Research Article

Strategic Development of the Pelung Chicken Agribusiness System in a Non-Origin Region: Evidence from Malang Raya, Indonesia

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Abstract | This study aims to formulate strategies for developing the Pelung chicken agribusiness system in Malang Raya as an effort to strengthen the sustainability of local poultry farming and preserve Indonesia's genetic resources. Pelung chicken (*Gallus gallus domesticus*) is a local breed with high economic and cultural value, particularly due to its distinctive crowing characteristics. The study utilized both primary and secondary data obtained through interviews, observations, and literature reviews. Data analysis was conducted using the Internal Factor Evaluation (IFE), External Factor Evaluation (EFE), SWOT Analysis, and Quantitative Strategic Planning Matrix (QSPM) to identify internal and external factors and to determine priority development strategies. The results showed that the total IFE score of 2.64 and EFE score of 2.87 placed the Pelung chicken agribusiness system in a 'hold and maintain' position, indicating a relatively stable system with potential for sustained improvement. The priority strategies derived from the QSPM analysis include: (1) optimizing local breeding stock, supported by academics and digital technology, to produce superior breeds (TAS = 3.26), (2) utilizing experienced human resources and production technology to maintain breeding quality and prevent fraud (TAS = 3.13), and (3) developing pricing strategies based on niche market trends such as collectors, contests, and hobbyists (TAS = 3.07). Successful implementation of these strategies requires collaboration among farmer communities, academics, hobbyist associations, and the government in building an adaptive, competitive, and sustainable Pelung chicken agribusiness system.

Keywords | Pelung chicken, Agribusiness, SWOT, QSPM, Development strategy, Malang Raya

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INTRODUCTION

Livestock production plays a strategic role in agricultural development, contributing to economic growth, rural livelihoods, and food system resilience. Beyond its productive function, the livestock sector also carries a critical responsibility in the conservation of animal genetic resources, which are essential for maintaining biodiversity, adaptive capacity, and long-term sustainability of farming systems. The preservation of local breeds, in particular, is increasingly recognized as a global priority, as these genetic resources possess unique traits shaped by long-term adaptation to local ecological, cultural, and socio-economic contexts. Effective management of local livestock

breeds both in situ and ex situ is therefore fundamental to safeguarding genetic diversity while simultaneously supporting rural economic development (Tenzin *et al*., 2023).

Among Indonesia's indigenous poultry genetic resources, the Pelung chicken (*Gallus gallus domesticus*) represents a distinctive local breed with high cultural and economic value. Originating from Cianjur, West Java, Pelung chickens are uniquely characterized by their long, melodious, and rhythmic crowing, as well as a relatively large body posture compared to other indigenous chickens (Asmara *et al*., 2020). These attributes differentiate Pelung chickens from conventional poultry breeds and position them within a dual-purpose niche, functioning not only as a source of animal protein but also as a cultural and recreational commodity, particularly within competitive crowing contests and hobbyist communities. Despite their growing popularity and geographic spread beyond their area of origin, comprehensive and reliable data on Pelung chicken population dynamics remain limited, indicating potential risks to genetic sustainability and structured development.

In recent years, Malang Raya has emerged as a promising area for Pelung chicken expansion, driven by the presence of organized enthusiast communities and increasing market interest. However, Pelung chicken rearing in this region remains largely informal and hobby-oriented, with production systems dominated by traditional management practices and limited technological adoption. Farmers primarily focus on contest participation and private collections, while agribusiness components such as systematic breeding management, value chain integration, pricing mechanisms, and institutional support remain underdeveloped. As a result, the existing Pelung chicken production system in Malang Raya has not yet evolved into a sustainable, competitive agribusiness model, limiting its economic contribution and long-term viability.

From an agribusiness perspective, sustainable livestock development requires the integration of upstream inputs, on-farm production, post-harvest handling, marketing, and institutional support within a coherent system. Community-based agribusiness approaches have been widely promoted as effective strategies for empowering smallholders, strengthening local institutions, and enhancing value creation through collective action (Iyai *et al*., 2020). In the context of Pelung chicken farming, community actors particularly breeder associations and contest-oriented farmer groups play a central role not only in production but also in maintaining genetic quality, market credibility, and cultural identity. However, without a clearly articulated development strategy, these community-driven initiatives risk stagnation and fragmentation, especially in the face of market uncertainty, limited policy support, and emerging risks such as price inconsistency and breeding fraud.

To date, most empirical studies on Pelung chickens have focused on phenotypic characteristics, vocal performance, or cultural aspects, while strategic analyses of Pelung chicken agribusiness systems particularly outside the breed's region of origin remain scarce. Specifically, there is a lack of integrative research that systematically evaluates internal strengths and weaknesses alongside external opportunities and threats to formulate evidence-based development strategies for Pelung chicken agribusiness at the regional level. This gap limits the ability of stakeholders to design informed policies, prioritize interventions, and ensure the sustainability of Pelung chicken farming systems.

Therefore, this study aims to formulate a comprehensive development strategy for the Pelung chicken agribusiness system in Malang Raya using a structured strategic management framework. By integrating internal and external factor analysis with strategic prioritization tools, this research seeks to provide a robust foundation for strengthening competitiveness, enhancing institutional collaboration among farmers, academics, government, and market actors, and promoting the sustainable utilization and conservation of Pelung chicken genetic resources. Beyond increasing production, the proposed strategy is expected to support long-term economic resilience, social cohesion, and genetic preservation within local poultry farming systems.

MATERIALS AND METHODS

Material

This research was conducted from August to September 2025 in Malang Raya (encompassing Malang Regency, Malang City, and Batu City), East Java, Indonesia. These locations were selected purposively due to their high concentration of Pelung chicken farmers relative to other districts in East Java. The data used in this study were primary and secondary data. Primary data were collected from interviews and observations, while secondary data were collected from scientific publications and government websites. Determination of respondents were snowball sampling and purposive sampling. Snowball sampling was conducted by interviewing an initial respondent and then identifying new respondents based on referrals from previous participants. It was done continuously until it met the same recommendations given with previously respondents. Purposive sampling was used to determine the respondents for weighting of internal and external factors.

Methods

The data were analyzed using the Internal Factor Evaluation (IFE), External Factor Evaluation (EFE),

SWOT Analysis, and the Quantitative Strategic Planning Matrix (QSPM). Internal factor evaluation consisted of strengths and weaknesses, while external factor evaluation consisted of opportunities and threats.

The IFE and EFE matrices were developed through a two-stage analytical process, consisting of expert-based weighting to determine the relative importance of strategic factors and respondent-based rating to assess actual field conditions. The identification of internal and external factors was based on field observations, interviews, and a review of relevant literature, supported by data collected through a structured questionnaire covering four agribusiness subsystems (input, production process, supporting services, and output/marketing).

Factor weights were independently assessed by three experts in Pelung chicken agribusiness, consisting of an experienced farmer, the chairman of the Malang Raya Pelung Chicken Lovers Community (KPPM), and an academic expert in livestock agribusiness. The expert-based weighting process was conducted using a structured importance assessment questionnaire, in which each expert evaluated the importance of every internal and external factor using a five-point Likert scale, ranging from 1 (very unimportant) to 5 (very important). Scores assigned by the experts were averaged to obtain a mean importance value for each factor, which was then normalized and converted into proportional weights ranging from 0.00 to 1.00, ensuring that the total weight for each matrix (IFE and EFE) summed to 1.00. Expert assessments were conducted independently, and potential differences in scoring were addressed by averaging expert judgments rather than forcing full consensus. Given the small number of experts and the strategic, exploratory nature of the IFE–EFE framework, formal inter-rater reliability statistics (e.g., Cohen's Kappa) were not applied.

Factor ratings were derived exclusively from farmer respondents. Although the questionnaire included a combination of categorical, multiple-choice, and open-ended questions across agribusiness subsystems, responses were systematically transformed into numerical ratings for the IFE and EFE analyses. Each internal and external factor was operationalized into a four-point evaluation scale, where 1 represented a very weak or unfavorable condition and 4 represented a very strong or favorable condition. The mean rating for each factor was calculated from the standardized scores of all respondents.

The weighted score for each factor was calculated by multiplying its assigned weight by the corresponding mean rating. The total IFE and EFE scores were obtained by summing all weighted scores. The total IFE score was plotted on the horizontal axis, while the total EFE score was plotted on the vertical axis of the Internal–External (IE) matrix to determine the strategic position of the agribusiness system. The IE matrix was divided into three strategic zones: growth-oriented strategies ("grow and build") in cells I, II, and IV; stability-oriented strategies ("hold and maintain") in cells III, V, and VII; and divestment-oriented strategies ("harvest or divest") in cells VI, VIII, and IX. The IE matrix is presented at Figure 1.

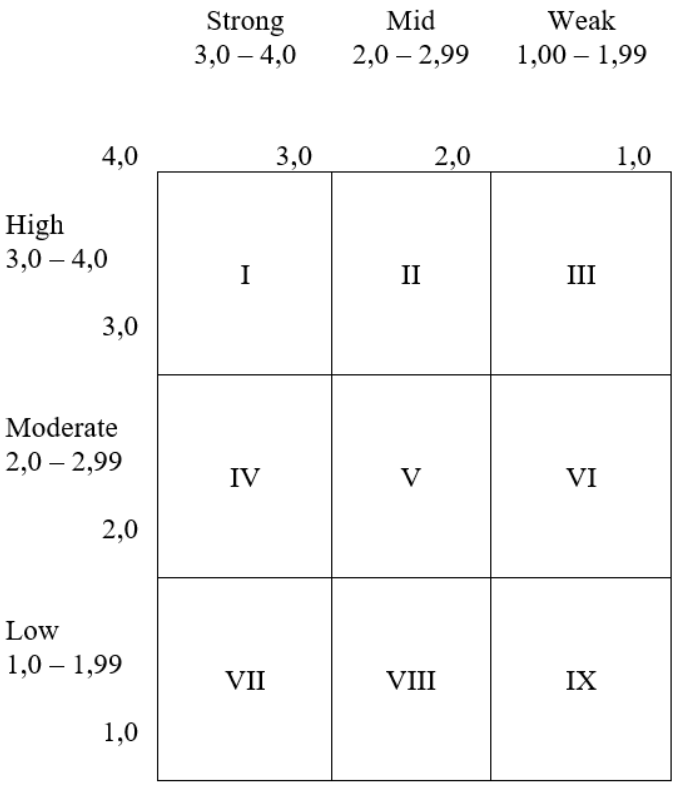

Figure 1: Internal and external matrix.

SWOT analysis (Strengths, Weaknesses, Opportunities, and Threats) was used as a strategic planning tool to formulate alternative development strategies by systematically matching internal strengths and weaknesses with external opportunities and threats. This analysis resulted in four types of strategic alternatives: Strength–Opportunity (SO), Weakness–Opportunity (WO), Strength–Threat (ST), and Weakness–Threat (WT) strategies.

The Quantitative Strategic Planning Matrix (QSPM) was employed as the final stage of strategic analysis to prioritize alternative strategies generated from the SWOT matrix. The Attractiveness Scores (AS) in the QSPM were assigned by the researchers following the standard QSPM procedure proposed by David (2011). Each alternative strategy was evaluated comparatively against the internal and external strategic factors identified in the IFE and EFE matrices.

AS values ranged from 1 (not attractive) to 4 (very attractive) and were determined based on explicit criteria,

including feasibility of implementation, expected impact on agribusiness performance, and consistency with existing resources and environmental conditions. The scoring process followed a structured comparative assessment across strategies and was grounded in empirical findings from field observations, questionnaire results, and relevant literature to reduce subjectivity.

The Total Attractiveness Score (TAS) for each strategy was calculated by summing the products of factor weights and their corresponding AS values. Strategies with higher TAS values were considered higher priorities for development. The complete QSPM calculation matrix, including factor weights and AS assignments, is provided as supplementary material to enhance transparency and replicability.

A conceptual research framework illustrating the analytical workflow of this study is presented in Figure 2 to improve methodological transparency. The framework outlines the sequential integration of data collection, identification of internal and external factors, evaluation using the IFE and EFE matrices, strategic positioning through the IE matrix, formulation of alternative strategies using SWOT analysis, and prioritization of development strategies using the QSPM.

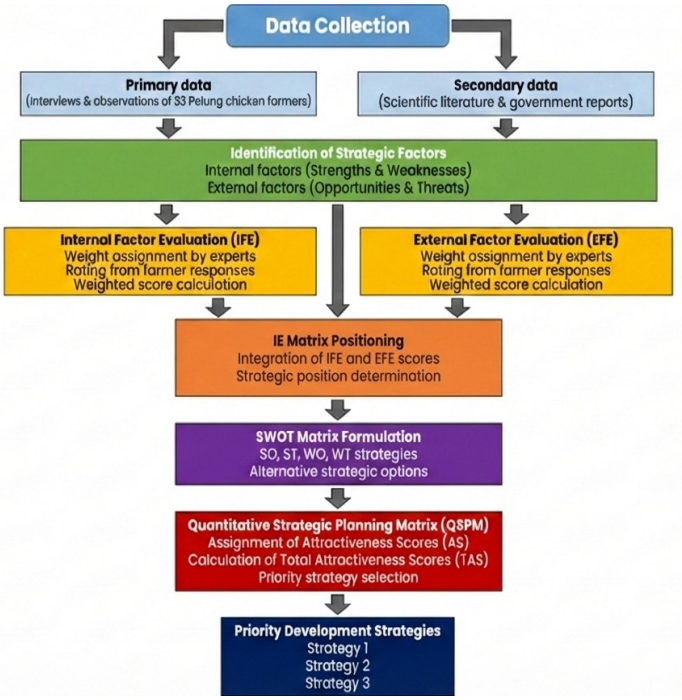

Figure 2: Internal and external matrix.

RESULT AND DISCUSSION

Respondent characteristics

The respondents in this study were 33 Pelung chicken farmers across Malang Raya, with ages ranging from 17–30 years at 27.3%, 31–45 years at 39.4%, and 46–64 at 33.3%, all were male (100%). Respondents' education levels varied: Elementary school graduates (18.2%), junior high school graduates (21.2%), high school graduates (27.3%), and college graduates (27.3%). All respondents are members of the Malang Raya Pelung Chicken Lovers Community (KPPM). All Pelung chicken farmers are members of the KPPM community. This community provides a regular monthly meeting program with events in the form of training so that Pelung chickens have a strong mentality when participating in a Pelung chicken contest. Some chickens in the contest were found unable to crow because they were not used to crowing around other Pelung chickens.

General description of the Pelung Chicken Agribusiness System in Malang Raya

Input subsytem

The majority of Pelung chicken farmers in Malang Raya obtained chickens from local traders, from fellow KPPM members, and from farmers who come from Cianjur Regency, the area where Pelung chickens originate. Most farmers chose breeds from fellow KPPM members because they believed that by buying breeds from fellow KPPM members they could find out the pedigree of their offspring. Farmers tried to get Pelung chickens with good voices by buying offspring from Pelung chickens that had won contests. By raising offspring of Pelung chickens with good voices, farmers could generate higher profits when selling them because the majority of the chickens they raised sound like their parents. Pelung chicken farmers felt that the existence of KPPM was very helpful in providing Pelung chicken breeds. Many farmers avoided buying breeds online because the breeds sent sometimes did not match the video of the condition of the breeds shown by the seller.

Feeding during rearing involved a combination of factory feed and local feed with the distribution pattern adjusted based on the chicken's growth phase. In the Day Old Chick (DOC) phase up to two months of age, the feed given came entirely from factory feed to support optimal early growth. Entering the age of two to four months, farmers began to mix manufactured feed and local feed such as rice bran, corn, a mixture of rice bran and boiled corn, as well as additional feed in the form of vegetables and fruit which farmers believe enhances vocal quality of Pelung chickens before the contest period, especially for male Pelung chickens. The study conducted by Kafle *et al.* (2024) revealed that a mixture of local feed (corn and rice bran) with factory feed produced final body weight, weight gain and feed conversion ratio (FCR) that were equivalent or better than pure factory feed, as well as significantly reducing production costs.

Farmers reported that procuring medicines and cage equipment was straightforward, citing affordable prices

and reliable availability. Farmers could use natural materials such as bamboo and wood to make cages and feed areas. The results of these findings could be interpreted that the supporting facilities for Pelung chicken farming in Malang Raya were quite well available.

Production process subsystem

The process of cultivating Pelung chickens generally used three methods, namely intensive, semi-intensive and extensive. The method commonly used by Pelung chicken farmers was semi-intensive, where chickens were kept in cages but are still given the opportunity to do activities outside the cage at certain times (Manyelo *et al*., 2020). This rearing method was considered effective in maintaining the chickens' physical condition, reducing susceptibility to paralysis and stress, while also facilitating farmer monitoring, management, and cage maintenance.

The main products produced by farmers were adult roosters prepared for contests, broodstock for breeding, and day old chicks (DOC) as a result of hatching. Roosters for contests are products with the highest economic value because their selling value is influenced by how good and long the crowing sound they produce.

Most farmers had implemented sustainable practices in their production processes. Farmers collected chicken manure and sun-dried it, then used them as natural fertilizer for plants around the farm. Some farmers were also trying to implement genetic conservation to maintain the purity of the Pelung chicken breed so that it did not mix with other chicken breeds. This effort was carried out through separating cages, mating arrangements, and selecting broodstock from pure Pelung chicken lineages. Farmers exchanged superior males and farmers who were believed to be pure breeds with fellow community members to produce superior breeds with pure breeds. Farmers' efforts to produce superior breeds are the same as the study conducted by Restoux *et al.* (2022) that farmers often exchanged chickens between families or communities to maintain genetic diversity and reduced the risk of inbreeding. This practice is also supported by community or government programs that encouraged population increases and the preservation of as many family lines as possible.

Production technology had been used by farmers, although it was still simple. The technology used in the production process was a simple egg incubator machine that was assembled by themselves or fellow members of the Pelung chicken community. However, not all farmers used this technology. Farmers who did not use egg incubators chose to use natural incubating by the hens. They prefered to maintain the mother's maternal instincts. The advantage of using egg incubator technology was that it allowed hatching of eggs on a larger scale without depending on the mother hen (Tanjungsari *et al*., 2023) but it diminished the hens' maternal instincts (Edgar *et al*., 2016).

Supporting services subsystem

Supporting services in livestock businesses were generally in the form of capital, institutions and technical assistance. Pelung chicken farmers never used capital support services because they considered that the Pelung chicken farming currently being run was small scale and did not require capital assistance. Farmers used personal capital obtained from the sale of livestock or from their own savings (Umeh and Odo, 2021).

Institutional activities among Pelung chicken farmers in Malang Raya were quite active through regular meetings held once a month by KPPM. This meeting was a means of sharing information and experience between farmers regarding chicken rearing techniques, feed management, voice training, as well as discussing contest agendas and other community activities. Through this activity, farmers reported positive interaction and cooperation, both in terms of exchanging information and increasing knowledge about Pelung chickens.

The most recent government-supported service activity occurred in 2017 and 2018, namely through holding a Pelung chicken contest at the Kanjuruhan Stadium which was held to commemorate the anniversary of Malang Regency. Apart from that, the Pelung chicken contest also was held again in 2024 at the Islamic University of Malang (UNISMA) involving academics and the community as a form of collaboration in preserving the Pelung chicken.

Output subsystem

Pelung chickens were marketed directly without going through intermediaries. Transactions were carried out face to face at the farm location, during Pelung chicken contest activities, or based on recommendations from community members. This marketing pattern was considered to provide greater profits and guarantee trust between sellers and buyers (Peelen *et al*., 1989). Buyers could directly assess the chicken's physical condition, body posture and voice quality before making a transaction. Personal relationships and farmer reputation were important factors in maintaining sales credibility, because most Pelung chicken transactions were based on trust between farmers or between sellers and buyers who already knew each other. Some farmers also sell through community networks such as the Malang Raya Pelung Chicken Lovers Community (KPPM), where members shared information regarding the availability of chickens, selling prices and the quality of superior breeds when farmers wanted to sell.

The Pelung chicken market segmentation in Malang Raya was divided into several groups, namely collectors, contest participants and hobbyists. Collectors generally looked for chickens with long, melodious and distinctive rhythmic sounds to collect or enter into large-scale contests. Contest participants usually bought roosters that still had vocal potential for further training, while hobbyists bought Pelung chickens because they were attracted to their aesthetic value and distinctive vocal characteristics.

Determining the price of Pelung chickens did not have a standard and was very dependent on sound quality, bloodline, physical condition, and previous contest achievements. Champion Pelung chickens could be of high value and sell for tens of millions of rupiah, while chickens without achievements were usually sold at lower prices. Champion Pelung chickens were sold for 10–25 million rupiah (based on rangking), but the others were sold for 400-600 thousand rupiah. Price negotiation typically occurred directly between the farmer and the buyer, taking into account the uniqueness and sound potential of the chicken in question.

Internal and external matrix

Internal factor evaluation (IFE)

Identification of internal factors was the initial stage of Internal Factor Evaluation (IFE) analysis which aims to assess the strengths and weaknesses of the farm (David, 2011). This process was carried out by identifying various internal aspects such as the availability of breeds, feed, cultivation, technology and marketing. Each factor identified was then given a rating on a scale of 1-4 based on the extent to which the factor influenced strengths and weaknesses. The weighting of internal factors was based on the results of interviews with experts. The weight value was then combined with the determination of the rating obtained from the average of the assessment results. This stage of weighting and rating was used to assess how much influence each factor has on the Pelung chicken farming agribusiness system in Malang Raya. The complete calculation of the weight values for internal factors was shown in Table 1.

The total IFE score for the Pelung chicken farming agribusiness system in Malang Raya was 2.64. This score indicates that internal strengths generally support the system so that existing strengths need to be increased to get better results. The three main strengths that can be maximized are the existence of sustainable genetic conservation practices (weighted score = 0.40), the existence of sustainable organic feeding practices (weighted score = 0.32), and the existence of clear marketing channels (weighted score = 0.28).

Table 1: Interval facator evaluation (IFE).

Code	Internal factors	Respondents assessment distribution (standardized to a 1–4 scale)				Mean score (used as rating)	Weighting	Rating × Weighting
		1	2	3	4			
	Strengths							
S1	Availability of Pelung chicken breeds from own production (reducing dependence on imports).	0	29	4	0	2.12	0.07	0.15
S2	Some farmers already use combination feed (local + factory).	7	1	0	25	3.30	0.08	0.26
S3	The existence of sustainable practices in providing organic feed	0	0	0	33	4	0.08	0.32
S4	The existence of sustainable waste processing practices	12	0	18	3	2.36	0.07	0.16
S5	The existence of sustainable genetic conservation practices	0	0	0	33	4	0.10	0.40
S6	Use of production technology (hatching machines, vaccination, feed fermentation).	15	13	5	0	1.70	0.10	0.17
S7	Clear marketing channels	2	6	5	20	3.30	0.09	0.28
S8	Rearing uses traditional/semi intensive.	13	0	20	0	2.21	0.10	0.22
S9	The existing human resources are experienced	2	2	8	21	3.45	0.07	0.23
S10	Marketing channels using technology	7	0	26	0	2.58	0.10	0.26
	Sub total						0.85	2.44
	Weakness							
W1	Pricing strategy is not yet consistent.	0	33	0	0	2	0.05	0.11
W2	Access to funding/banking has not been utilized.	33	0	0	0	1	0.10	0.10
	Sub Total						0.15	0.20
	Total						1.00	2.64

Note: Respondents' assessments were transformed into standardized scores ranging from 1 (very weak) to 4 (very strong). The mean score for each factor was calculated from these standardized values and directly used as the rating in the IFE matrix before being multiplied by the assigned weight.

Table 2: External factor evaluation (EFE)

Code	External factors	Respondents' assessment distribution (standardized to a 1–4 scale)				Mean score (used as rating)	Weighting	Rating × Weighting
		1	2	3	4			
	Opportunities							
O1	Academic support	0	0	33	0	3	0.05	0.14
O2	Market prospects for the next 5 years	3	3	0	27	3.55	0.07	0.25
O3	Development of digital technology in obtaining superior breeds	18	0	15	0	1.91	0.07	0.14
O4	Use of social media to connect with stakeholders	0	1	30	2	3.03	0.08	0.24
O5	Utilization of online learning platforms to increase knowledge in maintenance	15	0	18	0	2.09	0.05	0.10
O6	Pelung chicken hobby trends and contests as a social strata culture	0	33	0	0	2	0.07	0.14
O7	Availability of feed in the future	0	0	3	33	3.91	0.08	0.31
O8	Availability of medicines in the future	0	0	0	33	4	0.08	0.32
O9	Availability of breeds in the future	4	6	23	0	2.58	0.07	0.19
O10	Extension/training support	0	33	0	0	2	0.05	0.11
O11	There is a special market: collectors, contests, pelung chicken hobbyists	0	14	13	6	2.76	0.07	0.19
O12	There are no other chicken competitors whose voices are exploited	0	0	33	0	3	0.07	0.21
O13	Availability of livestock production facilities in the future	0	0	0	33	4	0.08	0.32
	Sub Total						0.90	2.66
	Threats							
T1	Declining government support	0	0	0	33	4	0.05	0.19
T2	Fraud in purchasing Pelung chicken breeds	31	2	0	0	1.06	0.02	0.02
	Sub Total						0.06	0.21
	Total						1.00	2.87

Note: Respondents' assessments were transformed into standardized scores ranging from 1 (very weak) to 4 (very strong). The mean score for each factor was calculated from these standardized values and directly used as the rating in the EFE matrix before being multiplied by the assigned weight.

External factor evaluation (EFE)

Identification of external factors in the External Factor Evaluation (EFE) analysis aims to assess various opportunities and threats that can influence the Pelung chicken farming agribusiness system (David, 2011). This analysis was carried out by identifying various external aspects such as institutional support, availability of production input, technological developments. Each factor identified is then given a rating on a scale of 1-4 based on the extent to which the factor influences opportunities and threats. The weighting of external factors is based on the results of interviews with experts. The weight value is then combined with the determination of the rating obtained from the average of the assessment results. This stage of weighting and rating is used to assess how much influence each factor has on the condition being analyzed. The complete calculation of the weight values for internal factors is shown in Table 2.

The total EFE score for the Pelung chicken farming agribusiness system in Malang Raya is 2.87. This score shows that overall opportunities support this agribusiness system, so existing opportunities need to be maximized to get better results. The three main opportunities that can be maximized are the availability of production inputs in the future (weighted score = 0.32), the availability of medicines in the future (weighted score = 0.32), and the availability of feed in the future (weighted score = 0.31).

The IE Matrix is a tool for determining a company's position based on internal and external factors. Based on the internal factor scores and external factor scores above, the position of the Pelung chicken farming agribusiness in Malang Raya can be seen in Figure 3. The scores for the internal factors and external factors of the Pelung chicken farming agribusiness system in Malang Raya are 2.64 and 2.87 respectively. The internal factor score is depicted on the X axis and the external factor score is depicted on the Y axis, so that both bring the Pelung chicken farming agribusiness in Malang Raya to quadrant 5 which is in the hold and maintain strategy position. Pelung chicken farmers can maintain their current position to ensure consistency and stability.

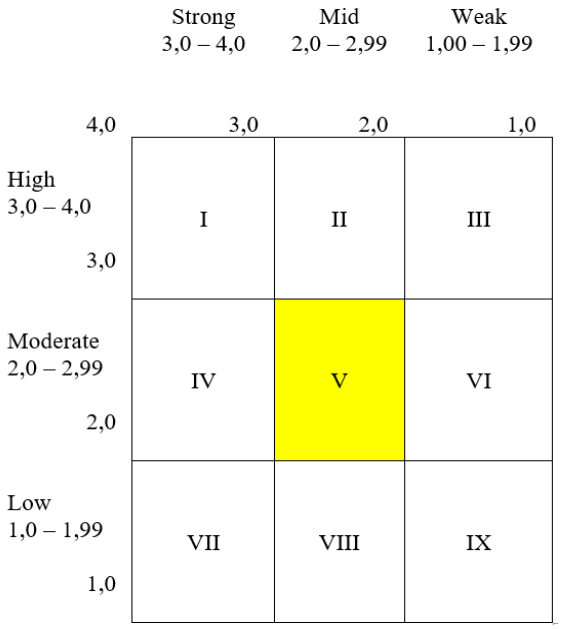

Figure 3: Positioning of the Pelung chicken agribusiness system in Malang Raya on the IE Matrix based on calculated IFE (2.64) and EFE (2.87) scores.

The positioning of the Pelung chicken agribusiness system in Malang Raya in the "hold and maintain" category indicates that the internal and external conditions of the system are relatively stable. This position shows that the current agribusiness system can be maintained and still requires improvement in several aspects to achieve better performance. The "hold and maintain" position does not indicate stagnation but reflects the need for strengthening and gradual improvement without major or fundamental changes.

The Pelung chicken agribusiness system in Malang Raya still faces several constraints under these conditions. Limited institutional support, differences in farmers' capacity to adopt and apply innovations, and strong dependence on the role of farmer communities are among the main challenges. These conditions need to be considered when interpreting the IE Matrix results so that the identified position can serve as a basis for determining development directions that are consistent with actual field conditions.

SWOT ANALYSIS

SWOT analysis is used to formulate a strategy for developing an agribusiness system for Pelung chicken farming in Malang Raya by combining internal and external factors. The strategies formulated are mapped using the SWOT matrix in Table 3. In this table four types of strategies are formulated, namely strategies that combine strength and opportunity (SO), strength and threat (ST), weakness and opportunity (WO), and weakness and threat (WT). Based on Table 3, 13 strategies have been formulated to develop the Pelung chicken agribusiness system in Malang Raya.

Table 3: Strategy formulation based on a combination of strength and opportunity (SO), strength and threat (ST), weakness and opportunity (WO).

Code	Strategy Formulations
Strength – Opportunity (SO)	
SO-1	Optimization of local breeds with the support of academics and digital technology to produce superior breeds.
SO-2	Expansion of marketing through social media and technology to reach niche markets.
SO-3	Utilization of human resources experience and pelung chicken contests to increase sales value.
SO-4	Strengthening organic practices and waste processing is in line with healthy and sustainable market trends.
Strength – Threat (ST)	
ST-1	Strengthening pelung chicken branding through contests and social media to reduce the impact of minimal government support.
ST-2	Utilization of experienced human resources and production technology to maintain breed quality and prevent fraud.
ST-3	Strengthening genetic conservation to maintain competitiveness despite reduced government support.
Weakness – Opportunity (WO)	
WO-1	Utilization of online learning platforms and outreach to improve price management.
WO-2	Academic support and training to improve financial strategies and utilize access to funding.
WO-3	Development of custom market trend-based pricing strategies (collectors, contests, hobbyists)
Weakness – Threat (WT)	
WT-1	Optimizing the role of the pelung chicken farmer community as a collective forum to strengthen their bargaining position, facilitate access to funding, and become a means of protection against fraudulent breed practices.
WT-2	Develop price standards based on the quality of superior breeds through community agreements, so that pricing is more consistent even if there is a decrease in support from the government.
WT-3	Increasing collaboration between the community, academics and related stakeholders to encourage the establishment of a breed certification or verification system, so that the credibility and quality of pelung chicken breeds is more guaranteed.

The first SO strategy (SO-1) is to use the internal strengths of the Pelung chicken agribusiness system by maximizing external opportunities. The first strategy is optimizing local breeds with the support of academics and digital technology to produce superior breeds. Academics could participate in the KPPM's monthly meetings to share knowledge on broodstock management for producing superior offspring. So far, the implementation of recording had not been carried out by Pelung chicken farmers. Pelung chicken farmers had a collaborative network with fellow KPPM members to procure breeds. They borrowed superior males and females from each other in order to have superior breeds. Unfortunately, this method was not accompanied by proper recording so the truth about the superiority of the breeds cannot be validated.

Academic involvement in Malang Raya is considered feasible due to the presence of several universities with programs in agriculture and animal science that regularly carry out community service activities through extension programs, student fieldwork, and applied research. Interaction between academics and farmer communities has taken place through training activities, field demonstrations, and community-based research, indicating institutional capacity and willingness to engage at the farmer level. Academic support can be implemented through technical assistance during community meetings, on-farm trials related to breeding management, and the use of simple digital recording systems to support broodstock selection and genetic documentation.

The second SO strategy (SO-2) is expanding marketing through social media with technology to reach special markets. This strategy combines strengths in forming marketing channels with opportunities in the form of developments in digital technology in the form of social media. Marketing, which is currently not maximizing social media, can be strengthened so that it can reach a wider market. Farmers may use more than one type of social media. Farmers who only use Facebook and WhatsApp can expand their marketing by using Instagram and TikTok.

The third SO strategy (SO-3) is the use of human resources experience and Pelung chicken contests to increase sales value. The Chairman of KPPM Malang Raya has experience judging Pelung chicken contests with one other member. They were often contacted by farmers when farmer chickens that have good voices were to be purchased. The farmer asked them the price. Until now there is no definite price standard regarding the selling price based on votes. Establishing prices based on vocal quality could increase sales of Pelung chicken.

The fourth SO strategy (SO-4) is strengthening organic practices and waste processing in line with healthy and sustainable market trends. This strategy combines strength factors in implementing sustainability practices in the form of providing organic feed, waste processing, and genetic conservation efforts with opportunity factors in the form of market prospects for the next 5 years, hobby trends and Pelung chicken contests as social culture, academic support and counseling, as well as developments in digital technology and social media.

The first ST strategy (ST-1) is to strengthen Pelung chicken branding through contests and social media to mitigate the impact of limited government support. This strategy combines internal factors, namely Pelung chicken farmers have experienced resources, clear marketing channels and have utilized digital technology, the existence of sustainable practices with external factors in the form of decreasing government support.

The second ST strategy (ST-2) is the use of experienced human resources and production technology to maintain breed quality and prevent fraud. This strategy combines internal factors in the form of experienced human resources and the use of production technology with external factors in the form of the threat of fraud when buying chicken breeds. The involvement of academics supports this strategy through capacity-building activities, technical guidance, and verification support related to breeding practices and production processes. Collaboration can be conducted through periodic mentoring, joint field evaluations, and assistance in applying simple digital systems to improve transparency and traceability, thereby reducing the risk of fraud at the farmer level.

The third ST strategy (ST-3) is strengthening genetic conservation to maintain competitiveness even though government support is reduced. This strategy combines internal factors in the form of sustainable genetic conservation practices and the availability of Pelung chicken breeds from own production with external factors in the form of decreasing government support.

The first WO strategy (WO-1) is the use of online learning platforms and outreach to improve price management. This strategy is combined from internal factors of weakness in the form of inconsistent pricing strategies with external factors of opportunities in the form of the use of online learning platforms to increase knowledge in maintenance, support for counseling or training from academics and related agencies, as well as developments in digital technology to support access to information and markets.

The second WO strategy (WO-2) is academic support and training to improve financial strategies and utilize access

to funding. This strategy combines internal factors in the form of weaknesses in accessing funding and pricing with external factors in the form of opportunities for academic support, counseling or training support and developments in digital technology and online learning platforms.

The third WO strategy (WO-3) is the developing a pricing strategy based on niche market trends. This strategy is a combination of internal factors of weakness in the form of inconsistent pricing strategies and access to funding that remains underutilized with external factors of opportunities in the existence of special markets, trends in Pelung chicken hobbies and contests as a culture and social strata, and bright prospects for the next five years.

The first WT strategy (WT-1) is optimizing the role of the Pelung chicken farmer community as a collective forum to strengthen their bargaining position, facilitate access to funding, and become a means of protection against fraudulent breed practices. The second WT strategy (WT-2) is to develop price standards based on the quality of superior breeds through community agreements, so that pricing is more consistent despite a decrease in support from the government.

The third WT strategy (WT-3) is to increase collaboration between the community and academics and related stakeholders to encourage the establishment of a breed certification or verification system, so that the credibility and quality of Pelung chicken breeds is more guaranteed. These three strategies are combined from internal factors of weakness in the form of access to funding that remains underutilized and pricing strategies that have not been consistent with external factors in the form of the threat of decreasing government support and the occurrence of fraud when buying Pelung chicken breeds.

Limited government support represents a major institutional constraint for the long-term sustainability of the Pelung chicken agribusiness system. The strategies proposed in this study should not be interpreted as substitutes for government policy or financial support. The strategies reflect adaptive and community-based responses to current conditions in which institutional support remains limited.

Branding activities, community organization, and market-based approaches can help farmers reduce vulnerability and maintain system performance in the short to medium term. Long-term development still requires stronger government involvement, particularly in regulation, certification, access to finance, and extension services. The strategies proposed in this study aim to strengthen local capacity and resilience while building a foundation for future policy support and continued government involvement.

Quantitative strategic planning matrix (QSPM)

The QSPM was used to identify the most suitable strategy in developing an agribusiness system for Pelung chicken farming in Malang Raya. QSPM is used as a tool by strategy experts to determine the best strategy among various strategies that have been formulated based on internal and external factors. The selection of strategies is based on feasibility, relevance and potential application so that the selected recommendations are practical and can be implemented.

Based on the QSPM in Table 4, there are three prioritized strategies, namely (1) Optimizing local breeds with the support of academics and digital technology to produce superior breeds; (2) Utilization of experienced human resources and production technology to maintain breed quality and prevent fraud; (3) Development of specific market trend-based pricing strategies (collectors, contests, hobbyists). These three strategies were chosen because they have the highest TAS scores in terms of feasibility and impact, directly addressing weaknesses and threats while maximizing strengths and opportunities.

The first prioritized strategy is optimizing local breeding supported by academic collaboration and digital technology to produce superior Pelung chicken breeds (TAS= 3.26). This strategy obtained the highest total attractiveness score because it effectively utilizes existing strengths in local breeding capacity and genetic management among Pelung chicken farmers. Farmers in Malang Raya typically manage breeding independently through both natural and artificial hatching methods. Most rely on natural mating, while a few have adopted artificial insemination (AI). These practices indicate that farmers have maintained sustainable genetic conservation by selecting parent stock based on phenotypic quality and avoiding crossbreeding with other chicken types, which could compromise the characteristic crowing sound of Pelung chickens.

Academic involvement in this strategy is crucial for advancing genetic research and ensuring that breeding practices align with the Decree of the Minister of Agriculture No. 2918/Kpts/OT.140/6/2011, which sets the official phenotypic and performance standards for Pelung chickens. Academics can also facilitate the adoption of digital technologies for data recording, breeding management, and artificial insemination to enhance reproductive efficiency and genetic improvement. A study by Wang *et al.* (2024) demonstrated that artificial insemination enables one male to fertilize multiple females, thereby accelerating genetic progress and improving breeding productivity.

Table 4: Quantitative strategy planning matrix (QSPM).

Code	Strategy	TAS	Strategy Prioritization
SO-1	Optimization of local breeds with the support of academics and digital technology to produce superior breeds.	3.26	1
SO-2	Expansion of marketing through social media and technology to reach niche markets.	2.76	9
SO-3	Utilization of human resources experience and pelung chicken contests to increase sales value.	2.71	10
SO-4	Strengthening organic practices and waste processing is in line with healthy and sustainable market trends.	2.62	11
WO-1	Utilization of online learning platforms and outreach to improve price management.	2.62	12
WO-2	Academic support and training to improve financial strategies and utilize access to funding.	2.79	8
WO-3	Development of custom market trend-based pricing strategies (collectors, contests, hobbyists)	3.07	3
ST-1	Strengthening pelung chicken branding through contests and social media to reduce the impact of minimal government support.	3.05	4
ST-2	Utilization of experienced human resources and production technology to maintain breed quality and prevent fraud.	3.13	2
ST-3	Strengthening genetic conservation to maintain competitiveness despite reduced government support.	2.80	7
WT-1	Optimizing the role of the pelung chicken farmer community as a collective forum to strengthen their bargaining position, facilitate access to funding, and become a means of protection against fraudulent breed practices.	2.80	6
WT-2	Develop price standards based on the quality of superior breeds through community agreements, so that pricing is more consistent even if there is a decrease in support from the government.	2.61	13
WT-3	Increasing collaboration between the community, academics and related stakeholders to encourage the establishment of a breed certification or verification system, so that the credibility and quality of pelung chicken breeds is more guaranteed.	2.86	5

From a policy perspective, this strategy aligns with Indonesia's National Livestock Breeding Program and Smart Farming Initiative, which emphasize the integration of digital systems and research-based breeding for genetic sustainability. In terms of sustainability outcomes, optimizing local breeding ensures the long-term preservation of genetic resources (environmental sustainability), improves productivity and farmer income (economic sustainability), and strengthens cooperation among farmers, academics, and government agencies (social sustainability). Therefore, the TAS value of 3.26 not only reflects numerical superiority but also indicates that this strategy provides the most comprehensive foundation for sustainable development of the Pelung chicken agribusiness in Malang Raya.

The second prioritized strategy is utilizing experienced human resources and production technology to maintain breed quality and prevent fraud (TAS = 3.13). This strategy highlights the integration of local expertise and appropriate technology to ensure the authenticity and quality of Pelung chicken breeds. In Malang Raya, several farmers possess advanced technical capacities, such as serving as judges in Pelung chicken contests, performing artificial insemination, and developing self-designed hatching machines. Some have also incorporated traditional herbal treatments in poultry health management, demonstrating the synergy between local innovation and indigenous knowledge.

However, farmers still face challenges related to breed fraud, particularly through online sales platforms, where sellers often display videos of high-quality crowing roosters while the purchased birds fail to meet the expected sound performance. This issue causes significant economic losses, as the crowing sound remains the main determinant of the market value of Pelung chickens. Combining the experience of skilled farmers with the adoption of modern technology, such as hatching machines (Reimer *et al*., 2024), artificial insemination (Wang *et al*., 2024), and digital-based breeding record systems (Birhanu *et al*., 2022), can serve as an effective approach to safeguard genetic integrity and reduce fraudulent practices. Experienced human resources can play an essential role in field verification, farmer mentoring, and local capacity-building, while digital technologies ensure traceability, transparency, and data-based quality assurance.

This strategy aligns with national policy agendas for livestock digitalization and human resource empowerment under Youth Entrepreneurship and Employment Support Services (YESS). In terms of sustainability outcomes, the

strategy promotes economic sustainability by protecting farmers from market fraud and income loss, social sustainability through knowledge transfer and peer learning, and institutional sustainability by enhancing community trust and accountability in the Pelung chicken breeding network. Therefore, the TAS score of 3.13 demonstrates that strengthening human capital and digital transparency provides a practical pathway toward a more resilient and competitive Pelung chicken agribusiness system.

The third prioritized strategy is developing a pricing system based on specific market trends, particularly those related to collectors, hobbyists, and contest participants. This strategy aims to establish a market-oriented pricing mechanism that reflects the quality and uniqueness of Pelung chickens beyond mere production aspects. The target market segment possesses relatively high purchasing power and evaluates Pelung chickens according to their vocal quality, physical appearance, and contest performance, rather than production traits such as growth rate or feed efficiency. Consequently, this strategy has the potential to enhance the economic value of Pelung chickens through a pricing mechanism that captures their intangible and cultural value (Robinson and Lakhani, 1975).

Standardized pricing criteria have not been established in Malang Raya. Each farmer applies their own subjective price benchmark, leading to significant price variation and weak bargaining positions in the market. When uncertain about pricing, some farmers rely on informal consultations with peers to determine a "fair" value. This situation indicates the absence of a unified price structure and limited knowledge of market dynamics, resulting in inconsistent profits and under-optimized market potential.

The development of a pricing system based on market trends and product quality is essential. Such Farmers should determine selling prices using objective performance indicators**,** including vocal quality, phenotype, and contest achievements, which are validated through transparent scoring criteria or formal certification procedures. This initiative should be supported by collaboration among academics, and farmer community through joint forums aimed at designing standardized quality and pricing guidelines, as well as conducting market management training and digital marketing initiatives for farmers.

This strategy supports government initiatives under the Village Creative Economy and Agrotourism Development Program (Program Pengembangan Ekonomi Kreatif dan Agrowisata Desa) which emphasize value addition and creative branding for local products. In terms of sustainability outcomes, this strategy enhances economic sustainability by strengthening farmers' market competitiveness and income stability, social sustainability through participatory pricing and collective standard-setting, and institutional sustainability by fostering transparency and trust among stakeholders. Therefore, this strategy effectively addresses internal weaknesses in price inconsistency while exploiting external opportunities in high-value niche markets to promote a more transparent, competitive, and sustainable Pelung chicken agribusiness.

The priority strategies identified through the QSPM appear proactive in nature. These strategies are not intended to drive rapid expansion or major structural change. The focus of the strategies is on strengthening and optimizing existing practices within the current capacity of the agribusiness system. The IE matrix reflects the current strategic position of the Pelung chicken agribusiness system in Malang Raya. The prioritized strategies represent gradual improvement efforts aimed at improving performance and addressing existing weaknesses. These efforts may gradually improve the strategic position of the agribusiness system in the long term, while remaining consistent with the "hold and maintain" classification identified through the IE matrix.

CONCLUSION

This research shows that the Pelung chicken agribusiness system in Malang Raya has significant potential for sustainable development through synergies between the internal strengths of farmers and the external opportunities available. Based on the results of the IFE and EFE analysis, the respective scores of 2.64 and 2.87 place the Pelung chicken agribusiness in a 'hold and maintain' strategic position, which means that this system is in a strong enough condition to be maintained and improved. The main strengths lie in sustainable practices such as genetic conservation, organic feeding and established marketing channels, while the main opportunities come from academic support, developments in digital technology and the growing prospects of niche markets. However, weaknesses such as pricing inconsistencies and underutilized access to funding are still obstacles that need to be overcome so that Pelung chicken agribusiness can transform into a more productive economic sector.

Based on the results of the QSPM analysis, three priority strategies to strengthen sustainability are to strengthen the sustainability of Pelung chicken agribusiness in Malang Raya are: (1) optimizing local breeds with the support of academics and digital technology to produce superior breeds, (2) utilizing experienced human resources and production technology to maintain breed quality and prevent fraud, and (3) developing price strategies based on special market trends such as collectors, contests and hobbyists. These three strategies are considered the most relevant because they directly address weaknesses and threats, while maximizing existing strengths and

opportunities. Implementation of this strategy requires active collaboration between the farmer community, academics, government and hobbyist associations to build an integrated, competitive, and sustainable Pelung chicken agribusiness system oriented toward economic sustainability and preserving the germplasm of local Indonesian poultry.

Future research should focus on strengthening the sustainability framework of Pelung chicken farming enterprises. This includes evaluating the economic resilience of farmers under different market conditions, the effectiveness of institutional collaborations among farmer groups, government, and academics, and the social impacts of community-based breeding and marketing models. Further studies could also investigate environmental sustainability aspects such as resource efficiency, waste management, and animal welfare within small-scale Pelung chicken production systems. In addition, research integrating digital technologies for traceability, breeding management, and market access would be valuable to support sustainable business transformation while maintaining the genetic integrity and cultural heritage of Pelung chickens.

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NOVELTY STATEMENT

This study provides the first integrative strategic assessment of the Pelung chicken agribusiness system in a non-origin region (Malang Raya), combining genetic resource conservation with agribusiness development using an IFE–EFE–SWOT–QSPM framework. Unlike previous studies that focus primarily on phenotypic traits, vocal performance, or cultural aspects of Pelung chickens, this research systematically translates local genetic and cultural uniqueness into actionable, prioritized agribusiness strategies. The findings offer an evidence-based pathway for transforming hobby-oriented Pelung chicken farming into a sustainable, competitive, and institutionally supported agribusiness system.

AUTHOR'S CONTRIBUTION

Ahmad Ridwan: The data curation, methodology, visualization, formal analysis, and writing. Nevy Zephira Putri Luni: The conceptualization, methodology, investigation, data curation, and formal analysis. Siti Azizah: The conceptualization, methodology, supervision, formal analysis and validation. Anif Mukaromah Wati: The conceptualization and project administration. Achadiah Rachmawati and Irfan H. Djunaidi: The project administration. Aulia Rahayu Putri: The review and editing.

Ethical consideration

Ethical issues including plagiarism, consent to publish, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancy have been checked by all the authors.

Generative AI and AI-assisted technology statement

The authors declare that generative artificial intelligence (AI) tools, including ChatGPT (OpenAI) and QuillBot, were used in a limited capacity to improve grammatical accuracy, linguistic clarity, manuscript quality, and to assist in refining the interpretation of the study's findings. All data analyses, scientific reasoning, interpretations, and final revisions were conducted and fully verified by the authors, who take full responsibility for the integrity and accuracy of the manuscript's content.

Conflict of interest

The authors have declared no conflict of interest.

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