

SWOT ANALYSIS OF THE DEVELOPMENT OF NILE TILAPIA (*Oreochromis niloticus*) GROW-OUT FARMING BUSINESSES IN CIREBON CITY, WEST JAVA

Analisis SWOT Terhadap Pengembangan Usaha Pembesaran Ikan Nila (*Oreochromis niloticus*) di Kota Cirebon, Jawa Barat

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ABSTRACT

Nile tilapia (*Oreochromis niloticus*) is one of the most strategically important freshwater aquaculture commodities in Indonesia, contributing significantly to national fisheries production, food security, and community welfare. This study aims to identify internal and external factors and to formulate strategies for the development of Nile tilapia (*Oreochromis niloticus*) aquaculture business in Cirebon City, West Java. The method used was SWOT analysis, encompassing evaluation of strengths, weaknesses, opportunities, and threats. Data were collected through interviews, field observations, questionnaire and literature review. Internal Factor Evaluation (IFE) results showed total strength score of 1.581 and weakness score of 1.630, yielding a difference of -0.049 . External Factor Evaluation (EFE) produced an opportunity score of 1.489 and threat score of 1.445, with a difference of $+0.044$. The business position was located in Quadrant III (Weakness-Opportunity) of the SWOT Matrix. Development programs formulated include improvement of aquaculture technology, digital marketing development, human resource strengthening, financing access, institutional partnerships, product quality certification, and fisheries educational tourism development.

Keywords: Aquaculture Business Development, Nile Tilapia, SWOT Analysis

ABSTRAK

Ikan nila (*Oreochromis niloticus*) merupakan salah satu komoditas budidaya air tawar yang memiliki peran strategis dalam mendukung produksi perikanan nasional, ketahanan pangan, dan peningkatan kesejahteraan masyarakat di Indonesia. Penelitian ini bertujuan untuk mengidentifikasi faktor-faktor internal dan eksternal serta merumuskan strategi pengembangan usaha pembesaran ikan nila (*Oreochromis niloticus*) di Kota Cirebon, Jawa Barat. Metode yang digunakan adalah analisis SWOT yang mencakup evaluasi kekuatan, kelemahan, peluang, dan ancaman usaha budidaya. Data dikumpulkan melalui wawancara, observasi lapangan, kuesioner serta studi literatur. Hasil analisis Internal Factor Evaluation (IFE) menunjukkan total skor kekuatan sebesar 1,581 dan kelemahan 1,630, menghasilkan selisih $-0,049$. Analisis External Factor Evaluation (EFE) menghasilkan skor peluang 1,489 dan ancaman 1,445 dengan

selisih +0,044. Posisi usaha berada pada Kuadran III (Weakness-Opportunity) dalam Matriks SWOT. Program pengembangan yang dirumuskan mencakup peningkatan teknologi budidaya, pengembangan pemasaran digital, penguatan SDM, akses pembiayaan, kemitraan kelembagaan, sertifikasi mutu produk, serta pengembangan wisata edukasi perikanan.

Kata Kunci: Analisis SWOT, Ikan Nila, Strategi Pengembangan Usaha

INTRODUCTION

The aquaculture sector is one of the subsectors that plays a strategic role in national economic development and food security in Indonesia. Hidayaturohman (2026) stated that aquaculture contributes to food supply, increases community income, and supports regional economic development. The importance of this subsector is reflected in its contribution of more than 55% to the total national fisheries production (Hamzah et al., 2025). This condition indicates that aquaculture has considerable potential to be further developed in order to support food production growth and improve community welfare.

At the global level, aquaculture is recognized as the fastest-growing food production sector compared to other agrifood sectors. According to Abwao et al. (2021), the development of aquaculture plays an important role in promoting rural development, enhancing food and nutritional security, and reducing poverty in developing countries. One of the commodities contributing significantly to this sector is Nile tilapia (*Oreochromis niloticus*), which has high economic value and continuously increasing market demand. The growing demand for Nile tilapia is supported by several advantages, including rapid growth, tolerance to a wide range of environmental conditions, and strong adaptability, enabling its cultivation under various farming systems (Islamiyah et al., 2026). According to data from the Ministry of Marine Affairs and Fisheries (KKP), national tilapia production increased from 1.35 million metric tons in 2022 to 1.5 million metric tons in 2024. The success of the Karawang BINS program demonstrates that the development of tilapia farming businesses can make a tangible contribution to increasing national production while also expanding the empowerment of the local workforce (KKP, 2025).

Furthermore, the rapid expansion of Nile tilapia aquaculture in various regions, including Africa and Southeast Asia, underscores its global importance as a key aquaculture commodity (Kwikiriza et al., 2025). The expansion of Nile tilapia aquaculture is also driven by its biological characteristics that support sustainable production activities. Abaho et al. (2025) explained that the increasing popularity of Nile tilapia farming is attributed to its ease of reproduction under culture conditions, rapid growth rate, ability to utilize artificial feed after yolk-sac absorption, tolerance to diverse environmental conditions, and high market acceptance. These advantages make Nile tilapia one of the most promising freshwater aquaculture commodities with strong prospects for future development.

The success of Nile tilapia aquaculture development depends not only on production management but also on the availability of high-quality broodstock and seed. Nugraha et al. (2023) emphasized that broodstock and seed are essential production inputs that largely determine the success of aquaculture operations. Therefore, the provision and distribution of superior seed must meet several criteria, including the right species, timing, quality, quantity, location, size, and price. The availability of seed that meets these standards is a crucial factor in supporting the productivity and sustainability of Nile tilapia farming.

The increasing market demand for Nile tilapia, its favorable biological characteristics, and the importance of high-quality seed availability indicate that the Nile tilapia grow-out business has significant development potential. However, the development of grow-out enterprises must also consider various internal and external factors that may influence business performance. Therefore, an analysis is needed to identify the strengths, weaknesses,

opportunities, and threats faced by Nile tilapia grow-out enterprises. Several studies have applied SWOT analysis to tilapia aquaculture enterprises in Indonesia, highlighting critical internal and external strategic factors that shape business performance and development directions (Hikmah *et al.*, 2023; Saputra *et al.*, 2024). Such an analysis is essential for formulating appropriate business development strategies that can enhance the competitiveness and sustainability of Nile tilapia grow-out businesses in Cirebon City, West Java.

RESEARCH METHODS

Time and Place of Research

This research was conducted from October to November 2025 in Cirebon City, West Java, Indonesia. The research location was selected purposively considering that Cirebon City has potential for the development of Nile tilapia (*Oreochromis niloticus*) grow-out businesses.

Tools and Materials

The tools used in this study included questionnaires, interview guides, observation sheets, stationery, cameras, and laptop computers. The materials consisted of primary and secondary data. Primary data were obtained through observations, interviews, and questionnaires, while secondary data were collected from scientific journals, books, reports from related institutions, and other relevant literature.

Research Procedures

The research was conducted through several stages. First, preliminary observations and a literature review were carried out to identify initial issues related to Nile tilapia grow-out farming. Second, a Focus Group Discussion (FGD) was conducted with purposively selected participants to explore, discuss, and validate strategic factors affecting business development. FGD is useful for obtaining diverse perspectives through structured group interaction and discussion (Krueger & Casey, 2014). Third, the FGD results were synthesized and classified into strengths (S), weaknesses (W), opportunities (O), and threats (T). Fourth, questionnaires were used to assess the identified factors. Finally, the validated factors were analyzed using the IFE and EFE matrices, followed by the SWOT Matrix to formulate SO, WO, ST, and WT strategies. The strategy formulation follows the TOWS framework proposed by Weihrich (1982), which emphasizes systematic matching of internal and external factors to develop strategic alternatives.

Data Analysis

Data were analyzed using SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis to identify internal and external factors affecting the development of Nile tilapia (*Oreochromis niloticus*) grow-out businesses in Cirebon City. The identified factors were subsequently evaluated using the Internal Factor Analysis Summary (IFAS) and External Factor Analysis Summary (EFAS) matrices. The results were then incorporated into the SWOT Matrix to formulate SO (Strengths–Opportunities), WO (Weaknesses–Opportunities), ST (Strengths–Threats), and WT (Weaknesses–Threats) strategies as recommendations for the development of Nile tilapia grow-out businesses in Cirebon City, West Java.

RESULT

Based on observations, interviews, questionnaire distribution, and documentation studies, various strategic factors influencing the development of Nile tilapia (*Oreochromis niloticus*) grow-out farming in Cirebon City, West Java, were identified. These factors were classified into internal factors consisting of strengths and weaknesses, and external factors consisting of opportunities and threats. The identification of internal and external factors was

conducted to determine the current condition of Nile tilapia farming enterprises and to serve as a basis for formulating business development strategies. The results indicate that Nile tilapia grow-out farming in Cirebon City possesses several potentials that can be utilized to support business development; however, it also faces a number of constraints and challenges that require attention. The internal and external factors identified in this study are presented in Table 1.

Table 1. Internal and External Factors Affecting the Development of Nile Tilapia (*Oreochromis niloticus*) Grow-Out Farming in Cirebon City, West Java

No.	Strengths	No.	Weaknesses
1	Availability of sufficiently large aquaculture land in Cirebon City	1	Aquaculture technology remains traditional and not yet intensive
2	Strategic geographical location close to fish markets and distribution centers	2	Insufficient labor availability
3	Extensive farming experience of fish farmers (>5 years)	3	Suboptimal water quality management
4	Nile tilapia produced is highly preferred in the local market	4	Limited business capital and access to formal financing
5	Support from local government (seed, feed assistance, and extension services from DKPP)	5	Low human resource capacity in adopting modern technology
6	Stable availability of water resources throughout the year	6	Marketing system remains limited and poorly organized
7	Adequate aquaculture pond infrastructure	7	Poor financial record-keeping practices
8	Easy access to transportation facilities	8	Limited utilization of digital marketing and e-commerce platforms
9	Active Fish Farmer Groups (Pokdakan)	9	Dependence on commercial feed
10	Availability of local labor	10	Absence of product quality certification
No.	Opportunities	No.	Threats
1	Increasing market demand for Nile tilapia	1	Extreme weather conditions that hinder Nile tilapia production
2	Development of digital marketing technologies creating opportunities for market expansion	2	Pollution of aquaculture water sources
3	Potential development of saline Nile tilapia culture (BINS) in the Pantura region	3	Fish disease outbreaks (parasites and bacteria) that may reduce production
4	Relatively low competition in Nile tilapia grow-out farming in Cirebon City	4	Competition from other major production areas (Tasikmalaya, Cianjur, and Karawang)
5	Opportunities for collaboration with Koperasi Merah Putih and MSMEs	5	Climate change affecting water quality and availability
6	Growth of the fish processing industry in Cirebon City	6	Fluctuating and increasing commercial feed prices
7	Nile tilapia is a widely accepted commodity in the market	7	Difficulty in obtaining high-quality fish seed
8	High profit prospects for Nile tilapia farming	8	Conversion of aquaculture land to other uses

9	Support from national food security programs	9	Instability of fish selling prices
10	Potential for aquaculture-based educational tourism development		

Based on the identification results, 10 strength factors, 10 weakness factors, 10 opportunity factors, and 9 threat factors were identified as influencing the development of Nile tilapia (*Oreochromis niloticus*) grow-out farming. These factors served as the basis for constructing the IFAS, EFAS, and SWOT matrices to formulate appropriate and sustainable business development strategies.

Internal Factors

Internal factors consist of strengths and weaknesses originating from the conditions of Nile tilapia grow-out farming in Cirebon City. The main strengths include the availability of aquaculture land, a strategic location, farmers' experience, market-preferred product quality, and support from the local government. Meanwhile, the main weaknesses include the continued use of traditional farming technologies, limited capital, low human resource capacity, suboptimal marketing systems, and the absence of product quality certification.

The results indicate that Nile tilapia grow-out farming in Cirebon City possesses several key strengths, including the availability of sufficiently large aquaculture land, a strategic geographical location, extensive farming experience, market-demanded fish quality, support from the local government, stable water availability, adequate aquaculture infrastructure, easy access to transportation, the presence of active Fish Farmer Groups (Pokdakan), and the availability of local labor. These factors represent important assets that support increased productivity, operational efficiency, and the competitiveness of Nile tilapia grow-out farming enterprises in Cirebon City.

Table 2. Internal Factor Evaluation (IFE) Matrix for the Development of Nile Tilapia (*Oreochromis niloticus*) Grow-Out Farming in Cirebon City, West Java

No.	Internal Factors	Rating	Weight	Score
Strengths				
1	Availability of relatively extensive aquaculture land in Cirebon City	2	0.039	0.079
2	Strategic geographic location near distribution centers and fish markets	4	0.055	0.221
3	Considerable farming experience of fish farmers (>5 years)	2	0.039	0.079
4	High market acceptance of locally produced Nile tilapia	4	0.057	0.229
5	Support from local government (seed assistance, feed support, and extension services)	3	0.051	0.154
6	Stable availability of aquaculture water resources throughout the year	3	0.045	0.136
7	Adequate aquaculture pond infrastructure	3	0.052	0.157
8	Easy access to transportation facilities	4	0.059	0.237
9	Active Fish Farmer Groups (Pokdakan)	3	0.047	0.142
10	Availability of local labor	3	0.049	0.148
Subtotal Strengths				1.581
Weaknesses				

No.	Internal Factors	Rating	Weight	Score
1	Aquaculture technology remains traditional and not yet intensive	3	0.051	0.154
2	Insufficient labor availability	3	0.044	0.133
3	Suboptimal water quality management	3	0.044	0.133
4	Limited business capital and restricted access to formal financing	3	0.050	0.151
5	Low human resource capacity in adopting modern aquaculture technologies	4	0.055	0.221
6	Marketing system is still limited and poorly organized	3	0.046	0.139
7	Financial record-keeping is not well managed	3	0.046	0.139
8	Limited utilization of digital marketing and e-commerce platforms	3	0.054	0.163
9	Dependence on commercial feed	4	0.062	0.249
10	Absence of product quality certification	3	0.049	0.148
Subtotal Weaknesses				1.630
Total			1.000	3.211
Difference (S – W)				–0.049

The results of the IFE Matrix analysis indicate that the total internal factor score of Nile tilapia grow-out farming in Cirebon City is 3.211 (Table 2). This score suggests that the internal condition of the business is relatively strong, as it exceeds the average benchmark value of 2.5. Therefore, the farming enterprises are considered capable of leveraging their strengths to support business development while addressing existing weaknesses.

Among the strength factors, the highest scores were obtained by easy access to transportation facilities (0.237), high market acceptance of Nile tilapia products (0.229), and a strategic geographic location near distribution centers and fish markets (0.221). These findings indicate that accessibility and market proximity are major competitive advantages supporting the marketing and distribution of Nile tilapia products in Cirebon City. In addition, product quality contributes significantly to enhancing business competitiveness.

Conversely, the highest weakness scores were associated with dependence on commercial feed (0.249), limited human resource capacity in adopting modern aquaculture technologies (0.221), and suboptimal utilization of digital marketing platforms (0.163). These findings suggest that technological adoption, human resource development, and production cost efficiency remain key challenges for the sustainable development of Nile tilapia farming.

Overall, the subtotal score for weaknesses (1.630) is slightly higher than that for strengths (1.581), resulting in a difference of –0.049. Nevertheless, the relatively high total IFE score indicates that Nile tilapia grow-out farming in Cirebon City possesses strong internal potential for further development, provided that existing weaknesses can be minimized through technological improvements, capacity building of farmers, and diversification of marketing strategies.

External Factors

Table 3. External Factor Evaluation (EFE) Matrix for the Development of Nile Tilapia (*Oreochromis niloticus*) Grow-Out Farming in Cirebon City, West Java

No.	External Strategic Factors	Rating	Weight	Score
Opportunities				
1	Increasing market demand for Nile tilapia	3	0.057	0.171

No.	External Strategic Factors	Rating	Weight	Score
2	The development of digital marketing technology creates opportunities for market expansion	3	0.057	0.171
3	Potential for the development of saline Nile tilapia culture (BINS) in the North Coast (Pantura) region	2	0.048	0.096
4	The level of competition in Nile tilapia grow-out farming in Cirebon City is relatively low	3	0.055	0.165
5	Opportunities for collaboration with Koperasi Merah Putih and MSMEs	2	0.050	0.100
6	Growth of the fish processing industry in Cirebon City	2	0.054	0.108
7	Nile tilapia is a commodity that is widely accepted by consumers	4	0.059	0.236
8	High profit prospects for Nile tilapia farming	3	0.056	0.168
9	Support from national food security programs	3	0.056	0.168
10	Potential for fisheries educational tourism development	2	0.053	0.106
Subtotal Opportunities				1.489
Threats				
1	Extreme weather conditions that hinder Nile tilapia production	4	0.057	0.228
2	Pollution of aquaculture water sources	2	0.043	0.086
3	Fish disease outbreaks (parasites and bacteria) that may reduce production	4	0.058	0.232
4	Competition from other production centers (Tasikmalaya, Cianjur, and Karawang)	3	0.051	0.153
5	Climate change affecting water quality and availability	3	0.058	0.174
6	Fluctuation and rising prices of commercial feed	3	0.045	0.136
7	Difficulty in obtaining high-quality fish seed	2	0.042	0.084
8	Conversion of aquaculture land to other uses	3	0.049	0.147
9	Instability in fish selling prices	4	0.051	0.204
Subtotal Threats				1.445
Total			1.000	2.934
Difference (O – T)				0.044

The External Factor Evaluation (EFE) matrix generated a total score of 2.934, suggesting that Nile tilapia grow-out farming in Cirebon City is relatively well-positioned to adapt to external environmental conditions and capitalize on opportunities for business development.

Based on the EFE results, the most significant opportunity was the high consumer acceptance of Nile tilapia products, reflected by the highest score of 0.236. This result reflects the strong demand for Nile tilapia, supported by its affordability, accessibility, and widespread consumer preference. Other key opportunities include the growing demand for Nile tilapia products and the expansion of digital marketing technologies, each obtaining a score of 0.171. These factors provide considerable potential for market expansion and improved marketing performance. Additionally, the promising profitability of Nile tilapia farming and the availability of national food security support programs each scored 0.168, indicating favorable conditions for future business growth.

In terms of threats, fish disease outbreaks received the highest score (0.232), highlighting their significant impact on production performance and profitability. This was followed by extreme weather conditions with a score of 0.228, which can disrupt aquaculture activities and reduce productivity. Moreover, fluctuating fish market prices scored 0.204, demonstrating the

potential for unstable income among farmers. Other external challenges include climate change impacts on water resources (0.174) and competition from major tilapia-producing regions (0.153).

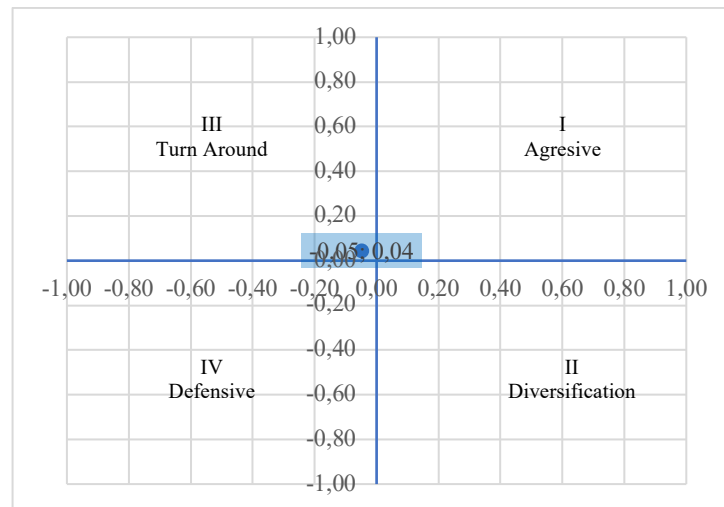


Figure 1. Strategic Position of Nile Tilapia (*Oreochromis niloticus*) Grow-Out Farming Development in Cirebon City, West Java

Figure 1 illustrates that the development position of Nile tilapia (*Oreochromis niloticus*) grow-out farming in Cirebon City is located in Quadrant III (W–O) of the SWOT matrix, with coordinates $X = -0.05$ and $Y = 0.04$. This position indicates that the business still faces several internal weaknesses but possesses considerable external opportunities that can be utilized for future development. Therefore, the recommended approach is a Turn-Around Strategy, which focuses on leveraging external opportunities to overcome internal weaknesses. The strategy emphasizes improving human resource capacity, adopting modern technology and digital marketing, strengthening access to capital, and enhancing production efficiency. Through the implementation of this strategy, Nile tilapia grow-out farming in Cirebon City is expected to improve its competitiveness and ensure long-term business sustainability.

Formulation of Alternative Strategies Using the SWOT Matrix

Table 4. SWOT Matrix for the Development of Nile Tilapia (*Oreochromis niloticus*) Grow-Out Farming in Cirebon City, West Java

Internal Factors	Strengths (S)	Weaknesses (W)
	S1. Availability of extensive aquaculture land in Cirebon City	W1. Aquaculture technology remains traditional and not yet intensive
	S2. Strategic geographical location near distribution centers and fish markets	W2. Insufficient labor availability
	S3. Extensive farming experience (>5 years)	W3. Suboptimal water quality management
	S4. High market demand for locally produced Nile tilapia	W4. Limited business capital and access to formal financing
	S5. Government support (seed, feed, and extension services)	W5. Low human resource capacity in adopting modern technology
	S6. Stable water availability throughout the year	W6. Limited and unorganized marketing system

	S7. Good pond infrastructure conditions S8. Easy access to transportation S9. Active Fish Farmer Groups (Pokdakan) S10. Availability of local labor	W7. Poor financial record-keeping W8. Low utilization of digital marketing and e-commerce platforms W9. Dependence on commercial feed W10. Lack of product quality certification
External Factors	SO Strategy (Strength–Opportunity)	WO Strategy (Weakness–Opportunity) (Priority)
O1. Increasing demand for Nile tilapia	SO1. Increasing production capacity to meet rising market demand (S1, S4, O1)	WO1. Improving modern aquaculture technology adoption and human resource capacity (W1, W5, O1)
O2. Growth of digital marketing technology	SO2. Utilizing strategic location and transport access for market expansion (S2, S8, O2)	WO2. Developing digital marketing to overcome traditional marketing limitations (W6, W8, O2)
O3. Potential development of brackish-water tilapia (BINS)	SO3. Developing BINS using available land and water resources (S1, S6, O3)	WO3. Enhancing human resource skills in BINS technology (W5, O3)
O4. Low competition level	SO4. Expanding production scale using farmer experience (S3, O4)	WO4. Improving business management and financial recording (W7, O4)
O5. Cooperation with cooperatives and MSMEs	SO5. Strengthening farmer groups and government support for partnerships (S5, S9, O5)	WO5. Using partnerships to overcome capital limitations and expand markets (W4, W6, O5)
O6. Growth of fish processing industry	SO6. Supplying high-quality raw materials for processing industry (S4, O6)	WO6. Building partnerships to increase product value-added (W6, W10, O6)
O7. High market acceptance of tilapia	SO7. Developing product diversification (S4, O7)	WO7. Encouraging product quality certification (W10, O7)
O8. High profitability prospects	SO8. Optimizing infrastructure for higher productivity (S7, O8)	WO8. Attracting investment to strengthen capital (W4, O8)
O9. National food security program support	SO9. Maximizing farmer groups' role in accessing government programs (S9, O9)	WO9. Improving human resources and technology through government programs (W1, W5, O9)
O10. Aquaculture education tourism potential	SO10. Developing aquaculture areas for educational tourism (S8, O10)	WO10. Using tourism as promotion and income diversification (W6, O10)
External Factors	ST Strategy (Strength–Threat)	WT Strategy (Weakness–Threat)

T1. Extreme weather affecting tilapia production	ST1. Utilizing stable water resources and farmers' experience to reduce the impact of extreme weather (S3, S6, T1)	WT1. Improving aquaculture technology adoption to reduce production losses due to extreme weather (W1, T1)
T2. Water pollution in aquaculture sources	ST2. Optimizing pond infrastructure and water management to maintain environmental quality (S6, S7, T2)	WT2. Improving water quality management and environmental monitoring systems (W3, T2)
T3. Fish disease outbreaks (parasites, bacteria)	ST3. Utilizing government support and fish farmer groups in implementing biosecurity measures (S5, S9, T3)	WT3. Enhancing human resource capacity in fish health management and biosecurity practices (W3, W5, T3)
T4. Competition from other production centers	ST4. Maintaining product quality and strengthening marketing networks (S2, S4, T4)	WT4. Improving marketing systems and product quality to remain competitive (W6, W10, T4)
T5. Climate change affecting water availability and quality	ST5. Utilizing farmers' experience in climate adaptation strategies (S3, T5)	WT5. Increasing farmers' capacity for climate change adaptation through technical training (W5, T5)
T6. Fluctuation and increase in commercial feed prices	ST6. Improving feed efficiency with support from government and farmer groups (S5, S9, T6)	WT6. Developing alternative feeds based on local raw materials to reduce dependency on commercial feed (W9, T6)
T7. Difficulty in obtaining quality seed	ST7. Utilizing farmer group networks to improve access to quality seed (S9, T7)	WT7. Strengthening financial access to ensure availability of quality seed (W4, T7)
T8. Conversion of aquaculture land	ST8. Optimizing available land use efficiently and productively (S1, T8)	WT8. Increasing land productivity through intensive aquaculture technology (W1, T8)
T9. Price instability of fish products	ST9. Expanding distribution and marketing networks to reduce price fluctuation impacts (S2, S8, T9)	WT9. Improving financial records and market diversification to cope with price instability (W7, W8, T9)
—	ST10. Utilizing strategic geographic location to enhance competitiveness amid market competition and price fluctuations (S2, T4, T9)	WT10. Developing digital marketing and market diversification to reduce competition and price volatility impacts (W8, T4, T9)

Based on the SWOT analysis, four strategic alternatives were identified: SO (Strengths–Opportunities), WO (Weaknesses–Opportunities), ST (Strengths–Threats), and WT (Weaknesses–Threats) strategies. The strategic mapping indicates that Nile tilapia grow-out farming in Cirebon City is positioned in Quadrant III (WO/Turn-Around Strategy). Therefore, the priority strategy is to utilize external opportunities to overcome existing internal weaknesses.

The SO strategy focuses on leveraging strengths such as land availability, strategic location, product quality, government support, and active fish farmer groups (Pokdakan) to expand production, strengthen digital marketing, develop saline tilapia farming (BINS), build partnerships, and diversify products. The WO strategy, as the main priority, emphasizes the

adoption of modern aquaculture technology, improvement of human resource capacity, expansion of digital marketing, increased access to financing, and utilization of national food security programs. Meanwhile, the ST strategy aims to use existing strengths to address threats such as climate change, fish diseases, rising feed prices, and market competition through biosecurity measures, feed efficiency, stronger marketing networks, and climate adaptation practices. The WT strategy focuses on reducing weaknesses and minimizing threats through alternative feed development, improved water quality management, enhanced human resource skills, better financial management, and market diversification.

Development Program Plan for Nile Tilapia Grow-Out Farming

The SWOT results indicate that Nile tilapia farming in Cirebon City has substantial development opportunities despite several internal constraints. Since the business is positioned in Quadrant III (WO), development efforts should prioritize strengthening internal capacities to maximize available opportunities. Recommended programs include farmer training on modern aquaculture technologies, strengthening Pokdakan institutions, expanding digital marketing, improving access to financing, enhancing business management practices, and developing alternative feeds to reduce dependence on commercial feed. These programs are expected to improve productivity, efficiency, competitiveness, and the long-term sustainability of Nile tilapia farming in Cirebon City.

Table 5. Development Program Plan for Nile Tilapia (*Oreochromis niloticus*) Grow-Out Farming in Cirebon City, West Java

No.	Strategy	Program	Involved Stakeholders
1	Enhancement of modern aquaculture technology adoption	Training and technical assistance on intensive aquaculture technology, water quality management, and production efficiency of Nile tilapia	Food Security, Agriculture and Fisheries Service (DKPP), Fisheries Extension Officers, Universities, Fish Farmer Groups (Pokdakan)
2	Development of digital marketing and market expansion	Training on digital marketing, social media utilization, marketplaces, and e-commerce platforms for Nile tilapia marketing	DKPP, Cooperative and MSME Service, Fisheries Extension Officers, Pokdakan, MSME Actors
3	Improvement of aquaculture human resource capacity	Technical training on Nile tilapia culture, saline Nile tilapia culture (BINS), fish health management, and fisheries business management	DKPP, Fisheries Training Centers, Universities, Fisheries Extension Officers
4	Strengthening access to business financing	Facilitation of access to People's Business Credit (KUR), cooperative financing, and government assistance programs for Nile tilapia farming enterprises	DKPP, KUR Partner Banks, Koperasi Merah Putih, Financial Institutions
5	Strengthening business partnerships and farmer institutions	Development of cooperation among Pokdakan, cooperatives, MSMEs, and fisheries business actors	DKPP, Koperasi Merah Putih, Pokdakan, MSMEs, Private Sector
6	Development of partnerships with	Sustainable supply of Nile tilapia raw materials and development of aquaculture product supply chains	DKPP, Fish Processing Industries, Pokdakan, Fisheries Business Actors

No.	Strategy	Program	Involved Stakeholders
	fish processing industries		
7	Improvement of product quality and certification	Assistance in quality certification, food safety standards, and implementation of Good Aquaculture Practices (CBIB)	DKPP, Fish Quarantine Agency, Certification Bodies, Pokdakan
8	Development of investment and business scale expansion	Facilitation of aquaculture investment and development of more productive Nile tilapia grow-out farming units	DKPP, Investors, Banking Institutions, Pokdakan
9	Optimization of national food security programs	Utilization of government support programs, including seed, feed, production facilities, and farmer empowerment assistance	DKPP, Ministry of Marine Affairs and Fisheries, Fisheries Extension Officers, Pokdakan
10	Development of fisheries educational tourism	Development of Nile tilapia farming areas as educational, training, and fisheries-based tourism destinations	DKPP, Tourism Office, Pokdakan, Universities, Local Communities

Based on Table 5, the development program for Nile tilapia (*Oreochromis niloticus*) grow-out farming in Cirebon City is focused on strengthening farmers' internal capacities through ten major programs. These programs include the adoption of modern aquaculture technologies, development of digital marketing strategies, enhancement of human resource competencies, improvement of access to financing, strengthening of business partnerships and farmer institutions, development of collaborations with fish processing industries, improvement of product quality and certification, expansion of investment and business scale, optimization of national food security programs, and development of fisheries-based educational tourism.

The implementation of these programs involves various stakeholders, including the Food Security, Agriculture and Fisheries Service (DKPP), fisheries extension officers, universities, cooperatives, financial institutions, fish processing industries, investors, and fish farmer groups (Pokdakan). Collaboration among these stakeholders is expected to enhance productivity, business efficiency, market access, product quality, and the capacity of aquaculture farmers, thereby improving the competitiveness and long-term sustainability of Nile tilapia grow-out farming in Cirebon City.

DISCUSSION

The findings of this study indicate that Nile tilapia (*Oreochromis niloticus*) grow-out farming in Cirebon City possesses relatively strong internal conditions, as reflected by the IFE score of 3.211. This result suggests that farmers have several strategic advantages that can support business development, including extensive aquaculture land availability, strategic access to fish markets and distribution centers, favorable product quality, adequate pond infrastructure, and support from local government institutions. These strengths provide a solid foundation for improving productivity, operational efficiency, and business competitiveness. Similar findings were reported by León-balderrama et al. (2026), who emphasized that market accessibility, transportation networks, and infrastructure availability are among the key determinants of successful aquaculture development. Likewise, Tricahya et al. (2023) identified several internal strengths in tilapia farming enterprises, such as stable production income, efficient production systems, effective water management, diversified feed utilization,

and sound fish health management practices, all of which contribute positively to business performance.

Another important strength identified in this study is the high market acceptance of Nile tilapia. This finding is consistent with the study of Abaho *et al.* (2025), which reported that the rapid expansion of Nile tilapia aquaculture is largely driven by its fast growth rate, adaptability to a wide range of environmental conditions, efficient utilization of artificial feed, and strong consumer acceptance. These characteristics make Nile tilapia one of the most commercially attractive aquaculture commodities and support its role in meeting the increasing demand for affordable animal protein.

Despite these strengths, several internal weaknesses remain significant constraints to business development. The most critical weakness identified was farmers' dependence on commercial feed, which obtained the highest weakness score in the IFE analysis. Feed costs generally account for the largest proportion of aquaculture production expenses and substantially influence farm profitability. Rodríguez-hernández *et al.* (2025) reported that feed costs in intensive tilapia production systems can represent up to 60% of total production costs, making feed efficiency a central determinant of economic viability. Similarly, Burad-méndez *et al.* (2023) demonstrated that the scale of production and feed management strategies are critical factors affecting profitability and return on investment in Nile tilapia farming. Therefore, improving feed efficiency and developing alternative feed sources based on locally available raw materials are essential strategies for reducing production costs and increasing business sustainability. Similar conclusions were reported by Sarker *et al.* (2020) who found that feed management is a crucial factor affecting economic performance and sustainability in tilapia farming systems.

Another notable weakness is the limited capacity of farmers to adopt modern aquaculture technologies. The results indicate that many farming operations still rely on traditional production systems with relatively low levels of technological innovation. This condition may reduce productivity and limit opportunities for business expansion. Recent studies have demonstrated that advanced technologies such as biofloc systems, aquaponics, and Recirculating Aquaculture Systems (RAS) can significantly improve production efficiency, resource utilization, and environmental sustainability in tilapia farming. In particular, Khanjani *et al.* (2022) highlighted that biofloc technology (BFT) can enhance water quality, reduce feed conversion ratios, and improve growth performance in tilapia culture, offering a promising pathway toward more sustainable and intensive production systems. Santikawati *et al.* (2025) highlighted that technological innovation plays a critical role in increasing production performance and reducing environmental impacts. Therefore, strengthening human resource capacity through technical training, extension services, and technology transfer programs should become a priority for sustainable aquaculture development.

The EFE analysis revealed that external opportunities slightly outweigh existing threats, as indicated by the total EFE score of 2.934. One of the most important opportunities identified is the increasing market demand for Nile tilapia. Growing consumer awareness of healthy protein sources and the expansion of aquaculture markets have contributed to rising demand for tilapia products. This finding is consistent with Abwao *et al.* (2021), who reported that improving tilapia production systems are essential for enhancing food availability, economic empowerment, and nutritional security. In addition to market demand, the development of digital technologies presents considerable opportunities for business expansion. Tricahya *et al.* (2023) similarly identified online marketing and information technology utilization as important external opportunities for fisheries businesses. Anam *et al.* (2023) found that consumer perceptions of online fishery products are generally positive, with product quality, price, and delivery reliability being key determinants of consumer satisfaction in digital fisheries marketing. Furthermore, Leonardi *et al.* (2024) emphasized that digital ICT adoption

among small-scale fish processors in Indonesia can significantly enhance market reach and business efficiency, though barriers such as limited internet infrastructure and low digital literacy must first be addressed.

Among the external threats, fish disease outbreaks emerged as the most influential factor affecting tilapia farming development. Disease outbreaks can cause substantial economic losses through increased mortality rates, reduced growth performance, and higher production costs. The challenge becomes even more significant under changing environmental conditions, which may increase pathogen prevalence and disease transmission risks. Consequently, the implementation of effective biosecurity measures, routine health monitoring, and proper farm management practices is essential to maintain production stability and minimize economic losses.

The SWOT analysis positioned Nile tilapia grow-out farming in Cirebon City within Quadrant III (WO), indicating that development efforts should prioritize utilizing external opportunities to overcome internal weaknesses. This strategic position suggests that business development should focus on improving technological adoption, strengthening farmer competencies, enhancing access to capital, and expanding digital marketing capabilities. Similar findings were reported by Sugiana *et al.* (2023), who concluded that the WO strategy is the most appropriate approach for tilapia aquaculture development, emphasizing the importance of maximizing financial support, developing alternative feed sources, utilizing available natural resources efficiently, expanding market access, and leveraging government support programs. Hikmah *et al.* (2023) similarly found that the development of Nile tilapia farming villages in Magelang Regency requires a combination of strategic policies addressing both internal constraints and external market opportunities. Saputra *et al.* (2024) also confirmed that tilapia farming enterprises in Jember Regency face comparable challenges, where internal weaknesses in technology adoption and capital access must be overcome through strategic partnerships and capacity-building programs. Furthermore, León-balderrama *et al.* (2026) and Asante *et al.* (2024) highlighted that technological innovation, farmer training, institutional strengthening, and extension services are critical factors influencing aquaculture development and innovation adoption.

Institutional strengthening also plays an important role in supporting sustainable business development. The presence of active Fish Farmer Groups (Pokdakan) provides opportunities for knowledge sharing, collective action, and improved access to government assistance programs. Gichuki *et al.* (2025) demonstrated that farmers who participate in common interest groups and aquaculture development programs achieve significantly higher fish productivity and net returns compared to non-members, underscoring the value of collective institutional arrangements in small-scale aquaculture development. Additionally, Kurnia *et al.* (2023) found that access to credit facilities, extension services, and farmer organizations positively influences technology adoption and farm performance in aquaculture enterprises.

Overall, the results demonstrate that Nile tilapia grow-out farming in Cirebon City has promising prospects for future development. However, achieving sustainable growth will require coordinated efforts to address existing weaknesses while maximizing available opportunities. Strategic priorities should include enhancing technological adoption, improving human resource competencies, increasing feed efficiency, strengthening biosecurity systems, expanding digital marketing utilization, and improving climate adaptation capacity. With strong collaboration among government agencies, universities, financial institutions, fish farmer groups, and private-sector stakeholders, these strategies are expected to improve productivity, competitiveness, and the long-term sustainability of Nile tilapia farming in Cirebon City.

CONCLUSION

This study revealed that Nile tilapia (*Oreochromis niloticus*) grow-out farming in Cirebon City has considerable potential for development, supported by relatively strong internal conditions, as indicated by the IFE score of 3.211. The main strengths include strategic market access, favorable product quality, adequate aquaculture infrastructure, stable water availability, and support from local government and fish farmer groups (Pokdakan). However, several internal constraints remain, particularly the dependence on commercial feed, limited adoption of modern aquaculture technologies, low human resource capacity, and restricted utilization of digital marketing platforms.

The EFE analysis generated a total score of 2.934, indicating that external opportunities slightly outweigh existing threats. The most significant opportunities include increasing market demand for Nile tilapia, the rapid development of digital marketing technologies, high profitability prospects, and government support through national food security programs. Conversely, major threats consist of fish disease outbreaks, extreme weather conditions, climate change impacts, and market price instability.

The SWOT analysis positioned the business in Quadrant III (WO), suggesting that the most appropriate development approach is a Turn-Around Strategy that focuses on utilizing external opportunities to overcome internal weaknesses. Priority strategies include improving the adoption of modern aquaculture technologies, strengthening farmers' technical competencies, expanding digital marketing utilization, increasing access to financing, strengthening institutional capacity, and developing partnerships with fisheries-related stakeholders.

Therefore, the sustainable development of Nile tilapia grow-out farming in Cirebon City requires integrated efforts involving government agencies, extension services, universities, financial institutions, private-sector actors, and fish farmer groups. Through the implementation of these strategic initiatives, Nile tilapia farming is expected to achieve higher productivity, improved competitiveness, greater business efficiency, and long-term sustainability while contributing to local economic development and national food security objectives.

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