO Strategy</b></p> <ul style="list-style-type: none"> <li>- Build communal brands to fulfill export demand</li> <li>- Marketing efforts to boost knowledge transfer about fish products</li> </ul>
<p><b>Threat</b></p> <ul style="list-style-type: none"> <li>- Weather and water unavailability</li> <li>- Budget tightening for the fisheries industry</li> <li>- Substandard business practices</li> </ul>	<p><b>ST Strategy</b></p> <ul style="list-style-type: none"> <li>- Coordinate with water supply services and urban planning agencies</li> <li>- Cater to local fisheries communities and plan a budget through bottom-up coordination</li> </ul>	<p><b>WT Strategy</b></p> <ul style="list-style-type: none"> <li>- Allocate a higher budget to help reduce one-time cycles</li> <li>- Educate on business models</li> </ul>

Figure 1 TOWS Matrix

Figure 1 shows the TOWS matrix results. Aquaculturists often lack economic literacy, reducing their bargaining power with buyers and distributors. This increases vulnerability to fraud, financial losses, and bankruptcy (Bjørndal et al., 2015). Implementing economic education programs can empower aquaculturists, enhancing their position in the supply chain and elevating their perceived value (Sumbodo et al., 2021).

4.5. Marketing Aspects

Creating a communal brand for small-scale aquaculturists can address economic disparities. It fosters collaboration and equitable earnings based on contributions, aligning with aquaculturists' strengths. A focused marketing campaign to boost local fish consumption is vital, reducing dependence on government aid and ensuring steady income for aquaculturists.

#### 4.6. Collaborative Coordination Aspects

East Java's aquaculture sector needs a significant boost, and providing essential working capital funds could alleviate poverty and enhance productivity. Bottom-up coordination, prioritizing input from aquaculturists, is recommended based on research findings Alexander et al., 2020. This approach ensures that assistance aligns with the sector's real needs (Andriessse et al., 2021; Ballarini et al., 2021), empowering stakeholders to shape effective solutions. Establishing a strategic coordination platform can facilitate direct communication between aquaculturists and the Marine and Fisheries Agency, ensuring policies are tailored to their concerns.

### 5. CONCLUSION

The TOWS analysis conducted in East Java revealed key insights into the aquaculture sector. Strengths include problem-solving abilities and technological adaptability, while weaknesses encompass low domestic consumption rates and production challenges. Opportunities lie in high export demand and government initiatives, while threats include weather-related challenges and budget constraints. This study builds on previous research by Alexander et al. (2020), Andriessse et al. (2021), and Ballarini et al. (2021), offering strategies to increase production, build brands, and collaborate with agencies. Theoretical implications include enhancing understanding of TOWS in aquaculture, while practical implications aid policymakers and practitioners. Limitations include the exclusive use of TOWS analysis, suggesting future research combining TOWS and IFAS methodologies for comprehensive strategies (Adi Wibbowo, 2022).

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