Strengthening Breeding Stock Supply: A Study of Community-Based Duck Farming in Magelang under Good Breeding Practice Guidelines

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ABSTRAK

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Rencana pelaksanaan *breeding* dianggap penting dalam meningkatkan produktivitas ternak. Penelitian ini bertujuan mengkaji (1) pelaksanaan breeding Itik Magelang dengan membandingkan *existing breeding* di masyarakat dengan standar *Good Breeding Practice* (GBP), dan (2) kelayakan Kabupaten Magelang sebagai sumber bibit. Penelitian melibatkan 30 peternak itik Magelang yang dipilih secara *purposive sampling*. Data dikumpulkan melalui wawancara dan dianalisis secara deskriptif. Variabel meliputi pemilihan bibit; prasarana dan sarana; kesehatan hewan; pelestarian fungsi lingkungan; sumber daya manusia; pendampingan dan pengawasan oleh pemerintah. Penilaian kelayakan menggunakan data primer dari peternak dan data sekunder dari Dinas Peternakan, dianalisis dengan skoring dan SWOT. Hasil penelitian diperoleh bahwa jika dibandingkan dengan aspek GBP maka aspek pada peternak itik di Magelang masih di bawah standar GBP terlihat dari *skoring* (skala 1-5) untuk pemilihan bibit sebesar 2,67; prasarana dan sarana 2,85; kesehatan hewan 2,67; pelestarian fungsi lingkungan 2,16; SDM 3,33; pendampingan dan pengawasan oleh pemerintah 3. Kelayakan Kabupaten Magelang sebagai sumber bibit ditunjukkan dari hasil analisis SWOT dengan nilai internal dan eksternal berturut-turut sebesar 1,55; 1,05. Hasil ini menempatkan Magelang pada kuadran I yang menunjukkan adanya kekuatan dan peluang untuk dikembangkan. Kesimpulannya, meskipun belum memenuhi standar GBP, Kabupaten Magelang masih menunjukan potensi yang kuat sebagai sumber bibit itik.

Kata Kunci: *Good Breeding Practice*, Itik Magelang, Kelayakan Wilayah, Sumber Bibit

ABSTRACT

Rahayu A, Hartatik T, Sasongko H, Guntoro B, Wihandoyo, Ariyadi B, Maharani D. 2025. Strengthening breeding stock supply: A study of community-based duck farming in Magelang under Good Breeding Practice guidelines. JITV 30(2): 93-107. DOI:http//dx.doi.org/10.13443/jitv.v30i2.3528.

Breeding implementation is crucial to improve livestock productivity. This study evaluated (1) Magelang duck breeding practices compared to Good Breeding Practice (GBP) standards, and (2) the feasibility of Magelang District as a breeding stock source. Thirty Magelang duck farmers were selected purposively. Data were collected through direct interviews and analyzed descriptively. Variables observed included breeding stock selection, infrastructure and facilities, animal health, preservation of environmental functions, human resources, government assistance, and supervision. A feasibility analysis was conducted using primary farmer data and secondary data from the Animal Husbandry Department, and assessed through scoring and SWOT analysis. Results showed that current practices remain below GBP standards, with average scores (scale 1-5) for breeding stock selection (2.50); infrastructure and facilities (2.85); animal health (2.67); environmental function preservation (2.16); human resources (3.33); government assistance and supervision (3,00). SWOT analysis indicated Magelang has potential as a breeding stock source, with internal and external scores of 1.55 and 1.05, placing it in Quadrant I (supporting growth strategies). In conclusion, although current practices have not fully met GBP standards, Magelang District still shows strong potential as a producer of quality duck breeding stock.

Key Words: Breeding Stock Source, Good Breeding Practice, Magelang Duck, Region's Feasibility

INTRODUCTION

Breeding is a series of cultivation activities to produce livestock breeding stock. A breed stock source area is an agroecosystem area that is not limited by government administrative boundaries and has the potential to develop breed stock of specific types, breeds, or strains of livestock (Peraturan Menteri Pertanian Republik Indonesia 2014). Based on the Decree of the Minister of Agriculture No. 701/Kpts/PD.410/2/2013 on the Determination of Magelang Duck Breeds, it is stated that Magelang ducks are local Indonesian duck breeds

that have been cultivated for generations, thus becoming a valuable resource of local Indonesian genetic diversity (Ricardo et al. 2024). It is hoped that Magelang ducks can become a national breed stock source, as the Minister of Agriculture has identified twenty-two breed stock source areas with twenty-four kinds of livestock commodities (Direktorat Jenderal Peternakan dan Kesehatan Hewan 2002) in Indonesia, and Magelang ducks are omitted. The decree on the Magelang duck breeds is expected to become a source area for Magelang ducks in the Magelang district and surrounding areas.

Magelang ducks are among the most productive local poultry for producing meat and eggs (Rahayu et al. 2022). Along with domestic activity, ducks make various adaptations to adapt to the new environment. Adaptations, such as very active behavior, either in the cage or outside the cage (Rahayu et al. 2020). Magelang ducks have a characteristic white necklace around their neck. These ducks act as a source of egg production, ranging from 48-70%. If they are intensively maintained, the production can reach 80% a notable improvement for Magelang ducks, which are typically rejected for use as meat ducks (Yuwono, 2012). Magelang ducks have a large body proportion that can reach 1.5 kg, with relatively high egg production and varied plumage colors compared to other local ducks (Rahayu et al. 2015). According to (Luthfiana et al. 2020), the difference between male and female Magelang ducks is evident in their posture, with male ducks being slimmer than female ducks. According to Rahayu et al. 2019), the body weight of Magelang ducks is approximately 1.9 kg, the body length is approximately 30.67 cm, the neck length is approximately 14.18 cm, and the chest circumference is approximately 39.09 cm. These ducks have been bred and raised for many years in the Magelang district and surrounding areas. However, many duck varieties in Indonesia are not considered pure breeds and still exhibit significant genetic and phenotypic diversity. This situation partly arises from the changing rearing practices, such as the herding system, which leads to random crossbreeding and potentially alters the genetic makeup of the duck population; this is evident in the wide variation observed in both body morphology and productivity levels. People tend to prefer raising ducks over native chickens due to their higher egg production (Rahayu et al. 2019). Therefore, it is essential to enhance breeding practices, both genetically and phenotypically, to produce high-quality breeding stock.

Ducks, once primarily raised for egg production, are now also valued for their meat. As their role expands, the demand for duck breeding stock has also grown. Duck farming in Indonesia remains mostly traditional and small-scale, with no specialized businesses focused on producing hatching eggs (Rahayu et al. 2020). To meet the demand for ducks as both egg and meat producers, it is essential to have high-quality hatching eggs available in sufficient quantities. Therefore, a breeding business is needed to produce screaming breed stock. The breeding stock source area is integral to the breeding program, which in Indonesia lags behind those in developed countries. Key challenges include inadequate farm infrastructure resulting from traditional methods, limited facilities, poor market access, and varying levels of farmer education. Additionally, there is a lack of long-term, government-supported breeding programs. Therefore, an effective implementation plan for breeding programs is necessary.

A breeding implementation plan is crucial for enhancing livestock productivity. To develop this plan, key information required encompasses breeding stock selection, infrastructure and facilities, animal health, environmental conservation, human resources, and government assistance and supervision. The current state of the breeding program in the community is suspected to be substandard and has not been formally evaluated. Additionally, the suitability of the Magelang district as a breeding source area remains unclear. There has been no in-depth research on the implementation of Magelang duck breeding, making it essential to study its practices in comparison to existing breeding and Good Breeding Practice (GBP) standards. Therefore, this study aims to (1) evaluate the breeding practices of Magelang duck farmers in comparison with Good Breeding Practice (GBP) standards; and (2) assess the feasibility of Magelang District as a breeding stock source based on SWOT analysis.

MATERIALS AND METHODS

Materials

The study is divided into two parts: (1) comparing existing breeding practices with GBP standards and (2) assessing the feasibility of the Magelang district as a source of breeding stock. This research was conducted for three months (June-August 2023) in Magelang Regency. The study involved 30 respondent farmers in Magelang. Interviews were conducted to gather data on the implementation of breeding among Magelang duck farmers. The questionnaire validation was carried out by obtaining expert opinions, specifically from the academic supervisor and experts in the fields of poultry farming and socio-economics, to review the drafted questionnaire. The expert assessment included: (1) clarity of language and sentences in each question item, (2) suitability of the questions with the research objectives, and (3) relevance and coverage of the content in each question item to the variables being studied. Suggestions and input from experts were utilized to revise the questionnaire, resulting in a more precise and more targeted document (Sugiyono, 2019). The revised

questionnaire was then tested on 5-10 respondents who had similar characteristics to the primary research respondents. This trial aimed to: (1) assess the extent to which respondents understood the meaning of each question, (2) identify whether there were any ambiguous or difficult-to-understand questions, and (3) estimate the time required to complete the questionnaire. Based on the validity test results, the questionnaire was further revised and refined before being used for data collection in the main study. This research phase took place at smallholder farms in the Magelang district and at the local Animal Husbandry Department.

Ethical approval

The Faculty of Veterinary Medicine, Universitas Gadjah Mada, Yogyakarta, Indonesia, approved this experimental work (Approval Number: 005/EC-FKH/Eks./2023).

Methodology

Comparing existing breeding with GBP standards

Thirty farmers were interviewed in person, selected based on the criteria of having at least 10 years of breeding experience, raising ducks from day-old ducklings (DOD) to culling, and having a solid understanding of duck breeding practices. The survey took place among farmers in the Magelang district who specialize in raising Magelang ducks. The farmers were provided with a structured questionnaire designed to assess the breeding system of Magelang ducks within the community. The survey covered several variables, including breed stock selection, infrastructure and facilities, animal health, environmental preservation, human resources, and government assistance and supervision. The assessment data will be compared with GBP standards and analyzed using a SWOT analysis, as detailed in the data analysis section. Data from the farmer interviews were analyzed descriptively and scored according to GBP standards.

Feasibility of Magelang ducks as a viable source of breeding stock

The tools used to collect data on breeding practices included a structured questionnaire and stationery. The study utilized both primary and secondary data. Primary data was gathered through direct interviews with breeders in the field, while secondary data was collected from the local office. The data, presented in a scoring system from 1 to 5, was processed to determine weight and rating values. The scoring was based on the combination of strengths and weaknesses, as well as opportunities and threats. The rating of questionnaire data obtained was established through discussions with Magelang duck farmers in the Magelang district. The weight is derived from the balance of strengths and weaknesses, as well as opportunities and threats. The weight value is determined based on interviews conducted between researchers and Magelang duck farmers in Magelang District. The score for each aspect is then totaled and averaged by dividing it by the number of respondents. As stated by David (2009) livestock development strategies can be formulated using a SWOT analysis, which involves identifying internal and external factors summarized in the IFAS (Internal Factors Analysis Summary) and EFAS (External Factors Analysis Summary) matrices. According to (Rangkuti F, 2006), strategic factors can be identified by combining external strategic factors (opportunities and threats) with internal strategic factors (strengths and weaknesses) into a strategic factors analysis summary.

Data analysis

This study employs quantitative descriptive analysis to determine the score for each aspect of good breeding practice in Magelang duck farms. Data obtained from the questionnaire were processed to obtain an average score for each aspect, then interpreted based on categories (low, medium, high). Data were analyzed using descriptive quantitative analysis with Microsoft Excel and SPSS version 25 to calculate mean scores, frequency distributions, and to present the data in tables for more precise interpretation.

RESULTS AND DISCUSSION

Comparing existing breeding with GBP standards

The study examined the condition of Magelang duck farms across several aspects, including breeding stock selection, infrastructure and facilities, animal health, environmental preservation, human resources, and government assistance and supervision. These findings are detailed in the following sub-chapters. The study results were then compared to the GBP standard using a scoring system ranging from 1 to 5, where (1) indicates poor, (2) sufficient, (3) moderate, (4) good, and (5) very good.

Breeding stock selection

Breeding stock selection is a crucial element of any breeding program. The aspects involved in breeding stock selection encompass criteria, objectives, methods, and crossbreeding practices. The scoring outcomes for breeding stock selection at Magelang duck farms are presented in Table 1.

Table 1. Aspects of breed stock selection in Magelang duck farms, Magelang district

Aspect	Score	Description
a. Breedstock selection criteria	3.00	As per SNI, as many as 2 criteria
b. Purpose	3.94	Layers and broilers
c. Selection method	2.37	Not understand
Average	2.77	

Based on the results obtained by examining three aspects of breeding stock selection, the scores for breeding stock selection criteria, objectives, and selection methods were 3.00, 3.94, and 2.37, respectively, with an average score of 2.77; this is because several factors in GBP cannot be found directly in the field. For example, there should be several criteria for selecting minimum technical requirements (MTR or PTM : Persyaratan Teknis Minimal) breed stock; however, in the field, there are only two criteria: the age of 5-6 months, and a brownish fur color with light to dark brown variations, accompanied by a white collar on the neck. According to Keputusan Menteri Pertanian Republik Indonesia Nomor 701/Kpts/PD.410/2/2023, Magelang ducks are defined by both qualitative and quantitative traits. Qualitative characteristics include feather and eggshell color as well as body shape. Magelang ducks typically have brown feathers, ranging from light to dark brown or blackish, and may sometimes be entirely black. They also feature a distinctive white necklace around their neck. The eggshell color is bluish-green (Rahayu et al. 2015).

Male Magelang ducks have a slim body shape and maintain an upright posture when standing and walking, perpendicular to the ground. The body shape of female Magelang ducks is upright, and they do not incubate their eggs. Quantitative characteristics of Magelang ducks include male ducks weighing between 1.8 and 2.5 kg, while females weigh between 1.5 and 2.0 kg. The average weight of their eggs ranges from 60 to 70 grams, with hatching eggs weighing approximately 67.1±4.7 g. These ducks produce between 200 and 300 eggs per year, with a peak egg production rate of 55.1%. They reach sexual maturity at 5 to 6 months of age, have an egg production period of 9 to 10 months, and a feed conversion ratio of 4 to 5. The width of the white necklace around their neck ranges from 1 to 2 cm. The score for the objective is 3.94, which is based on the purpose of the Magelang duck itself, as determined by the criteria in the GBP scoring, specifically as a commercial egg and meat producer.

The purpose of raising Magelang ducks is for egg and meat production, where the ducks produced will lay eggs daily. After being culled, they will be sold for use as meat ducks. Therefore, a proper selection method is needed to achieve this goal. The selection method is important in achieving breeding goals. The scoring result for the selection method was 2.37, indicating that farmers still do not fully understand the selection methods. Selection can be carried out using both quantitative and molecular approaches. Quantitative selection involves measuring and comparing observable traits in livestock to identify those that are most beneficial to the breed.

On the other hand, molecular selection utilizes DNA markers. However, most breeders are familiar only with quantitative selection and have not engaged in molecular methods; many are even unfamiliar with the concept of molecular selection. Breeders typically practice crossbreeding within a single breed to preserve the original characteristics. According to Maharani et al. (2017), the objectives of crossbreeding are: (1) creating a new breed by combining traits from two or more breeds; (2) achieving heterosis, which aims to produce crossbred livestock with performance exceeding the average of the parent breeds; (3) developing a commercial cross; and (4) grading up, which involves crossing local livestock with imported studs using the backcross method to enhance the traits of the animals.

Based on the research results (Table 1), the average score for the breeding stock selection aspect among Magelang duck farmers was categorized as low. Most farmers did not perform optimal selection of breeding stock and tended to use ducklings hatched by themselves or purchased from local markets without considering genetic quality. This low breeding stock selection can be attributed to several factors (1) Lack of knowledge regarding superior breeding stock criteria. According to interviews, most farmers did not understand the importance of selecting breeding stock based on body weight, body conformation, beak and leg color, or the production history of the parents. They only chose ducklings that appeared healthy without considering their productivity traits. According to North & Bell (1990) selecting superior breeding stock based on genetic traits and body conformation is a key factor in improving egg production and growth performance in meat ducks. (2) Limited access to superior breeding stock. Magelang duck farmers often face difficulties in obtaining high-quality breeding stock due to the limited availability in the local area. They frequently used ducklings from their hatchings or from small local

hatcheries, which did not necessarily have good genetic quality. Wibowo TB et al. (2020) also noted that limited access to superior breeding stock is a significant obstacle to the development of Tegal ducks, (3) Limited business capital. Purchasing superior breeding stock requires higher costs compared to ordinary ducklings. Farmers with constrained financial resources tend to select more affordable ducklings or rely on home hatching, even if the resulting quality is not optimal. Syafwan et al. (2019) reported that the relatively high price of superior breeding stock is one reason why smallholder farmers are reluctant to replace or refresh their breeding stock. When compared to Alabio duck farmers in South Kalimantan, the breeding stock selection practices of Magelang duck farmers were relatively lower. Syafwan et al. (2019) reported that Alabio duck farmers routinely performed breeding stock selection based on lineage and production performance to maintain duck productivity and quality.

Infrastructure and facilities

Data for the infrastructure and facilities aspect was gathered by descriptively comparing the current field conditions with the GBP standard. The scoring was derived from interviews with farmers and direct observations in the field, which were then compared to the standards outlined in Minister of Agriculture Regulation No. 32/Permentan/OT.140/2/2014. The scores for the infrastructure and facilities aspects of Magelang duck farms are presented in Table 2. The use of these facilities and infrastructure is intended to maximize the effectiveness of tools and items that meet the farm's needs. Key considerations include the objectives to be achieved through their use, the characteristics of the users, and the availability of supporting facilities and infrastructure.

Infrastructure

The results in Table 2 show a score of 4.14 for land and location, while water and energy sources have a score of 4.17. This value is close to the GBP (Peraturan Menteri Pertanian Republik Indonesia 2014), where the land and location are easily accessible and can be reached using transport. The assessment is conducted descriptively, involving the scoring of interview results and direct observation of field conditions from the researcher's perspective. Land surveying refers to the physical environment, including climate, terrain, soil, water systems, and vegetation. These factors affect the potential and ability of land to support livestock development. Land resource factors are categorized into land units. Magelang district covers a total area of 108573 hectares, accounting for approximately 3.34% of Central Java province. This land is divided into 34.05% paddy fields, 38.61% dry land, and 27.34% non-agricultural land. The district's strategic location and remarkable soil fertility are enhanced by its surrounding natural features, including the mountains of Merapi, Merbabu, and Sumbing, as well as the Menoreh hills. These geographical features create a diverse landscape, with elevations ranging from 153 to 3065 meters above sea level, and an average altitude of 360 meters (BPS 2022).

Magelang District has potential for developing both large and small-scale livestock, due to its advantageous tropical climate, marked by distinct rainy and dry seasons, with temperatures ranging from 20 to 27°C. The area receives substantial rainfall and has plentiful water resources, supported by the Progo and Bogowonto watersheds, which encompass springs and rivers. The district features 10 significant rivers, with peak flow rates of up to 2314 cubic meters per second during the wet season and a minimum of 110.3 cubic meters per second in the dry season, as well as 55 springs that collectively discharge 9509 liters per second.

Facilities

The results presented in Table 2 indicate that the buildings have received a score of 2,22 as they do not meet the GPB standards (Peraturan Menteri Pertanian Republik Indonesia 2014). For an effective local duck breeding operation, the buildings should adhere to specific criteria, including the type, construction, and layout of the structures. However, the facilities on duck farms in Magelang District fail to meet these standards. Specifically, the existing buildings are not compliant with the GPB requirements; they use a single type of cage that serves multiple functions, such as housing both starter and finisher ducks, rather than having specialized cages for different stages of growth. Sick ducks are usually still housed in the same cage as healthy ducks, with no isolation cage. Feed is stored near the cage, without allocated storage room. The farm is typically situated behind the house, occupying an area of approximately 3 x 6 meters. Water and energy sources are usually obtained by allowing the ducks to access rice fields or rivers located some distance away from the house. The score for the farm equipment and machinery used is 2.17, which is because it is still below the GBP standard, as shown in Figure 1. It can be seen that only a basin is provided for feed, and there is also a box near the door for egg storage. The score for breeding stock is 3. The breed stock used is close to the average GBP standard. DOD is obtained by hatching or buying from larger farmers, with attention to the good condition of the breed stock.

Based on the research results (Table 2), the average score for the facilities and infrastructure aspect among Magelang duck farmers was categorized as moderate. This aspect includes the availability of housing, feed and

Table 2. Aspects of Infrastructure and Facilities in Magelang Duck Farms, Magelang District

Aspect	Score	Description
a. Infrastructure:		
1. Land and location	4.14	Strategic location, supported by transportation and road access
2. Water and Energy Sources	4.17	Sufficient clean water and energy sources are available
b. Facilities:		
1. Buildings (type of building, building construction, and building layout)	2.22	There are buildings, but the type, construction, and layout are not appropriate
2. Equipment and devices for animal farming and veterinary care	2.17	Equipment and devices for animal farming and veterinary care are quite appropriate
3. Breed stocks	3.06	Breed stock is by SNI
4. Feed	3.00	Feed by SNI
5. Veterinary medicine	2.37	Medicine is given traditionally
Average	3.02	

Figure 1. Magelang duck farm in Magelang district

drinking containers, sanitation tools, and other supporting facilities that play an important role in optimizing duck farming. A moderate score in this aspect indicates that most farmers already have the basic facilities needed, but the quality and quantity are not yet fully adequate. This condition can be attributed to several factors: (1) Limited business capital to improve existing facilities. The majority of Magelang duck farmers are small-scale farmers with limited capital. According to interviews, although farmers already have permanent or semi-permanent housing, the size remains minimal, with simple constructions made from bamboo, wood, and basic roofing materials. Feed and drinking containers are partly standard, but some farmers still use recycled items to save production costs. Syafwan et al. (2019) stated that limited capital is one of the main factors hindering the provision of better facilities and infrastructure in smallholder poultry farms in Indonesia. (2) Farmers' awareness of the importance of facilities and infrastructure is not matched with access to technology and financial assistance. Based on interviews, farmers realize that the quality of housing and equipment affects duck productivity. However,

most are not yet able to renovate their housing completely or replace traditional equipment with modern tools due to financial limitations and the absence of assistance from local governments. (3) Limited land area hinders the development of supporting facilities. Duck farming in Magelang typically occurs in home yards with limited space, so farmers only build housing as needed. This results in the unavailability of supporting facilities such as feed storage, hatching rooms, or waste processing areas. North & Bell (1990) stated that adequate facilities and infrastructure support livestock health, comfort, and management efficiency. When compared to Tegal duck farmers, the facilities and infrastructure of Magelang duck farmers were categorized as moderate, whereas those of Tegal duck farmers were better. Wibowo et al. (2020) reported that Tegal duck farmers generally have semi-intensive housing with permanent constructions, standard feed and drinking facilities, and access to government development programs for Tegal ducks, resulting in more optimal facilities and infrastructure to support duck farming productivity.

Animal health

Addressing several key animal health aspects is crucial in Magelang duck farms, including monitoring the occurrence of animal diseases, implementing effective disease prevention strategies, and enforcing comprehensive biosecurity measures. These factors are detailed in Table 3, highlighting the importance of maintaining overall farm health and safety.

It is crucial to address several key animal health aspects in Magelang duck farms, including monitoring the occurrence of animal diseases, implementing effective disease prevention strategies, and enforcing comprehensive biosecurity measures. These factors are detailed in Table 3, highlighting the importance of maintaining overall farm health and safety. Scores were determined by comparing interview responses with the GBP standard. The animal disease situation received a score of 2.91, reflecting the common occurrence of diseases like Newcastle disease (ND) and coccidiosis in the field. The score for disease prevention measures was 2.74, primarily because of traditional remedies. Practices giving garlic to sick ducks by placing one clove in their mouths daily are commonly used. The biosecurity score was 2.26, reflecting the minimal biosecurity practices typically implemented, such as basic cage cleaning and feed replacement, without any disinfection or sanitization processes. According to GBP standards, comprehensive disinfection and sanitation should be applied to every person, piece of equipment, and vehicle entering or leaving the farm; this includes providing disinfectant containers and handwashing stations near the farm entrance, which are changed daily. Additionally, strict controls should be placed on the movement of items such as livestock products, feed, manure, bedding, and litter that could carry viruses, with all goods disinfected before entering the farm, except for feed and medicine (Peraturan Menteri Pertanian Republik Indonesia 2014).

Based on the research results (Table 3), the score for the animal health aspect among Magelang duck farmers was categorized as low, as evidenced by the low implementation of vaccination programs, the use of deworming medication, and the lack of routine disease control among farmers. The low score for animal health can be attributed to several factors: (1) Lack of knowledge about animal health. Most farmers do not understand the importance of animal health programs, such as regular vaccination and vitamin supplementation. Based on interviews, farmers only provide medication to ducks when they show signs of illness. However, North & Bell (1990) stated that preventive measures, such as vaccination and good sanitation, are more effective in maintaining the health and productivity of poultry. (2) Absence of regular animal health assistance. Farmers rarely receive visits from veterinary paramedics or livestock health extension officers, which limits their knowledge, and treatments are often based on trial and error or personal experience. Syafwan et al. (2019) also stated that the lack of visits from animal health officers is a significant constraint in disease control among smallholder poultry farmers. (3) Limited funds for treatment and vaccination. Vaccinations and medications are considered additional expenses that burden small-scale farmers. Therefore, some farmers choose not to vaccinate their ducks and instead rely on traditional methods to treat diseases. When compared to Tegal duck farmers, the implementation of animal health practices among Magelang duck farmers is relatively lower. Wibowo et al. (2020) reported that most Tegal duck farmers administer at least one vaccination during the starter period to prevent infectious diseases. According to North & Bell (1990), animal health is a crucial aspect of poultry farming, as diseases can reduce production performance, egg quality, growth, and even increase mortality, leading to economic losses for farmers.

Preservation of environmental functions

The scoring data for the aspect of environmental function preservation was derived by descriptively comparing the current field conditions with the GBP standard. This evaluation was based on interviews with farmers and direct observations in the field, which were then compared to the criteria outlined in the GBP standard, as specified in Peraturan Menteri Pertanian Republik Indonesia Number 32/Permentan/OT.140/2/2014, as shown in Table 4.

Table 4 shows a score of 2.91 for point a, indicating that the Magelang duck farm has an average level of envi-

Table 3. Aspects of Animal Health in Magelang Duck Farms, Magelang district

Aspect	Score	Description
a. Animal Disease Situation	2.91	There is an animal disease, and it is pretty dangerous
b. Animal Disease Safety Measures	2.74	Animal disease safety measures are adequate
c. Implementation of Biosecurity	2.26	Less implementation of biosecurity
Average	2.64	

Table 4. Aspects of Preserving Environmental Functions in Magelang Duck Farms, Magelang District

Aspect	Score	Description
a. Avoiding environmental pollution and erosion	2.91	Avoiding environmental pollution and erosion
b. Avoiding noise, foul odor, and water pollution	2.26	Lessening noise, foul odor, and water pollution
c. Making a waste treatment unit with a production capacity to produce organic fertilizer	2.26	Less making a waste treatment unit by the production capacity to produce organic fertilizer
d. Make sewage channels and disposal sites	2.26	Lack of sewage channels and disposal sites
e. Make a place for burning or burying duck carcasses	2.14	There is burning or burying of duck carcasses
f. Make air circulation	2.29	Lack of air circulation
Average	2.35	

ronmental pollution. Point b scores 2.26, as the cages are still located behind the house without considering noise levels. Point C also scores 2.26 due to the absence of a waste treatment facility capable of producing organic fertilizer. Duck carcasses are typically burned or buried near the house without a designated disposal site, resulting in a score of 2.14 for point e. Additionally, air circulation is poor due to the open cage, resulting in a score of 2.29 for point f. Overall, the conditions observed in the field do not align with the GBP standards.

Based on the research results (Table 4), the average score for the preservation of environmental functions aspect among Magelang duck farmers was categorized as low. This aspect encompasses waste management, odor control, and efforts to maintain the cleanliness of the surrounding area. The low score for preservation of environmental functions can be attributed to several factors: (1) Lack of knowledge and environmental awareness. Most farmers do not understand the impact of livestock waste on the environment and public health. According to interviews, farmers perceive duck waste, including manure and wastewater from cleaning duck houses, as posing no serious problems. However, North & Bell (1990) stated that improperly managed livestock waste can contaminate soil and water, causing foul odors that disturb nearby communities. (2) Limited land and waste management facilities. Magelang duck farmers typically raise ducks in their home yards, often with limited space, and therefore do not have dedicated areas to process or store waste. They usually dispose of manure directly into gardens or water channels without prior treatment. Syafwan et al. (2019) reported that limited land area is one of the main constraints in waste management for small-scale poultry farms. (3) Absence of strict regulations or environmental supervision. There are no strict regulations or sanctions related to environmental pollution by smallholder farms, causing farmers to be less concerned about implementing environmentally friendly waste management practices. When compared to Alabio duck farmers in South Kalimantan, the preservation of environmental functions practices of Magelang duck farmers was relatively lower. Syafwan et al. 2019 reported that Alabio duck farmers processed duck manure into compost fertilizer for their gardens or sold it to local farmers, which reduced environmental pollution while also increasing their income. According to North & Bell (1990), maintaining the preservation of environmental functions is essential in poultry farming to avoid causing health

problems for both the livestock and the surrounding community, and to ensure the sustainability of the farming business itself.

Human resources

Human resources on Magelang duck farms in Magelang district are scored based on the condition of farmers in the field compared to the GBP standard. The score for the human resource aspect in Magelang duck farms, as per Peraturan Menteri Pertanian Republik Indoneisa Nomor 32/Permentan/OT.140/2/2014, is presented in Table 5.

Based on the scoring results, the score for the physical and spiritual health aspect is 4.06; this means that the breeders found in the field are physically and mentally healthy. The score for having skills relevant to their field is 2.80, indicating that they possess sufficient skills in their field. The score for applying work safety and security according to the provisions is 3.00. When compared with the GBP score, the average score for human resources is 3.29, as not all aspects listed in the GBP can be implemented in the field; several factors, such as age, education level, and breeding experience, influence this. Human resources involved in duck farming must meet GBP standards, among others, as follows: 1. Able-bodied; 2. Have skills in their field and understand the risks associated with their work; and 3. Implementing occupational safety and security by the provisions of laws and regulations in the field of labor (Peraturan Menteri Pertanian Republik Indonesia 2014).

Human resources are individuals who work in organizations, set general goals and priorities, plan work processes, produce goods and/or services, track efficiency, allocate financial resources, and sell goods and/or services (Bratton & Gold 2017). The results showed that the organization had efficient and talented human resources (Obeidat et al. 2017). The factor considered most likely to achieve a competitive advantage is the provision of human resources related to management (Tahir et al. 2015, 2019). The issue of human resources essentially refers to the reassessment of labor capabilities (Hall 2008; Wright & McMahan, 2017). Hasibuan (2003) argues that human resources encompass the abilities possessed by everyone, including physical and mental capacities. The environment and heredity are natural factors, while the desire to fulfill their satisfaction is supported by work motivation. (Fathoni 2006) revealed that human resources are the wealth and capital of every most important human activity.

The study included 30 farmers, who were then used as research informants. Characteristics of Magelang duck farmers include age, education level, and farming experience. Age significantly impacts the condition of the farmer and their physical ability to perform work or activities. The productivity level of a young person is significantly faster compared to breeders who have entered old age, commonly referred to as non-productive. The results of interviews with breeders revealed that as many as 63% of breeders were dominated by the age group of 51-60 years. Maryam et al. (2016) stated that when reaching a certain age, such as 55, 60, or 65 years, a worker must either enter retirement or cease to be productive. Age has an impact on work productivity in jobs that require physical labor (Makatita et al.2014) Farmers in Magelang are more dominated by older individuals because breeding is only a secondary business and is also less attractive to young people. Usually, those who have retired or are approaching retirement make breeding their business after retirement.

The education level of farmers in Magelang is predominantly comprised of high school graduates (70%). This level of education reflects that most farmers are ready to receive knowledge about how to breed Magelang ducks properly. The farming experience of Magelang duck farmers in Magelang district is dominated by 10-20 years (86%). This experience is long enough to understand how to properly raise Magelang ducks. Farmers usually understand farming procedures because of their long-standing habit of raising livestock, so they are already familiar with the characteristics of the ducks.

Based on the research results (Table 5), the average score for the human resources (HR) aspect among Magelang duck farmers was categorized as moderate. This aspect includes educational level, farming experience, training attended, and technical knowledge of duck farming. The quality of human resources among Magelang duck farmers can be attributed to several factors, namely: (1) Low level of formal education. Most Magelang duck farmers only completed elementary or junior high school. This low level of education affects their ability to read, understand, and apply information related to modern livestock technology and management. (Handayani et al. 2020) stated that formal education has a significant influence on farmers' ability to adopt technological innovations. (2) Lack of training or technical extension. According to interviews, the majority of farmers had never participated in specific duck farming training in recent years. As a result, their knowledge of feed management, health, and biosecurity is only based on traditional experience passed down from previous generations. Syafwan et al. (2019) emphasized that regular training and extension services will enhance farmers' human resource capacity, thereby increasing livestock productivity. (3) Relatively old age of farmers. The majority of farmers are between 45 and 60 years old. This relatively old age reduces their motivation to learn new things. In addition, the regeneration of duck farmers in Magelang is low, as

younger generations are less interested in continuing the family duck farming business. Wibowo et al. (2020) reported a similar phenomenon among Tegal duck farmers, where younger generations prefer jobs in the non-agricultural sector. (4) Lack of awareness regarding the importance of HR development. Many farmers view duck farming merely as a side business or family tradition, and thus do not have a mindset oriented towards business growth and sustainability. According to North & Bell (1990), the quality of human resources is one of the key factors determining the success of poultry farming, particularly in terms of implementing effective management practices, cost efficiency, and animal health management. When compared to Alabio duck farmers in South Kalimantan, the human resource quality of Magelang duck farmers is relatively lower. Syafwan et al. (2019) demonstrated that Alabio duck farmers have access to regular training from local governments and non-governmental organizations, leading to improved knowledge and skills in duck farming.

Assistance and supervision by the Government

Aspects of assistance and supervision by the government in Magelang duck farms, according to Peraturan Mneteri Pertanian Republik Indonesia Nomor 32/Permentan/OT.140/2/2014, as stated in Table 6.

Based on the scoring results obtained, the scores for the assistance, supervision, and reporting aspects are 3.00, 3.00, and 3.00, respectively, due to the lack of assistance and supervision by the relevant Livestock Service Office. The scores for training, supervision, and reporting are each 3.00; this means that all three have sufficient values. Coaching is conducted to enhance effectiveness and efficiency in managing duck farming. Coaching is conducted within the context of implementing sustainable and environmentally friendly cultivation practices through education, training, and counseling (Purwanto, 2003) The central government undertakes development, while provincial and regional governments, as well as district/city local governments, do so within their respective jurisdictions. Supervision is carried out to ensure the quality and safety of duck products, and is carried out both directly and indirectly. Direct supervision is carried out at the cultivation site on site suitability, cultivation management, feeding, animal disease security, and preservation of environmental functions. Supervision of duck farming is carried out by a supervisory officer appointed by the head of the local district/city office, which oversees livestock and animal health functions.

Based on the research results (Table 6), the average score for government assistance and supervision among Magelang duck farmers is categorized as moderate, indicating that while some government programs have been implemented, they are not yet optimal across all farmers. Several factors contribute to this moderate score: (1) Existing programs are present but not evenly distributed. Interviews revealed that some farmers have received assistance, such as ducklings or feed, from the Livestock Service Office, but not every year, and often only for certain farmer groups. Some farmers have also received extension visits, but the frequency is low, so the impact of these programs is not widespread. (2) Limited number of livestock extension workers. The number of livestock extension officers in Magelang District

Table 5. Aspects of Human Resources in Magelang Duck Farms, Magelang District

Aspect	Score	Description
a. Physically and mentally healthy	4.06	Physically and mentally healthy
b. Have skills according to their field and understand the risks of the job	2.80	Fairly skilled in their respective field.
c. Able to apply work safety and security by the provisions of laws and regulations in the field of labor	3.00	Moderately able to apply work safety and security
Average	3.29	

Table 6. Aspects of Assistance and Supervision by Government in Magelang Duck Farms, Magelang District

Aspect	Score	Description
a. Assistance	3.00	Enough coaching
b. Supervision	3.00	Enough supervision
c. Reporting	3.00	Reporting is sufficient
Average	3.00	

is limited, resulting in low visitation intensity to duck farmers. Syafwan et al. (2019) note that the ratio of extension workers to farmers in rural areas is often unbalanced, which affects the effectiveness of technical support in the field. (3) Government programs are not explicitly focused on Magelang ducks. Most local government livestock programs still prioritize dairy cattle and goats, while local duck development has not become a primary focus. As a result, assistance and supervision for duck farmers are only a small part of general poultry programs. (5) Farmers' limited access to government program information. Many farmers are unaware of existing government training or assistance programs due to poor access to information and a lack of socialization. Wibowo et al. (2020) reported that low information literacy among farmers is one reason they rarely participate in training or apply for government assistance.

Feasibility of Magelang ducks as a viable source of breeding stock

Magelang district is one of the districts in Central Java province, located adjacent to several districts and cities, including Temanggung, Semarang, Boyolali, Purworejo, Wonosobo, and Magelang City, as well as the Yogyakarta Special Region Province. This condition is very favorable for trade routes from areas around the Magelang district. Magelang District is famous for its distinctive duck, known as the Magelang duck. This duck has been designated as the Magelang duck family based on Keputusan Menteri Pertanian Nomor 701/Kpts/PD.410/2013. Farmers favor Magelang ducks due to their good adaptability and relatively high egg productivity (200-300 eggs/year), with excellent egg quality. Male ducks weighing 1.8-2.5 kg can be used in culinary dishes that are popular with the public. In Magelang, ducks are raised by farmers who typically manage between 10 and 50 ducks, with an average of around 20. These farms are generally operated on a subsistence or part-time basis. Livestock are usually kept in the rice fields in the morning to feed on rice residue, snails, and worms, and in the afternoon, they are confined to a cage. Ducks also often get additional feed in the form of household food scraps and rice bran to support good egg production.

Magelang ducks have many advantages over other ducks, which is why they have spread to 21 sub-districts in the Magelang district. Another advantage is that it has a large body shape with a heavier body weight (Rahayu et al. 2021), so its meat is more marketable as a slaughtered duck and has high egg production. According to David (2009), breeding implementation strategies can be formulated through a SWOT analysis, utilizing the results of internal and external factor identification presented in the IFAS (Internal Factors Analysis Summary) matrix and the EFAS (External Factors Analysis Summary) matrix. A SWOT diagram is obtained by comparing internal and external factors to describe the position of the Magelang duck business. The Internal Factors Analysis Summary (IFAS) outlines the internal strengths and weaknesses of Magelang duck farmers. These factors are identified through a questionnaire and analyzed using the data analysis methods described. The results of the calculation of the strengths and weaknesses of Magelang Duck farmers, as listed in Table 7, are then used to give the weight of each internal factor by summing the data from each question on the aspects of strengths and weaknesses, and then dividing by the number of respondents. The IFAS matrix is presented in Table 7.

Several key factors influence the viability of Magelang as a source of duck breeding. On the strength side, Magelang's advantages include speedy livestock growth, high demand for eggs, and the potential to increase income. However, significant weaknesses include the relatively small number of ducks raised and the inactivity of livestock groups. Externally, the Analysis Summary of External Factors (EFAS) highlights opportunities and threats faced by Magelang duck farmers. Significant opportunities include easy access to duck breeds and a more consumptive society. Conversely, the primary threats are the high demand for livestock and competition from other commodities. These factors are detailed and weighted in the EFAS matrix presented in Table 8.

The weighting is determined by evaluating the combination of strengths and weaknesses, as well as opportunities and threats. The weight values are derived from interviews conducted between the research enumerator and Magelang duck farmers in the Magelang district. Determination of rating based on discussion with Magelang duck farmers in the Magelang district. The score is obtained by multiplying the weight and rating. The SWOT analysis indicates that Magelang duck farms in the Magelang district effectively capitalize on available opportunities and mitigate potential threats. The analysis positions the development plan for Magelang duck breeding in Quadrant I (Figure 2) (1.55; 1.05), as it falls on the x-axis at 1.55 and the y-axis at 1.05.

A growth strategy, which means maximizing strengths and opportunities to achieve growth, indicates that opportunities and strengths are key points that must be developed in the current situation. The strategy recommendation is that a progressive approach must be implemented, meaning that Magelang duck farms require guidance from various institutions, such as universities and local livestock services, to optimize their operations further. Opportunities and Strengths of Magelang Duck Farming that need to be developed, such as: (1) Adaptive genetic potential of Magelang ducks, Magelang ducks have good adaptability to local

environmental conditions, resilience to weather changes, and relatively good reproductive ability. These characteristics are fundamental strengths for population development and improvement in production. (2) Stable local market demand, Magelang duck eggs and meat already have their market in Magelang and surrounding areas, both for household consumption and traditional market traders. This stable demand is a key strength in ensuring the sustainability of the farming business. (3) Availability of alternative local feed resources. In Magelang, various local feed resources such as rice bran, bran, and leftover vegetables from markets are available and can be used as supplementary feed, thereby reducing feed costs. (4) Development of processed products based on Magelang ducks. Processing duck products such as salted eggs, shredded duck meat (abon itik), or crispy duck skin chips can increase product value and expand the market beyond the local area. (5) Implementation of Good Breeding Practices and biosecurity to improve productivity. (6) Applying modern management practices, good biosecurity, and using superior breeding stock will increase production efficiency and product quality, thus enhancing the competitiveness of Magelang duck products. (7) Support from local government programs for local duck development, Livestock development programs, training, and capital assistance from district or provincial livestock services are opportunities that can be utilized to improve farmers' human resources, facilities, and infrastructure, and livestock productivity. (8) Increasing trend of animal protein consumption. Public awareness of animal protein consumption continues to increase, making the market prospects for Magelang ducks, both for meat and eggs, more promising in the future.

Philipsson et al. (2003) suggested that the components that must be considered in a breeding program include the role of livestock, breeding objectives, recording, and building infrastructure. Methods to create a long-term breeding plan include (1) defining the production system, (2) defining the purpose and direction of breeding, (3) collecting the information needed, (4) determining selection criteria, (5) carrying out selection and mating, (6) dissemination, and (7) evaluation (Oldenbroek et al. 2014) .

This research is currently limited to defining the purpose and direction of breeding and collecting the necessary information to develop a breeding program.

Table 7. IFAS Matrix Calculation Results

No	Internal Factors	Weight	Rating	Score
	Strength	(a)	(b)	(c)
1	Speedy livestock growth	0.11	5.00	0.55
2	High demand for eggs	0.12	4.00	0.48
3	High farmer motivation to return to business	0.11	4.00	0.44
4	Long farming experience	0.12	5.00	0.60
5	Strategic business location	0.12	4.00	0.48
6	Business risk is relatively small	0.11	3.00	0.33
7	Low production cost	0.09	4.00	0.36
8	Private capital	0.11	3.00	0.33
9	Can increase income	0.11	4,00	0.44
	Total Strengths	1.00		4.01
	Weaknesses			
1	Difficulty of maintenance	0.14	3.00	0.43
2	The small number of ducks raised	0.17	2.00	0.34
3	Ducks raised are often consumed personally	0.12	3.00	0.36
4	Inactive livestock group	0.20	2.00	0.40
5	Fluctuating sales	0.19	3.00	0.57
6	Income contribution from the business is relatively small	0.18	2.00	0.36
	Total Weaknesses	1.00		-2.46

The results of the IFE matrix analysis on breeders in Magelang District obtained a total score of 1.55

Table 8. EFAS Matrix calculation results

No	External Factors	Weight	Rating	Score
		(a)	(b)	(c)
	Opportunities	0.17	4.00	0.70
1	Duck breeds are easy to obtain	0.17	4.00	0.70
2	An increasingly consumptive society	0.18	3.00	0.54
3	High interest in egg consumption	0.17	4.00	0.68
4	Almost every community has a duck business	0.15	4.00	0.60
5	The demand for duck eggs is starting to get high	0.16	3.00	0.48
6	The market is relatively open	0.16	4.00	0.64
	Total Opportunities	1.00		3.64
	Threats			
1	The many needs of farmers	0.27	2.00	0.53
2	The number of competitors in other livestock commodities	0.16	3.00	0.48
3	Lack of attention from the local livestock office	0.16	2.00	0.32
4	The complexity of internal and/or external problems of livestock groups	0.22	3.00	0.66
5	A large number of Magelang duck farmers	0.20	3.00	0.60
	Total Threat	1.00		-2.59

The results of the EFE matrix analysis on farmers in Magelang obtained a total score of 1.05

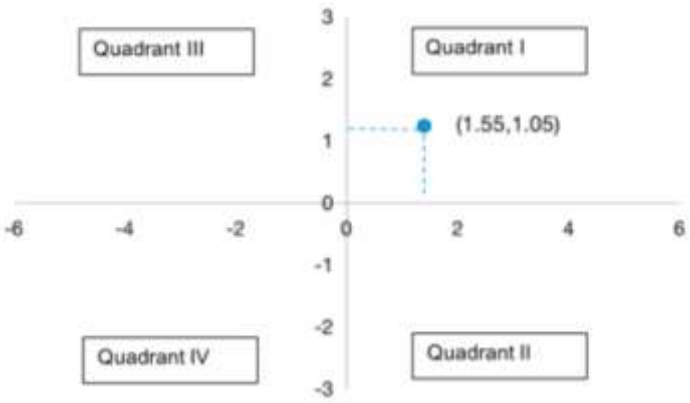

Figure 2. SWOT Diagrams

For the next stage, further research, including phenotypic and genotypic studies, will be carried out to fulfill all the required methods.

CONCLUSION

In conclusion, the data indicate that duck farming practices in Magelang District currently fall below the established Good Breeding Practice standards, such as breeding stock selection, animal health, and preservation of environmental functions. Nonetheless, the district remains a viable source of breeding stock. The SWOT analysis further reveals that Magelang duck farms are at an early stage of development. To enhance their practices and achieve higher standards, these farms must focus on leveraging identified opportunities and strengthening their existing capabilities such as adaptive genetic potential of Magelang ducks, stable local market demand, availability of alternative local feed resources, development of processed products

based on Magelang ducks, implementation of Good Breeding Practices and biosecurity to improve productivity, applying modern management practices, support from local government programs for local duck development, increasing trend of animal protein consumption.

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