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EMPOWERING FISH FARMERS THROUGH SUSTAINABLE *TILAPIA FISH* BREEDING BUSINESS DEVELOPMENT

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Abstract (English)

This study explores development strategies for tilapia (Oreochromis niloticus) hatchery businesses in Genteng District, Banyuwangi, in response to the growing demand for high-quality fry. The research involved 73 active tilapia hatchery farmers and employed a descriptive qualitative method with a case study approach. Data were collected through interviews, observation, focus group discussions (FGD), and literature review. Financial analysis shows the business is economically viable, with an average R/C Ratio of 1.78, a break-even point of 52,916 fry, and a payback period of 3.74 years. SWOT analysis places the business in quadrant I (aggressive SO strategy), indicating strong internal conditions and greater external opportunities. Key strengths include extensive marketing channels, abundant natural resources, self-funded capital, and skilled labor. Weaknesses involve limited modern managerial knowledge, low-quality broodstock, and unstructured bookkeeping. Opportunities consist of stable market demand, government support, technological advancements, and online marketing potential. Threats include disease outbreaks, climate fluctuations, high feed costs, and intense competition. Recommended SO strategies include digital marketing through e-commerce, adoption of RAS and IoT technologies, capacity building through government training, certified broodstock procurement, and strategic partnerships. The synergy between internal strengths and external opportunities is essential to enhancing the competitiveness of tilapia hatchery businesses.

Article History

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Key Words

Profitability, SWOT, Hatchery management

Abstrak (Indonesia)

This study examines the development strategy of a tilapia fish hatchery in Genteng District, Banyuwangi, to address the high demand for quality seeds. The study involved 73 active fish farmers and used a qualitative descriptive method with a case study approach. Data were collected through interviews, observations, focus group discussions (FGDs), and literature review. The financial analysis results indicate that this business is economically viable, with a R/C ratio of 1.78, a break-even point (BEP) of 52,916 seeds, and a payback period of 3.74 years. A SWOT analysis places the business in quadrant I (aggressive SO strategy), with dominant strengths and opportunities greater than threats. Key strengths include extensive marketing channels, supportive natural resources, capital independence, and workforce skills. Weaknesses include immature management, low broodstock quality, and unstructured bookkeeping. External opportunities include stable market demand, government support, technological advances, and the potential for online marketing. Key threats include pests, climate, feed costs, and competition. Suggested SO strategies include marketing digitalization, adoption of RAS and IoT technology, human resource training, procurement of superior broodstock, and strategic partnerships. The synergy of internal strengths and external opportunities is the key to increasing the competitiveness of the tilapia hatchery business.

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Kata Kunci

Profitability, SWOT, Seed Management.

INTRODUCTION

Aquaculture is an important sub-sector in meeting the protein needs of the Indonesian people, which continue to increase along with population growth. Tilapia (Oreochromis niloticus) stands out as a superior commodity due to its rapid growth, adaptability to various environmental conditions, and resistance to disease (Hadijah, Gatta, & Rusmin, 2022). In Banyuwangi Regency, the potential for freshwater aquaculture is enormous, with an area of 171.38 hectares in 2023 spread across 24 sub-districts, including Genteng District, which is a center for fish hatcheries, especially tilapia (Banyuwangi Regency Fisheries Service, 2023). Freshwater fish production data shows significant fluctuations: from 802,170 kg in 2018 to 2,108,000 kg in 2021, then decreasing to 1,144,700 kg in 2022, indicating the need for efforts to increase and stabilize production (Banyuwangi Regency Fisheries Service, 2023). A deeper focus on hatcheries shows that total artisanal fish seed production between 2019 and 2023 reached 32,529,200 fish. This dependence has the potential to cause significant supply and price fluctuations for hatchery farmers, thus requiring strengthening the independence of local hatcheries. Based on the SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis theory, this study identifies internal factors such as land availability, water quality, and independent capital, as well as weaknesses such as unstructured hatchery management, low broodstock quality, and poorly managed bookkeeping. Meanwhile, an economic feasibility study using R/C Ratio, NPV, and IRR indicators serves as a basis for evaluating profitability and return on investment (Witoko et al., 2013). Several previous studies have provided relevant insights: Wiranata et al. (2023) emphasized that extensive cultivation areas are a major strength, but dependence on collectors and limited local market penetration are weaknesses; while Witoko et al. (2013) showed that hatcheries for patin catfish are financially viable with a positive NPV and high IRR, and emphasized the need for a balance between internal strengths and weaknesses and external opportunities and threats. Mimbar et al.'s (2023) study on "Nila Gesit" cultivation highlighted the role of strategic location, water quality, and equity as determining factors for success, while Kurnia et al. (2023) recommended an aggressive SO strategy to strengthen seed sales expertise, maintain seed quality certification, and maintain consumer loyalty. From a technical hatchery perspective, Sukreni et al. (2024) found that a male to female ratio of 1:3 was able to produce egg hatchability of up to 93.75% and larval survival of 90.66%; Yoandan et al. (2023) reported a fecundity of 3,000 eggs, a fertilization rate of 83.33%, and a hatching rate of 80% in natural spawning; Aziz et al. (2020) showed that the use of a hatching funnel increased hatchability by up to 90%.6% and a seed survival rate of 96.15%; Ambarwati and Mujtahidah (2021) noted that seeds were ready to be transferred at three days old with a size of 3-5 cm, a hatching rate of 86.69%, and a survival rate of 80.53%; and Sumarni (2018) emphasized the importance of management functions from pond preparation to seed distribution to produce high-quality seeds. Despite the great potential and available technological support, the gap between the need for quality seeds and the production capacity of local hatcheries in Genteng is still felt, which impacts the availability of seeds for grow-out farmers and the stability of the cultivation supply chain. Therefore, this study aims to: (1) analyze the main challenges faced by tilapia fish seed farmers in Genteng District, Banyuwangi Regency; (2) evaluate the managerial, financial, marketing, and technical aspects of the tilapia fish seed business implemented by local farmers; and (3) formulate a strategy for developing a tilapia fish seed business that can increase productivity and business sustainability through a SWOT analysis approach and economic feasibility study.

METHOD

This research design used a qualitative descriptive method with a case study approach, conducted from February 2025 to April 2025 in Genteng District, Banyuwangi Regency. The main focus of the study was to identify and analyze managerial, financial, marketing, and

technical factors in the tilapia hatchery business. The research informants consisted of 73 active tilapia hatchery farmers in the area, from which the entire population was selected as a sample.

Data collection instruments include: (1) Observation Guidelines, to observe operational practices of hatcheries, environmental conditions, and cultivation infrastructure; (2) Interview Guidelines, containing open and closed questions that explore the challenges, strategies, and managerial-financial-marketing-technical aspects of hatcheries; and (3) Questionnaires, used to obtain quantitative and qualitative data related to farmers' perceptions and experiences. Secondary data were obtained from documents of the Banyuwangi Regency Fisheries Service or other references. All data were then organized, explained, and analyzed according to the case study framework to formulate a strategy for developing a tilapia hatchery business.

RESULTS AND DISCUSSION

Technical Aspects of Tilapia Fish Breeding

Tilapia hatchery production in Genteng involves preparing concrete and earthen ponds, including cleaning, drying, structural inspection, soil cultivation, liming, and fertilization to create an optimal environment. Concrete ponds are filled with water from wells, gradually topping up to 50–80 cm, while earthen ponds use clean, filtered river water to deter predators and maintain quality. Broodstock selection is based on physical characteristics, health, gonad maturity, and a weight of approximately 100–250 grams. The natural spawning process employs a 1 male:3 female ratio, with the male building the nest and the female incubating the eggs until they hatch.

(a) (b)

Figure 1. Pool preparation in concrete pools (a) and pool preparation in earthen pools (b)

After 15–20 days, the larvae are transferred to a maintenance pond, where they are gradually fed natural and supplemental food such as silkworms and pellets, accompanied by partial water changes every two weeks. Seed harvesting is carried out after 21 days using a net, using either a partial or total method depending on size, resulting in an average of 89,479 seeds per cycle before distribution.

Table 1. Range of Tilapia Farmers' Production Results

No	Number of Respondents	Production Range (tail)
1	20 Respondents	24,000 – 52,000 Heads
2	17 Respondents	> 52,000 – 80,000 Heads
3	18 Respondents	> 80,000 – 132,000 Heads
4	18 Respondents	> 132,000 – 160,000 Heads
Total		**6,532,000 Heads**
Average		**89,479 Heads**
Number of Respondents		**73 Respondents**

Source: Primary Interview Data, 2025

Management Aspects of Tilapia Fish Seed Farmers

Tilapia hatchery management in Genteng encompasses planning, organization, implementation, and control to ensure production continuity, seed quality, and business sustainability. Planning involves determining production times and cycles based on pond availability, market demand, and environmental factors such as water temperature, rainfall, and natural food availability. It also involves preparing infrastructure such as ponds, aeration systems, water sources, harvesting equipment, liming, and fertilization to ensure optimal conditions. Organization remains informal due to the individual nature of the business, with farmers carrying out all stages themselves; some only record production and manage feed stocks, and involve family or freelance workers for harvesting and marketing during high volumes. Implementation emphasizes discipline and the utilization of farmer skills and experience at every stage of the hatchery process. Control is still limited due to limited human resources and a lack of understanding of monitoring systems, resulting in suboptimal evaluation of spawning results, seed survival rates, feed effectiveness, and water quality.

Marketing Aspects of Tilapia Fish Seed in Genteng District

Tilapia seed marketing in Genteng relies on four main aspects: product, price, location, and promotion. Products include healthy, disease-free seeds measuring 0.7–1 cm, 1–2 cm, 2–3 cm, and 3–5 cm. Prices are determined based on production costs, market demand, and competitiveness, starting at IDR 35 per fish for 0.7–1 cm seeds, IDR 65 for 1–2 cm seeds, IDR 100 for 2–3 cm seeds, and up to IDR 250 for 3–5 cm seeds. Distribution channels include direct distribution to buyers without intermediaries for higher margins, and semi-direct distribution through retailers, allowing for wider reach despite lower prices to farmers.

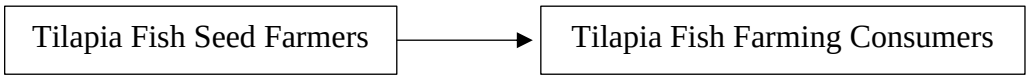


Figure 2. Direct Distribution Marketing Channel

Figure 3. Semi-Direct Distribution Marketing Channel

Promotions use roadside billboards to attract farmers and collectors, as well as word-of-mouth strategies, while the use of social media is still minimal to increase the trust and loyalty of local farmer consumers.

Financial Aspects of Tilapia Fish Breeding Business

The financial aspects of the tilapia hatchery business in Genteng include capital, production costs, revenue, profits, and analysis of the R/C ratio, break-even point (BEP), and payback period. Investment costs are the capital or costs incurred by fisheries businesses,

including fish farming, to finance the procurement of business facilities and infrastructure before operations begin (Syafril et al., 2022).

Table 2. Classification of Initial Capital of Tilapia Fish Farmers

No	Number of Respondents	Initial Capital Range (Rp)
1	10 Respondents	Rp. 9,500,000.00 – Rp. 19,600,000.00
2	10 Respondents	> Rp. 19,600,000.00 – Rp. 29,700,000.00
3	11 Respondents	> Rp. 29,700,000.00 – Rp. 39,900,000.00
4	8 Respondents	> Rp. 39,900,000.00 – Rp. 47,200,000.00
5	6 Respondents	> Rp. 47,200,000.00 – Rp. 59,600,000.00
6	9 Respondents	> Rp. 59,600,000.00 – Rp. 69,900,000.00
7	8 Respondents	> Rp. 69,900,000.00 – Rp. 79,100,000.00
8	5 Respondents	> Rp. 79,100,000.00 – Rp. 89,500,000.00
9	6 Respondents	> Rp. 89,500,000.00 – Rp. 94,700,000.00
Total Initial Capital		**Rp. 3,578,000,000.00**
Number of Respondents		**73 Respondents**
Average Initial Capital		**Rp. 49,013,698.63**

Source: Primary Interview Data, 2025

The average initial capital required is Rp 49,013,698.63 for investment in ponds, equipment, and supporting facilities, while the average annual working capital reaches Rp 18,520,547.95 for feed, electricity, and operational needs. The average annual fixed cost of Rp 6,835,616.44 includes depreciation and facility maintenance, while the average variable cost is Rp 11,684,931.51 for feed, medicine, and oxygen.

Table 3. Classification of Production and Revenue

No	Number of Respondents	Production Range (tail)	Acceptance Range (Rp)
1	20 Respondents	24,000 – 52,000 Heads	Rp. 8,400,000 – Rp. 18,200,000
2	17 Respondents	> 52,000 – 80,000 Heads	> Rp. 18,200,000 – Rp. 28,000,000
3	18 Respondents	> 80,000 – 132,000 Heads	> Rp. 28,000,000 – Rp. 46,200,000
4	18 Respondents	> 132,000 – 160,000 Heads	> Rp. 46,200,000 – Rp. 56,000,000
Total		**6,532,000 Heads**	**Rp. 2,286,200,000.00**
Average		**89,479 Heads**	**Rp. 31,317,808.00**
Number of Respondents		**73 Respondents**	**73 Respondents**

Source: Primary Interview Data, 2025

The average total production cost per respondent was Rp 18,520,547.95, while the average annual income reached Rp 31,317,808.00 with an average production of 89,479 fry. The average net profit was Rp 12,800,000.00 per year, resulting in an average R/C Ratio of 1.78. The average BEP point per farmer was 52,916 fry, with the lowest value being 11,429 fry and the highest being 97,143 fry. The average Payback Period was 3.74 years, ranging from 2 years to 5.45 years.

Table 4. Financial Analysis Statistics of Tilapia Fish Seed Farmers

Category	R/C Ratio	BEP	Payback Period
Total	-	3,862,858 heads	-
Average	1.76	52,916 heads	3.74 Years
Highest	2.45	97,143 heads	5.45 Years
Lowest	1.59	11,429 tails	2 years

Source:Processed fromprimary interview data, 2025

Identification of Internal Factors in Tilapia Fish Breeding

Internal factors include both exploitable strengths and weaknesses that hinder these efforts. Based on interviews and questionnaires with 73 field respondents, various internal factors influencing the success of tilapia hatchery were identified, which were then classified into strengths and weaknesses.

Table 5. Identification of Internal Factors of the Tilapia Fish Breeding Environment

No	Internal Factors	Strength	Weakness
1	Wide Marketing Channels	√	
2	Potential natural resources	√	
3	Workforce skills	√	
4	Source of Capital	√	
5	Modern knowledge of seed management is limited		√
6	Low quality of tilapia broodstock		√
7	Unorganized (detailed) production bookkeeping		√

Source:Processed fromPrimary Interview Data, 2025

Internal factors of tilapia fish hatchery in Genteng include strengths and weaknesses that influence business development; strengths include extensive marketing channels with 79.45% of farmers selling directly, some utilizing social media, potential natural resources in the form of 171.38 hectares of cultivated land, rivers, and irrigation channels that guarantee water supply, labor skills based on five to eighteen years of experience with 37% of farmers having ten to twelve years of experience, and capital sources that mostly come from own capital (80.82%) and 19.18% combine personal capital with bank loans for business expansion. Weaknesses include limited knowledge of modern hatchery management due to minimal training and access to technology, low broodstock quality with egg hatching rates of only 40-60% and dependence on local broodstock, and an unorganized production bookkeeping system that hampers evaluation, planning, and access to formal financing. These conditions hamper long-term business growth.

Identification of External Factors in Tilapia Fish Breeding

External environmental identification examines various factors external to the company that influence the development of the tilapia hatchery business in Genteng District. Based on interviews and questionnaires with 73 respondents in the field, several external factors were identified that influence the success of tilapia hatchery development in Genteng District, Banyuwangi Regency. These factors were then grouped into two main categories: opportunities and threats.

Table 6. Identification of External Factors in the Environment of Tilapia Fish Breeding

No	External Factors	Opportunity	Threat
1	Stable market demand	√	
2	Technology Improvement and Innovation (Adoption of Modern Technology)	√	
3	Government programs that support	√	
4	Collaboration with other cultivators	√	
5	Online marketing development	√	
6	Fish pests and diseases		√
7	The influence of weather and climate		√
8	High Feed Costs		√
9	Tight competition		√

Source:Processed fromprimary interview data, 2025

Opportunities include stable seed market demand and local deficits, increased adoption of modern technologies such as biofloc and RAS for production efficiency, and government program support in the form of superior broodstock distribution, training, and cooperative institutions. Collaboration with other farmers can be carried out through nucleus-plasma schemes, consortiums, or long-term contracts for market certainty and technology transfer. Developing online marketing through agritech marketplaces and social media enables cross-provincial sales, with digital payment systems and sales data analysis. Threats include pests and diseases such as Aeromonas hydrophila and parasites that increase mortality; the impact of unpredictable weather and climate that trigger stress and disrupt water quality; high feed costs due to fluctuations in raw materials that squeeze margins; and intense competition from large-scale hatcheries that trigger price wars.

External Factor Analysis (EFE) in Tilapia Fish Breeding Business

The Internal Factor Evaluation (IFE) Matrix is a strategic tool used to identify and evaluate the key strengths and weaknesses of an organization or business unit. In the context of the tilapia hatchery business in Genteng District, this analysis aims to assess the internal conditions that influence business performance and development potential. Based on the table presented, the total score obtained from the internal factor evaluation was 3.08.

Table 7. Internal Factor Evaluation

Internal Factors	Category	Weight	Rating	Score
Strength(Strengths)				
Wide Marketing Channels	Strength	0.18	4	0.72
Potential natural resources	Strength	0.17	4	0.68
Workforce skills	Strength	0.15	3	0.45
Source of Capital	Strength	0.16	4	0.64
Amount		**0.66**		**2.49**
Weakness (*Weaknesses*)				
Modern knowledge of seed management is limited	Weakness	0.13	2	0.26
Low quality of tilapia broodstock	Weakness	0.09	1	0.09
Unorganized (detailed) production bookkeeping	Weakness	0.12	2	0.24
Amount		**0.34**		**0.59**
Total Amount		**1.00**		**3.08**

Source:Processed fromprimary interview data, 2025

The IFE analysis of the tilapia hatchery business in Genteng showed a value of 3.08, indicating the dominance of internal strengths. The main advantage is extensive marketing channels (score 0.72), which is supported by research by Tarigan & Bangun (2024) that direct distribution further increases marketing efficiency. Yapanto et al. (2021) explained that marketing efficiency can be seen from the length or shortness of the goods distribution chain, where the longer the marketing chain, the less efficient it is; potential natural resources (0.68), in line with Ayuniar & Hidayat (2020) regarding the importance of water quality; availability of independent capital (0.64), in line with the findings of Aulia et al. (2022) regarding the significant influence of financial independence; and workforce skills (0.45), in line with Primawati et al. (2023) who stated that experience increases production efficiency. On the weakness side, limited modern management knowledge (0.26) is a barrier, in line with Tricahya et al. (2023) who highlighted the low adoption of RAS technology; Unorganized production bookkeeping (0.24) hinders evaluation and access to financing, as revealed by Primawati et al. (2023); and low broodstock quality (0.09) worsens productivity, as noted by Hadie et al. (2013) regarding the impact of inbreeding. These weaknesses have the potential to become growth inhibitors if not addressed promptly. By strengthening managerial capacity, disciplined business record-keeping, and improving the genetic quality of broodstock, seed farmers in Genteng can further leverage existing internal strengths to strengthen their competitiveness and business sustainability. In aggregate, the total score for strengths (2.49) far exceeds the score for weaknesses (0.59), indicating strong internal potential for business growth.

External Factor Analysis (EFE) in Tilapia Fish Breeding Business

External Factor Evaluation (EFE) is a strategic analysis tool for identifying and assessing opportunities and threats faced by a business in the external environment. The total EFE value of 2.62, which is above the midpoint of 2.5 on a scale of 1–4, indicates that the external conditions for the Oreochromis niloticus hatchery business in Genteng District tend to be favorable, with a number of opportunities having more positive impacts than negative threats.

Table 8. External Factor Evaluation

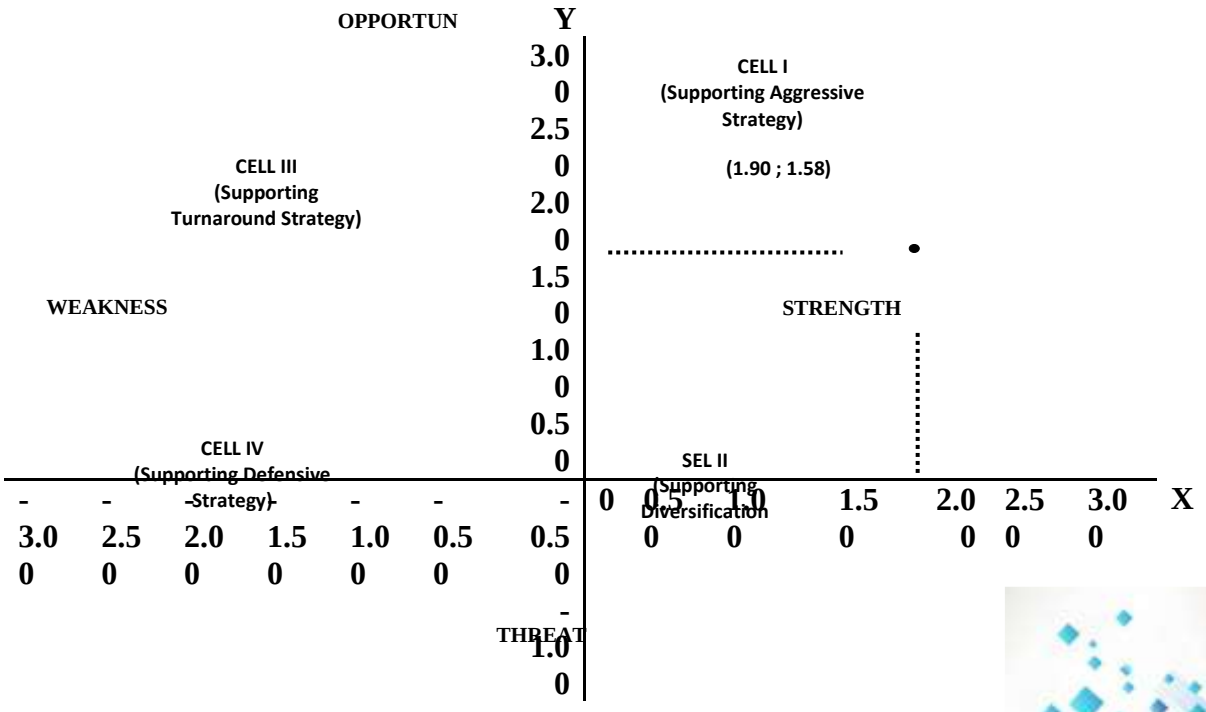
External Factors	Category	Weight	Rating	Score
Opportunity(opportunities)				
Stable market demand	Opportunity	0.17	4	0.68
Technology Improvement and Innovation (Adoption of Modern Technology)	Opportunity	0.13	3	0.39
Government programs that support	Opportunity	0.14	3	0.42
Collaboration with other cultivators	Opportunity	0.13	3	0.39
Online marketing development	Opportunity	0.11	2	0.22
Amount		**0.68**		**2.10**
Threat(Threats)				
Fish pests and diseases	Threat	0.08	1	0.08
The influence of weather and climate	Threat	0.10	2	0.20
High Feed Costs	Threat	0.04	1	0.04
Tight competition	Threat	0.10	2	0.20
Amount		**0.32**		**0.52**
Total Amount		**1.00**		**2.62**

Source:Processed fromprimary interview data, 2025

The EFE analysis of the tilapia hatchery business in Genteng yielded a total score of 2.62, reflecting the dominance of opportunities over threats. The greatest opportunity is stable market demand (score 0.68), in line with the findings of Rahmawati et al. (2022) that seed deficits create room for production expansion, and government program support (0.42) which is in line with Djaina W. et al. (2023) that assistance with facilities and training increases productivity. The adoption of modern technology (0.39) such as RAS and IoT sensors reduces mortality by up to 30%, as Lestari in Mendrofa, K., et al. (2025) shows a 25% increase in efficiency through IoT and is reinforced by the opinion of Jalil and Panggabean (2024), who stated the importance of modern technology and a data-driven approach in fisheries management so that it can facilitate more accurate decision-making based on real-time data, while collaboration between farmers (0.39) reduces costs and strengthens economies of scale. The development of online marketing (0.22) also opens up the national market, as evidenced by Mansyur et al. (2024) reported a significant increase in sales through social media. On the threat side, the influence of weather and climate (0.20) can trigger larval stress, as Cahyanti and Awalina (2022) revealed the impact of extreme temperatures on reproduction; intense competition (0.20) forces product differentiation; fish pests and diseases (0.08) require biosecurity protocols according to Taukhid et al. (2023); and high feed costs (0.04) encourage the exploration of alternative feeds, in line with Yulfiperius et al. (2024).

Analysis Using SWOT Diagram (Strengths, Weaknesses, Opportunities, and Threats)

The SWOT analysis of the tilapia fish hatchery business in Genteng District shows a strength value of 2.49, weakness 0.59, opportunity 2.10, and threat 0.52. The SWOT coordinates are calculated as X = strength - weakness = 2.49 - 0.59 = 1.90, and Y = opportunity - threat = 2.10 - 0.52 = 1.58, so that both positive values place the strategy in quadrant I. This indicates that the business has a strong internal foundation and many external opportunities to be exploited, so that the conditions are very supportive of growth and expansion. Therefore, the most appropriate strategy to be implemented in this context is the SO (Strength-Opportunities) strategy. This strategy focuses on utilizing internal strengths to seize and optimize opportunities available in the external environment.



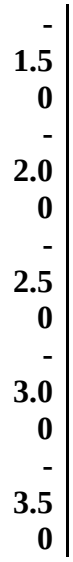


Figure 4. SWOT Diagram Image

Analysis Using SWOT Matrix (Strengths, Weaknesses, Opportunities, and Threats)

The SWOT matrix of the tilapia hatchery business in Genteng shows a position in quadrant I with strengths and opportunities dominating, resulting in four types of strategies. The SO strategy utilizes extensive marketing channels and potential natural resources to expand the online market, adopts modern technology, improves skills through government training, and uses capital to collaborate with farmers. The WO strategy emphasizes improving hatchery management through government programs, improving broodstock quality with certified assistance, and developing a digital bookkeeping system. The ST strategy uses existing marketing networks to overcome competition, maximizes natural resources and workforce skills to deal with the impact of extreme weather, and maintains production cost efficiency to overcome high feed costs. The WT strategy encourages management training to manage pests and diseases, procure certified superior broodstock, innovate alternative feeds, and establish cooperatives to face competition. The following is a summary of the strategies that farmers can choose from.

Table 9. Description of SO Strategy, WO Strategy, ST Strategy, WT Strategy

Strategy	Strategy Description
SO	1. Leveraging extensive marketing channels (S1) and workforce skills (S3) to expand market reach online (O5). 2. Optimizing potential natural resources (S2) by adopting modern seeding technology (O2) for production efficiency. 3. Improving workforce skills (S3) through training from government programs (O3) to strengthen the quality of human resources. 4. Using available capital (S4) to establish collaborative partnerships with other farmers (O4).
WO	1. Participate in government training and programs (O3) to improve knowledge of seed management (W1). 2. Improving the quality of broodstock (W2) by utilizing assistance from government programs (O3) 3. Develop a digital-based recording system (O5) to organize production bookkeeping (W3).

ST	1. Leveraging extensive marketing channels (S1) to overcome intense competition (T4). 2. Maximizing natural resources and workforce skills (S2, S3) to deal with weather and climate impacts (T2). 3. Maintaining seed quality and production cost efficiency by maximizing natural potential (S2) to offset high feed costs (T3).
WT	1. Improve management training (W1) to address pest and disease risks (T1). 2. Overcoming the low quality of broodstock (W2) by procuring certified superior broodstock and broodstock quarantine. 3. Participate in feed management training and create local alternative feed to reduce high costs (T3) and lack of knowledge (W1). 4. Forming cooperatives or joint business groups to share resources in marketing and production to overcome internal weaknesses and competitive threats (T4).

Source:Processed fromprimary interview data, 2025

Tilapia Fish Development Strategy Based on SWOT Analysis (Strengths, Weaknesses, Opportunities, and Threats)

The strategy for developing the tilapia hatchery business in Genteng focuses on leveraging internal strengths and external opportunities (SO). First, a broad distribution network and workforce skills are leveraged to expand the market online through educational content on social media, e-commerce, and interactive websites, reducing reliance on intermediaries. Second, potential natural resources such as water quality and freshwater access are optimized through the adoption of modern technologies (RAS, biofloc, IoT) to increase production efficiency, reduce disease risk, and increase output volume, in line with stable market demand. Third, government training (RAS, biosecurity, broodstock management, digital technology) improves the technical skills of hatcheries, combining field experience with scientific knowledge. Fourth, internal capital is used to form strategic partnerships (cooperatives, KUB, clusters) to achieve economies of scale in raw material procurement, infrastructure sharing, and access to external assistance, leading to integration, business efficiency, and sustainable regional and national competitiveness.

CONCLUSION AND SUGGESTIONS

Analysis shows that tilapia fish farmers in Genteng face internal constraints such as limited managerial knowledge, low broodstock quality, and unstructured production bookkeeping. External challenges include fluctuating weather, intense competition, disease risk, and high feed costs. However, internal strengths such as extensive marketing networks and capital independence still support business performance. Managerially, business owners rely more on practical experience and informal financial systems, with distribution channels reaching beyond the region but digital utilization still minimal. Technical potential, including optimal water quality and temperature, has not been optimized through RAS or a water quality monitoring system. Recommended development strategies include increasing human resource capacity through training, adopting modern technology, procuring superior broodstock, and establishing cooperatives to increase productivity and competitiveness.

For the Fisheries Service, the integration of SWOT findings into policies, revolving funding, and monitoring and evaluation indicators is highly recommended, and farmers are encouraged to adopt integrated management, broodstock quarantine, digital recording

applications, and online marketing under the “Benih Genteng” brand. Further research is recommended to conduct longitudinal studies of RAS/biofloc and explore digital cooperative models with fintech and integrated logistics.

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