Research Article

Sustainability Strategies for Alabio Duck (*Anas platyrhynchos Borneo*) Farming in Hulu Sungai Utara, South Kalimantan, Indonesia

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Abstract | Alabio duck is one of the indigenous duck breeds from South Kalimantan, Indonesia. In recent years there has been a decrease in the Alabio duck population. The aim of this study was to formulate strategies for the sustainability of Alabio duck farming by evaluating the internal and external factors that influence the farming business. This research was conducted in five districts of Hulu Sungai Utara Regency, namely: Sungai Pandan, Babirik, Amuntai Selatan, Amuntai Tengah, and Banjang District. The analytical method used is descriptive qualitative analysis and strategic management framework approach, which includes IFE, EFE, IE, SWOT, and QSPM analysis. Primary data were collected through in-depth interviews with informants, including Alabio duck farmers, government representatives, and academic representatives from local universities. Secondary data were collected from the Agricultural Department of Hulu Sungai Utara Regency, Breeding and Feed Development Center of Pelaihari, and the Statistics Bureau of Hulu Sungai Utara. The research results showed Alabio duck farming has several strengths and opportunities, such as government support and high market demand for Alabio duck products. However, the main weaknesses and threats lie in suboptimal management practices and the declining availability of Alabio ducks. To enhance the sustainability of Alabio duck farming, the recommended strategies include collaborating with farmer leaders in extension programs, revitalizing the Alabio duck hatchery center in Mamar Village, and collecting data on population, livestock product demand, and production capacity of Alabio ducks.

Keywords | Germplasm, Sustainability, SWOT, Waterfowl, Livestock

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INTRODUCTION

Duck is a type of waterfowl that is an important food source in the rural area of Southeast Asia. Ducks are easier to manage than chickens in regions with hot and humid climates, under such conditions duck can be preferred as a contributor to food security (Pingel and Germany, 2011). The meat and egg of duck have high nutritional value and consumers mostly prefer them not only because of their taste, but their nutritional value and the fact that they contain optimum quantity of essential amino acids and fatty acids (Molnar, 2017). Ducks held an important role in supplying protein to the people of Indonesia (Santoso *et al*., 2023). In South Kalimantan, Indonesia, duck farming is a primary livelihood for the people of Hulu Sungai Utara Regency, where the Alabio duck is officially recognized as

germplasm under the Minister of Agriculture Decree No. 2921/Kpts/OT.140/6/2011. The Alabio duck has a high adaptability to wetland environments and excels as a productive egg layer, making it a potential agricultural commodity for Hulu Sungai Utara Regency (Fitriyanti, 2018).

Between 2018 and 2022 the duck population in South Kalimantan decreased from 4,284,438 to 3,386,449 (BPS, 2024). This decrease was caused by major floods in 2020 and the COVID-19 pandemic, which forced many farmers to close their farming businesses. Additionally, shifting market demand toward other duck commodities has reduced farmer's interest in raising Alabio ducks (Fitriyanti and Pradana, 2021). Beside these economic and environmental challenges, the genetic purity of the Alabio duck is also at risk due to uncontrolled crossbreeding with other duck breeds, such as Mojosari, Tegal, and Pekin ducks. Without proper breeding management, the distinct genetic traits of the Alabio duck will gradually decline and eventually become extinct (Sulaiman *et al*., 2023). These challenges collectively threaten the sustainability of Alabio duck farming, making the development of Alabio duck farming difficult to achieve. Development cannot be achieved without sustainability (Pranira *et al*., 2024). Addressing these challenges is crucial to ensuring the availability of Alabio duck in the future.

In an era of growing environmental, socioeconomic, and market uncertainties, understanding the adaptive strategies of smallholder farmers is paramount for sustainable agricultural productivity and environmental management efforts (Touch *et al*., 2024). In the livestock sector, sustainability is determined by economic profitability, minimal environmental and social impacts, and optimal animal health and welfare (Wathes *et al*., 2008). Previous studies on Alabio duck farming in Hulu Sungai Utara indicate that its sustainability status is 'Moderately Sustainable,' with only one out of five assessed dimensions classified as sustainable (Putri *et al*., 2024). This classification was derived using the Rapfish method (Pitcher and Preikshot, 2001), which employs multidimensional scaling analysis to evaluate sustainability across five dimensions: economic, ecological, social, technological, and institutional. The method incorporates both quantitative and qualitative indicators, depending on the attributes assessed in each dimension. These findings highlight the need for further research to formulate strategies for addressing sustainability challenges and enhancing the long-term viability of Alabio duck farming. The novelty of this study lies in formulating sustainability strategies for Alabio duck farming, a native breed from South Kalimantan, which has not been specifically studied in previous research. To address this gap, an evaluation of internal and external factors influencing Alabio duck farming is conducted leading to the development of sustainability strategies. The results of this study provide actionable strategies for policymakers and stakeholders to enhance sustainability of Alabio duck farming with the efficient use of resources.

MATERIALS AND METHODS

Materials

The study was conducted from September 2023 to March 2024, in Sungai Pandan, Babirik, Amuntai Selatan, Amuntai Tengah and Banjang District of Hulu Sungai Utara Regency, South Kalimantan, Indonesia. The locations were purposefully selected as they represent the central areas for Alabio duck farming development. Data collection involved both primary and secondary sources. Primary data were collected through in-depth interviews with informants. The selection of informants followed a purposive sampling method. A total of eight experts were selected as informants, including representatives from the Agricultural Department of Hulu Sungai Utara Regency, the Breeding and Feed Development Center of Pelaihari, the heads of duck farmer groups from each districts (Sungai Pandan, Babirik, Amuntai Selatan, Amuntai Tengah, and Banjang), and academic representative from local University in South Kalimantan. Instead of broad statistical representation, the study prioritized in-depth qualitative insights. Direct field observations were conducted to assess farming management practices, environmental conditions, existing technologies, and infrastructure in the selected districts. Secondary data were collected from the Agricultural Department of Hulu Sungai Utara Regency, the Breeding and Feed Development Center of Pelaihari, and the Statistics Bureau of Hulu Sungai Utara Regency.

Methods

The study adopted Fred R. David's Strategic Management framework, which was modified to align with the specific conditions of Hulu Sungai Utara Regency. This research uses a descriptive qualitative analysis, where the result of the strategic management framework will be described. Primary data were collected through semi-structured interviews to ensure consistency while allowing flexibility in responses. Interview data were transcribed and categorized into key themes based on recurring patterns relevant to sustainability issues. To enhance reliability, responses were cross-checked with secondary data and multiple rounds of review were conducted to ensure coherence and accuracy. To further minimize biases, this study employed triangulation by cross-checking data from interviews, field observations, and secondary sources. Additionally, structured thematic coding was applied to categorize responses systematically, ensuring consistency in analysis and reducing subjectivity. The strategy formulation was divided into three stages including Input Stage, Matching Stage, and Decision Stage illustrated in Figure 1.

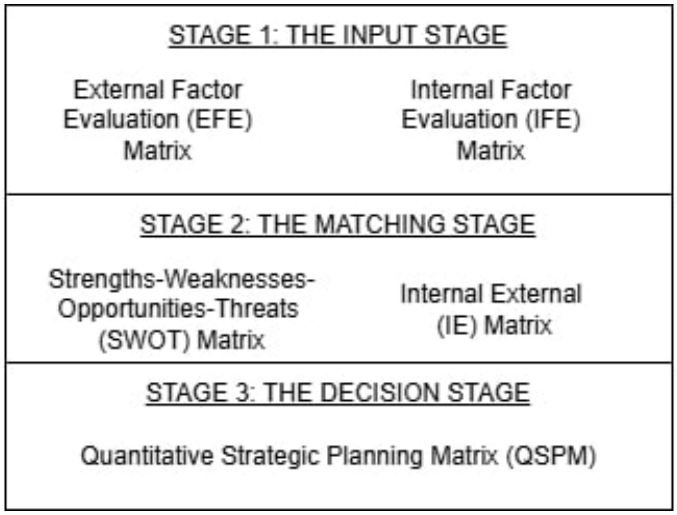

Figure 1: The strategy formulation analytical framework.

In the input stage, the External Factor Evaluation (EFE) and Internal Factor Evaluation (IFE) Matrices were developed based on interviews with informants, identifying 15 external and 9 internal factors. The internal and external factors in this study were carefully selected based on informants input to ensure their relevance and impact on Alabio duck farming sustainability. The list of internal and external factors presented in this study is not exhaustive. Instead, the selection process focused on identifying key factors with significant strategic impact based on expert input. Additional factors were considered but excluded due to limited relevance, insufficient data, or redundancy with existing factors. This approach aligns with the purpose of an internal and external audit, which prioritizes actionable insights over an exhaustive inventory of all possible influences (David, 2011). To ensure consistency in the evaluation process, a structured questionnaire with predefined rating scales was used to guide informants in assessing each factor. Weights, ranging from 0.0 to 1.0, were assigned to reflect the relative importance of each factor in the industry, ensuring that the total sum equaled 1.0. Informants then rated each factor on a scale from 1 to 4. For IFE, ratings indicated the extent to which each factor was a strength or weakness, where 1 = major weakness, 2 = minor weakness, 3 = minor strength, and 4 = major strength. For EFE, ratings reflected how effectively the current strategies responded to external factors, where 1 = poor response, 2 = average response, 3 = above-average response, and 4 = superior response. Unlike weights, which were industry-based, ratings were company-based and specific to the conditions of Alabio duck farming in Hulu Sungai Utara. Informants' responses were reviewed and discussed in follow-up consultations to resolve discrepancies, and final weights and ratings were determined by averaging informants' evaluations. The final weighted scores were then calculated by multiplying each factor's weight by its corresponding rating, and the total weighted score was obtained by summing all weighted scores.

The matching stage divided into two stages, first is the matching stage with Internal External (IE) Matrix resulting in positions of competitiveness duck farming in nine quadrant of IE matrix, then the second stage is SWOT matrix to match internal and external factors, resulting in alternative strategies for improving the sustainability of Alabio duck farming. The decision stage uses the Quantitative Strategic Planning Matrix (QSPM) to prioritize strategies by assessing their relative attractiveness. Attractiveness Scores (AS), ranging from 1 (not attractive), 2 (somewhat attractive), 3 (reasonably attractive), to 4 (highly attractive), were assigned based on expert evaluations of how well each strategy leverages strengths, addresses weaknesses, exploits opportunities, or mitigates threats. These scores were then multiplied by factor weights from the IFE and EFE matrices, ensuring consistency in the evaluation process. Following the structured approach outlined by David (2011), the process began by listing key internal and external factors identified in the IFE and EFE matrices and assigning them their respective weights. The Total Attractiveness Score (TAS) for each factor was calculated by multiplying the AS by its corresponding weight. The TAS was then derived by summing all AS values for each strategy, providing an objective ranking of alternatives. Strategies with higher TAS values were deemed more favorable for implementation, as they offered the greatest potential impact on the sustainability of Alabio duck farming.

RESULTS AND DISCUSSION

Among the three domestic duck farming patterns (intensive, semi-intensive, and quasi-ecological), duck farmers in Hulu Sungai Utara generally adopt a semi-intensive farming system. To optimize land use, the majority of duck farmers utilize raised housing structures above swamps. Most farmers rely on a combination of commercial feed and locally available feed, such as rice bran, sago, and salted fish, to reduce production costs. The availability of essential inputs such as Day-Old Ducks (DOD) in Hulu Sungai Utara Regency is relatively sufficient, especially for Mojosari-Alabio (MA) and Pekin ducks. However, Alabio DOD remains limited and is only available from the Breeding and Feed Development Center of Pelaihari (BPTU-HPT Pelaihari), making it less accessible for farmers. Due to economic considerations, most duck farmers prefer raising Peking and MA ducks. The higher price and limited availability of Alabio DOD have further discouraged farmers from raising this local breed. In the downstream subsystem, farmers primarily sell fresh eggs, hatching eggs, and duck meat through various marketing channels, with selling prices varying based on distribution channels. Some have adopted value-added processing methods, such as producing salted eggs and duck jerky to increase profitability. While the local government has provided production equipment, marketing training, and extension programs

to support this sector, challenges remain in ensuring the sustainability of Alabio duck farming. The shift in farmer preferences toward MA and Peking ducks, driven by faster growth rates and economic viability has contributed to the decline of Alabio duck populations in the region. Furthermore, the absence of a structured conservation breeding program or formal genetic monitoring system increases the risk of losing this valuable local breed.

Table 1: External factor evaluation (EFE).

Opportunity	Weight	Rating	Score
High market demand for Alabio duck products	0.08	4	0.32
Availability of local feed resources.	0.06	3	0.18
Distribution of farm products to areas outside the region.	0.07	4	0.28
Availability of government assistance	0.06	3	0.18
Minimal social conflicts within the community.	0.06	3	0.18
Accessibility to financial institutions.	0.05	3	0.15
Extension programs and training for farmers.	0.06	3	0.18
Subtotal	0.44		1.47
Threat			
Imported duck commodities in the Alabio duck development center.	0.07	1	0.07
Limited availability of Alabio Day-Old Ducks (DOD)	0.07	1	0.07
Insufficient research on Alabio duck farming practices.	0.06	2	0.12
Risk of annual flooding in farming areas	0.07	1	0.07
Prevalence of diseases and pest infestations	0.07	1	0.07
Fluctuations in feed prices	0.08	1	0.08
Volatility in the price of farming products (e.g., eggs, DOD, young ducks, and ducks meat)	0.07	2	0.14
Increased imports of livestock products from outside of region	0.07	1	0.07
Subtotal	0.56		0.68
EFE Score	1.00		2.16

Input Stage (EFE and IFE)

The ratings assigned to external and internal factors were based on informants' evaluations of their relative impact on the sustainability of Alabio duck farming. Factors with a stronger influence on long-term sustainability received higher scores, while those with less immediate impact were rated lower. After calculating the weight and rating value of each internal and external factor, the information collected from the EFE and IFE matrix provides basic input information needed for the matching and decision stage to formulate strategies. Regardless of how many factors are included in EFE and IFE matrices, the total weighted score can range from 0.1 to 4.0, with the average score being 2.5. Total weighted scores below 2.5 represent a weak internal organization, whereas scores above 2.5 indicate a strong internal position (David, 2011).

The total EFE score for Alabio duck farming in Hulu Sungai Utara Regency was 2.16 (Table 1). This score indicates that Alabio duck farming is currently poor in responding to external factors. This score suggests that external threats have a greater impact than opportunities, making the industry vulnerable to external pressures. Key challenges include rising feed costs, environmental risks, competition from imported duck commodities, and price fluctuations, which could negatively affect production efficiency and profitability. This finding aligns with previous studies, which show that smallholder farmers often struggle to respond to price fluctuations in agricultural products, leading to capital losses and shifts to alternative production activities (Huka *et al.*, 2014). Additionally, existing opportunities, such as government protection of Alabio ducks as a germplasm and growing consumer interest in native duck products, have not been fully utilized. Without strategic interventions to mitigate threats and leverage opportunities, the long-term sustainability of Alabio duck farming could be at risk.

Table 2: Internal factor evaluation (IFE).

Strength	Weight	Rating	Score
Government protection of Alabio duck status as a germplasm	0.13	4	0.52
Located in the center for Alabio duck farming development.	0.10	4	0.40
Availability of feed milling technology.	0.10	3	0.30
Member of farm groups.	0.12	3	0.36
Subtotal	0.45		1.58
Weakness			
Limited knowledge among farmers regarding management practices.	0.10	2	0.20
Lack of waste management practices.	0.10	2	0.20
Insufficient implementation of biosecurity practices	0.12	1	0.12
Limited access to capital for farm operations.	0.12	1	0.12
Insufficient availability of breeding and hatching technologies.	0.11	2	0.22
Subtotal	0.55		0.86
IFE Score	1.00		2.44

The total IFE score for Alabio duck farming was 2.44 (Table 2). This indicates that internal weaknesses slightly outweigh strengths, posing key challenges for industry sustainability. The industry faces issues related to farmers'

knowledge of livestock management practices, limited access to technology, and weaknesses in business management, which could limit its long-term competitiveness. If these challenges are not addressed, Alabio duck farming may struggle to compete with more industrialized poultry sectors. To enhance resilience and sustainability, strategic efforts should focus on improving farmer training, optimizing technology adoption, and expanding market access. Alabio duck farmers generally have limited knowledge of livestock management and inefficiencies in business operations. These weaknesses are similar with findings from research conducted in 2020 on Hulu Sungai Utara, which resulted in Alabio duck farmer's weaknesses are limited capital and knowledge of farmers about the nutritional content of animal feed (Rijaluzzaman *et al*., 2020). Addressing these challenges is important to improve the overall performance of Alabio duck farming to ensure the sustainability of Alabio duck farming in Hulu Sungai Utara Regency.

Matching Stage (IE and SWOT)

IE Matrix is an adaptive strategic formulation tool that focuses on alternative strategies by integrating weighted results from the IFE and EFE matrices. The X-axis of the IE Matrix represents the total weighted score from the IFE Matrix, while the Y-axis represents the total weighted score from the EFE Matrix. The IE Matrix consists of nine cells, each associated with a specific strategy (David, 2011).

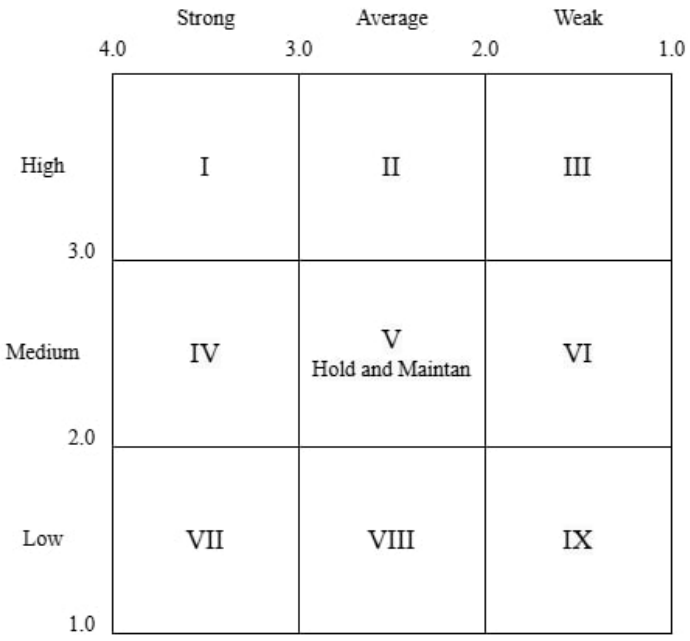

Figure 2: Internal External (IE) Matrix.

For the Alabio duck farming business in Hulu Sungai Utara Regency, the total EFE score is 2.16 and the total IFE score is 2.44. The mapping results of the IE Matrix, using the total IFE score as the X-axis and the total EFE score as the Y-axis, are presented in Figure 2. The Alabio duck farming business in Hulu Sungai Utara Regency falls into Cell V of the IE Matrix, representing the "Hold and Maintain" position. The results of the IE Matrix analysis align with the findings of study on duck farming in Hulu Sungai Utara Regency, which falls in Cell V indicating the "Hold and Maintain" Strategy (Hidayatullah *et al*., 2012).

After knowing the position of Alabio duck farming in IE Matrix, the second stage of Matching Stage uses SWOT matrix to formulate strategies for the sustainability of Alabio duck farming. SWOT matrix is used to identify strategies that can increase Strengths and Opportunities and reduce Weaknesses and Threats. Each strategy is identified based on internal and external factors that have been grouped into Strengths, Weaknesses, Opportunities, and Threats. The SWOT matrix can be seen in Table 3.

The SWOT matrix is a tool for formulating four strategic approaches: SO (Strength-Opportunity), WO (Weakness-Opportunity), ST (Strength-Threat), and WT (Weakness-Threat). As shown in Table 3, eight strategies have been identified. These alternative strategies are designed to improve the sustainability status of Alabio duck farming ensuring the optimal utilization of the potential in the region.

SO strategies use internal strengths of Alabio duck farming and maximize the external opportunities (Table 3). The first SO strategy is to conduct monitoring and evaluating the effectiveness of ongoing government programs related to development of Alabio duck farming to ensure optimal outcomes from the program. There are several ongoing programs in Hulu Sungai Utara to support Alabio's duck farming, but the implementation of the program needs stricter monitoring and evaluation to ensure it solves the main problem of Alabio duck farming such as the declining interest in raising Alabio duck among farmers. This strategy involves collecting feedback from farmers, measuring the impact of subsidies and training programs, and identifying areas for improvement. The evaluation process should include stakeholder consultations, performance indicators, and periodic reporting to enhance program efficiency and sustainability. The second SO strategy that can be implemented in Alabio duck farming is by collecting comprehensive data on Alabio duck populations, market demand, and production capacity. The data will offer stakeholders and policy makers valuable insights to formulate evidence-based policies to promote the growth and sustainability of the sector. Evidence-based livestock policies are crucial in supporting sustainable development goals, policy makers also need to conduct continuous evaluation of policies that are implemented to ensure that they are reaping their intended benefits in the most effective way possible (Mehrabi *et al*., 2020).

Table 3: SWOT Matrix.

Factor	Strength (S)	Weakness (W)
	• Government protects Alabio duck status as a germplasm. • Located in the center for Alabio duck development. • Availability of feed milling technology. • Member of farm groups.	• Limited knowledge among farmers regarding management practices. • Lack of waste management practices. • Insufficient implementation of biosecurity practices • Limited access to capital for farm operations. • Insufficient availability of breeding and hatching technologies.
Opportunity (O)	**SO Strategy**	**WO Strategy**
• High market demand for Alabio duck farming products. • Availability of local feed resources. • Distribution of farm products to areas outside the region. • Availability of government assistance. • Minimal social conflicts within the community. • Accessibility to financial institutions. • Extension programs and training for farmers.	• Monitoring and evaluating the effectiveness of ongoing government programs related to development of Alabio duck farming • Collecting data on the population, demand for livestock products, and production capacity of Alabio ducks.	• Collaborating with farmer's leaders in extension services. • Seek alternative sources of funding for business capital.
Threat (T)	**ST Strategy**	**WT Strategy**
• Imported duck commodities in the Alabio duck development center. • Limited availability of Alabio Day-Old Ducks (DOD) • Insufficient research on Alabio duck farming practices. • Risk of annual flooding in farming areas. • Prevalence of diseases and pest infestations. • Fluctuations in feed prices. • Volatility in the prices of farming products (e.g., eggs, DOD, young ducks, and culled ducks) • Increased imports of livestock products from outside region.	• Issuing regional policy to restrict the import of ducks from outside the region. • Revitalizing the Alabio duck hatchery center in Mamar Village.	• Partnering with research institutions to develop contingency plans, including the construction of flood-resistant infrastructure and the maintenance of the Alabio Polder. • Establishing a cooperative for Alabio duck farmers in Hulu Sungai Utara Regency.

WO strategies aim to improve internal weaknesses by taking advantage of external opportunities (Table 3). The first WO strategy is to find alternative sources of funding for business capital. Alabio duck farmers often face capital constraints that hinder farm development, and many are forced to close their farms if revenue consistently fails to cover expenses. Other than limited capital, one of the weaknesses in Alabio duck farming is the lack of proper management practices including feeding, waste processing, and biosecurity, which do not meet established standards. To address this, the second WO strategy focuses on collaborating with farmer's leaders in extension programs. Farmers are more likely to adopt new practices when guidance comes from respected peers. Agricultural extension agents can work alongside these farmer leaders to provide targeted training sessions aimed at improving farm management and productivity. This strategy involves a structured farmer-to-farmer extension approach, where experienced farmer leaders will provide targeted training on waste management, disease prevention, feed formulation, biosecurity, and financial management. These sessions will be delivered through workshops, on-farm demonstrations, and mentoring programs, ensuring practical knowledge transfer. The involvement of respected farmer leaders is expected to enhance adoption rates, as farmers are more likely to follow best practices when trained by peers. The effectiveness of extension services is influenced by factors such as gender, class, religion, and race, which can affect farmers' ability to engage and benefit from these programs. However, collaborating with farmer leaders can help overcome these barriers, fostering a more inclusive and impactful extension effort (Cook *et al*., 2021).

ST strategies use the Alabio duck farming strengths to avoid or reduce the impact of external threats (Table 3). The first ST strategy is issuing regional policy to restrict the import of duck's commodities from outside of Alabio development area. It is known that imported duck com-

modities in the Hulu Sungai Utara Regency can disrupt the sustainability of Alabio duck farming. Alabio duck farmers will find other duck commodities that are more economically beneficial to their farms; unregulated massive import activities, especially in the Alabio development area will threaten the balance between supply and demand for Alabio ducks. Policymakers can address this threat by issuing regional policy to restrict duck imports in order to stabilize the regional market and focus on the sustainability of Alabio duck farming. The second ST Strategy also aligns with the importance of Alabio duck supply in Hulu Sungai Utara, which is revitalizing the Alabio duck hatchery center in Mamar Village. This strategy can enhance local hatching capacities and ensure a sufficient supply of Alabio's DOD to meet market demand. The lack of institutional capacity and sustainable breeding programs in animal breeding may threaten the competitive advantage of local breeds (Hiemstra *et al*., 2006).

WT strategies are defensive strategies aimed at reducing internal weaknesses and avoiding external threats (Table 3). One of the main threats in Alabio duck farming is the risk of annual flooding in farming areas. A suitable WT strategy to address this issue involves the government partnering with research institutions to develop contingency plans, which could mitigate the effects of flooding in Hulu Sungai Utara Regency. Additionally, the government can invest in flood-resistant infrastructure and maintain the Alabio polder which is essential for controlling floods and waterlogging. To address threats such as price fluctuations, the second WT Strategy is establishing cooperatives for Alabio duck farmers that can help stabilize feed and Alabio's DOD prices by offering collective bargaining power and reducing market volatility. Smallholder farmers often face unfavorable bargaining conditions when selling their products, organizing themselves in cooperatives or other collective action organizations has been an effective way for farmers to strengthen their negotiating positions and build countervailing power (Bijman, 2018).

Decision Stage (QSPM)

In the decision stage, Quantitative Strategic Planning Matrix (QSPM) was used to identify the most suitable strategies for enhancing the sustainability of Alabio duck farming in Hulu Sungai Utara Regency. QSPM is a tool that enables strategists to objectively evaluate the outcomes of various alternative strategies based on previously identified internal and external factors (David, 2011). The strategies listed in this study are not exhaustive. Given the wide range of possible strategic options, the selection process focused on identifying those with the most significant impact on the sustainability of Alabio duck farming. Strategies were assessed based on their feasibility, relevance, and potential for implementation, ensuring that the proposed recommendations are practical and actionable for stakeholders. Based on the QSPM as shown in Table 4, three strategies with the highest Total Attractiveness Score (TAS) were prioritized: (1) Collaborating with farmer's leaders in extension programs, (2) Revitalizing the Alabio duck hatchery center in Mamar Village, and (3) Collecting data on the population, demand for livestock products, and production capacity of Alabio ducks. These strategies were selected because they ranked highest in feasibility and impact, directly addressing key weaknesses and threats while maximizing strengths and opportunities. Additionally, they were considered practical, resource-efficient, and aligned with existing government policies.

Table 4: Quantitative strategic planning matrix (QSPM).

Strategy	TAS	Strategy Prioritization
Collaborating with farmers leaders in extension programs	5.90	1
Revitalizing the Alabio duck hatchery center in Mamar Village	4.85	2
Collecting data on the population, demand for livestock products, and production capacity of Alabio ducks	4.75	3
Monitoring and evaluating the effectiveness of ongoing government programs related to development of Alabio duck farming	3.68	4
Partnering with research institutions to develop contingency plans, including the construction of flood-resistant infrastructure and the maintenance of the Alabio polder	3.54	5
Issuing regional policy to restrict the import of ducks from outside the region.	3.36	6
Establishing a cooperative for Alabio duck farmers in Hulu Sungai Utara Regency.	3.28	7
Seek alternative sources of funding for business capital.	3.10	8

The first strategy that can be prioritized is collaborating with farmer's leaders in extension programs (TAS =5.90). This strategy was rated higher because it directly addresses multiple internal weaknesses (such as limited farmer knowledge and poor management practices) while also leveraging existing opportunities (such as government support for extension programs). This strategy was considered more feasible, cost-effective, and capable of delivering immediate impact through knowledge transfer and improved farm management. Extension programs in rural communities play a critical role in linking farmers and other actors in rural developmental agenda, the relevance of these programs in agriculture is largely dependent on their ability to meet farmers needs since they are the stakeholders at the grassroots (Maulu *et al*., 2021). Most smallholder farm-

ers rely on inherited knowledge and personal experience yet often neglect essential management practices, such as proper feed management, waste management, and biosecurity, which can lead to low productivity. Conducting collaborative extension programs with respected farmer leaders in extension programs may help the farmers in adopting the latest technologies and knowledge about duck's management farming. This strategy emphasizes improving the knowledge and skills of Alabio duck farmers through collaboration between extension workers and respected farmer's leaders. Farmer's leaders can play a crucial role in fostering trust and promoting the adoption of standardized farming practices. Most of the extension agents are considered "outsiders" to farmers, so it is more effective if the extension agent collaborates with lead farmers so that the extension program can reach many farmers. Study about Farmer-to-Farmer extension, has shown that community based extension approaches can help reach many farmers within a short period of time (Kiptot and Franzel, 2015). However, in order to conduct farmer-to-farmer extension effectively encourage follower farmers to adopt innovations, it is essential for stakeholders to identify capable and motivated lead farmers who are not too socially distant from the target population in terms of personal characteristics and innovativeness (Fisher *et al*., 2018).

Another strategy that can be prioritized is revitalizing the Alabio duck hatchery center in Mamar Village (TAS=4.85), this strategy is critical for addressing the limited supply of Alabio's DOD, which poses a significant threat in Alabio duck farming. Farmers in Mamar Village must reduce their hatching capacity for crossbred ducks, such as Mojosari-Alabio (MA) and Peking ducks, to prioritize the hatching of purebred Alabio ducks. This approach can ensure a balanced supply of purebred Alabio ducks while preserving the pure breed's genetics. Revitalization, however, is not solely about preserving the past; it involves a dynamic process of adaptation and transformation that can contribute to sustainability (Dahlin and Svensson, 2021). The study of Velvet Deer Germplasm Resources in China showed that in order to protect germplasm resources, it is important to balance between purebred resource protection and the development of breeding innovation (Tang *et al*., 2022). Overproduction of crossbred Alabio duck's risks disrupting the sustainability of Alabio duck farming, particularly if crossbreeding efforts dominate the hatchery center that are designated for Alabio ducks. Revitalizing the role of the Mamar Village as an Alabio Hatching Center is crucial to ensuring a stable and high-quality supply of Alabio ducks. Government support, such as subsidies for hatchery operations for Alabio duck farms and facilities for producing high-quality hatching eggs combined with consistent monitoring and evaluation can enhance Alabio duck production capacity and genetic quality.

The last strategy recommended by this study is collecting data on the population, demand for livestock products, and production capacity of Alabio ducks (TAS=4.75). Availability of Alabio duck data in Hulu Sungai Utara Regency is crucial for informed decision making, particularly in promoting the sustainability of duck farming. However, a significant weakness in Indonesia's livestock management sector is the lack of comprehensive population data (Hartono and Widayati, 2011). In many developing countries, livestock data collection is inconsistent, and the methods of analysis are often inadequate and fragmented, limiting the ability to establish a reliable baseline for policy formulation (Pica-Ciamarra *et al*., 2014). The lack of comprehensive data hinders the development of accurate policy formulation, resource allocation, and long-term planning. Most of the data held by the relevant agencies are general data on livestock, without specifying the types of livestock. As a region designated for the development of Alabio ducks, it is vital for the local government to have detailed data on the Alabio duck population in the area. This aligns with the study on Sheko cattle, it stated that census and monitoring of livestock populations are essential to precisely monitor population size and structure, providing critical insights for breed improvement (Taye *et al*.,2009).

By collecting data on Alabio duck populations and market demand, the government can assess the region's ability to me*et al*abio duck production targets in Hulu Sungai Utara Regency. This data can also serve as a basis for evaluation by stakeholders to formulate strategies or policies related to Alabio duck farming in subsequent years. Detailed and specific data allow local governments to evaluate the region's capacity to meet production targets, ensure ecological balance, and identify areas requiring intervention or improvement.

CONCLUSIONS AND RECOMMENDATIONS

Alabio duck farming in Hulu Sungai Utara Regency has several strengths and opportunities, such as government support and high market demand for Alabio duck products. The main weaknesses and threats lie in suboptimal management practices and the declining availability of Alabio ducks. Currently, Alabio duck farming business is in a Hold and Maintain position, meaning it should focus on preserving existing conditions while making necessary improvements. The sustainability of Alabio duck farming depends on how effectively farmers and the government address these challenges to ensure its long-term viability. To enhance the sustainability of Alabio duck farming, this study recommends three priority strategies: collaborating with farmer leaders in extension programs, revitalizing the Alabio duck hatchery center in Mamar Village, and col-

lecting data on population, livestock product demand, and production capacity.

In addition to the recommended strategies, several policy implications should be considered by the government to strengthen the long-term sustainability of Alabio duck farming. Strengthening farmer-led extension programs is crucial for improving knowledge transfer and management practices, where integrating experienced farmer leaders into formal extension initiatives can enhance the adoption of best practices in feeding, biosecurity, and financial management. Additionally, conservation efforts for Alabio ducks should be reinforced through regulations that promote sustainable breeding and limit excessive crossbreeding, along with providing incentives for farmers who maintain purebred Alabio ducks to ensure genetic conservation. Another key policy priority is improving livestock data management and market integration of Alabio duck, which can be achieved by developing a centralized livestock database to track population trends, production capacity, and market demand, allowing for more accurate decision-making and better supply chain management. By implementing these policies, the government can enhance the resilience and productivity of Alabio duck farming while ensuring its long-term sustainability.

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NOVELTY STATEMENT

The novelty of this research is in the livestock commodity being studied. Experts have developed various theoretical and practical approaches to formulate sustainability strategies for livestock farming. However, research on the strategy for sustainability of duck farming particularly Alabio ducks, a native duck breed from South Kalimantan has not yet been conducted.

AUTHOR'S CONTRIBUTIONS

Aulia Rahayu Putri: Contributed to conceptualization, methodology, investigation, data curation, formal analysis, and wrote the article.
Siti Azizah: Contributed to conceptualization, methodology, supervision, and validation.
All authors accepted for the final manuscript.

Conflict of Interest

The authors have declared no conflicts of interest.

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