Sustainability Assessment of KUB Native Chicken Breeding Stock Availability in Malang Raya: A RAP-MDS Analysis

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ABSTRAK

Melinda PAR, Masyithoh D, Kalsum U, Halfi K, Setiasih, Rohaeni ES, Ariani M, Anggraeny YN. 2025. Penilaian keberlanjutan ketersediaan stok induk ayam KUB di Malang Raya: analisis RAP-MDS. JITV 30(4):219-228. DOI://dx.doi.org/10.1443/jitv.v30i4.3578.

Salah satu komoditas unggulan di subsektor peternakan adalah ayam khususnya ayam asli Kampung Unggul Balitbangtan (KUB), yang dikembangkan oleh Badan Litbang dan Pengembangan Pertanian Indonesia pada tahun 2014. Tujuan dari penelitian ini adalah untuk menganalisis status dan kondisi aspek keberlanjutan dalam hal ketersediaan stok pembibitan ayam KUB di Malang Raya (Kota Malang, Kabupaten Malang dan Kota Batu) pada bulan Maret - Juli 2025. Analisis RAP-Multi-Dimensional Scaling (MDS) digunakan dalam studi ini dengan melibatkan enam dimensi dan 29 atribut. Responden terdiri dari peternak, penyuluh, akademisi dan petugas dinas yang berpengalaman. Teknik pengumpulan data dilakukan dengan wawancara melalui kuisioner tersetruktur. Hasil analisis menunjukkan bahwa dimensi ekonomi memiliki nilai keberlanjutan tertinggi (70,77%) dibandingkan dengan dimensi lainnya. Hal ini secara berturut-turut adalah dimensi kesejahteraan hewan (56,31%), ekologi (55,42%), dan dimensi kelembagaan (50,24%). Dimensi sosial (49,92) dan teknologi (49,05) berada dalam kategori yang kurang berkelanjutan. Nilai indeks keberlanjutan dimensi secara keseluruhan berada dalam kategori hampir berkelanjutan (56,00), menunjukkan bahwa ketersediaan bibit ayam KUB di Malang Raya akan terus stabil dan berpotensi untuk pengembangan lebih lanjut. Atribut yang perlu diperkuat adalah dukungan masyarakat, peningkatan akses pelatihan, biosekuriti, program vaksinasi, dan adopsi teknologi seperti probiotik dan sistem pencatatan produktivitas ternak.

Kata Kunci: Bibit Ayam, Ayam Lokal, Multi-Dimensional-Scaling, Keberlanjutan

ABSTRACT

Melinda PAR, Masyithoh D, Kalsum U, Halfi K, Setiasih, Rohaeni ES, Ariani M, Anggraeny YN. 2025. Sustainability assessment of KUB native chicken breeding stock availability in Malang Raya: A RAP-MDS analysis. JITV 30(4): 219-228. DOI://dx.doi.org/10.1443/jitv.v30i4.3578.

One of the leading commodities in the poultry subsector is native chickens, especially the Kampung Unggul Balitbangtan (KUB) native chicken, which is developed by the Indonesian Agency for Agricultural Research and Development in 2014. The purpose of this study was to analyze the status and condition of the sustainability aspects related to the breeding stock availability of KUB native chickens in Malang Raya, examining it from six dimensions and 29 attributes. Respondents consisted of experienced farmers, extension workers, academics and service officers. The data collection technique was carried out by interviews through a structured questionnaire. The analysis uses the RAP-Multi-Dimensional Scaling (MDS) method to evaluate the sustainability indicators of breeding stock availability. Based on the study results, the dimensions that indicate an almost sustainable status are economic (70.77%), animal welfare (56.31%), ecological (55.42%), and institutional (50.24%). The dimensions social (49.92) and technological (49.05) are in the less sustainable category. The overall sustainability index value of the dimensions is in the almost sustainable category (56.00), indicating that the availability of KUB chicken seeds in Malang Raya will continue to be stable and has potential for further development. The attributes that need to be strengthened are community support, increasing access to training, biosecurity, vaccination program, and adopting technologies such as probiotics and productivity recording systems.

Key Words: Breeding Stock, Native Chicken, Multi-Dimensional-Scaling, Sustainability

INTRODUCTION

Native chickens have adapted to regional environments and traditional farming systems (Depison et al. 2022; Sumantri et al. 2020). These chickens are a local breed widely raised by Indonesian peoples. Due to their resilience and compatibility with conventional, low-input agricultural practices, native chickens serve as an essential genetic and economic asset within rural communities. These chickens make a significant

contribution to food security, rural livelihoods, and small-scale poultry development in Southeast Asia, including Indonesia (Abbasi, et al. 2024). In 2021, the population of native chickens in East Java reached 36.8 million (BPS 2023). One of the superior native chicken developed in Indonesia is the Kampung Unggul Balitbangtan (KUB). The KUB native chicken is the result of six generations of female-line genetic selection by the Indonesian Agency for Agricultural Research and Development (IAARD). KUB chickens have improved productivity traits compared to traditional native chickens, including 160–180 eggs per year, early laying age (22–24 weeks), low broodiness (10%), and an average slaughter weight of 800–900 grams at 10 weeks of age (Bakrie et al. 2021). Differences in egg and meat production potential are brought from different genetics, such as Sentul chickens are another potential local chicken, known as meat-producing chickens with good egg production (Sumantri et al. 2020).

Previous studies have highlighted the importance of breeding stock availability in ensuring the sustainability of the KUB chicken farming system (Antikasari et al., 2023). Sustainability is strongly influenced by the availability and quality of superior genetic stock (FAO 2010). Government institutions play a role in supporting this, the Balai Penerapan Modernisasi Pertanian (BRMP) East Java, located in Karangploso, Malang Regency, was established in 2017 as a regional center for producing and distributing certified KUB breeding stock. This institution plays a strategic role in preventing genetic degradation and ensuring the supply of Day-Old Chicks (DOCs) to farmers in East Java, including the Malang Raya area. Given the importance of breeding stock in the poultry production chain, maintaining both the quality and quantity of superior chicks is essential. The use of genetically superior breeding stock is directly linked to improved productivity and economic returns in poultry farming.

The development of a livestock commodity is highly determined by several factors, especially the availability of breeding stock, balanced feed, disease control, and post-harvest processing and marketing. The results of the study (Setiasih et al. 2021) in the province of East Java showed that the type of KUB chicken breeding business to produce DOC is the most economically feasible, this is because the DOC price of KUB chickens is still higher than other free-range chickens. The market demand for DOC KUB is much higher than other local chickens such as Sentul or Gaok. BRMP as a government institution that plays a role in producing KUB chicken breeding stocks is not able to satisfy market demand, so it has to foster breeders as partners. Therefore, research is needed on the sustainability of the provision of KUB chicken breeding stocks.

Therefore, this study aimed to evaluate the sustainability performance of KUB native chicken breeding stock availability in the Malang Raya, East Java, Indonesia. This research is expected to provide a comprehensive understanding of the current conditions and serve as a reference for BRMP East Java, the Regional Animal Husbandry Services, and other stakeholders in developing sustainable and competitive KUB breeding strategies.

MATERIALS AND METHODS

This study employed a descriptive mixed-method approach that combined quantitative and qualitative data. The research was conducted from March 3 to July 10, 2025, in 18 sub-districts located within Malang City, Batu City, and Malang Regency. These areas were selected purposively as central regions for KUB chicken breeding activities coordinated by the BRMP East Java.

A non-probability, purposive sampling technique was employed, involving 29 respondents selected based on their direct involvement in KUB breeding programs. The primary data were collected using structured questionnaires and face-to-face interviews with farmers, technical officers, academics, and institutional personnel. All respondents are people who are experienced with KUB chickens in their respective fields. Secondary data were obtained from relevant institutions, including BRMP East Java, BBPP Batu, the Central Statistics Agency (BPS), and the Ministry of Agriculture.

The classification of sustainability attributes is based on the dominant effect principle, although some attributes have cross-dimensional relationships (ecology, economic, and social), to avoid overlap between dimensions. This approach is commonly used in RAP-MDS analysis so that each dimension still represents its main sustainability function conceptually and operationally. The ecological dimension reflects the interaction of the KUB chicken breeding system with natural resources and environmental carrying capacity. The animal welfare dimension assesses the fulfillment of the biological needs and natural behavior of KUB chickens. The economic dimension represents the feasibility and stability of the breeding business. The social dimension emphasizes the contribution of the breeding system to the quality of life and social stability of the community. The institutional dimension describes institutional support for the KUB chicken breeding business, while the technological dimension reflects the level of innovation adoption in breeding activities for the sustainability of the breeding business. The analysis focused on six sustainability dimensions, comprising a total of 29 attributes showed in Table 1.

Sustainability analysis was conducted using the Rapid Appraisal for Poultry (RAP-Poultry) method, an adaption of the RAPFISH approach, based on non-metric Multidimensional Scaling (MDS) techniques (Pitcher & Preikshot, 2001; Kifaf et al., 2023). In RAP-

Tabel 1. Dimenssion and Atributes

No	Dimenssion	Atributes
1	Ecological	Availability of Local Feed and Water Sources
		Breeding productivity
		Feed Management Patterns
		The influence of climate conditions
2	Animal welfare	Cage System
		Expressing Natural Behaviors
		Biosecurity protocol
		Vaccination program
		Access to food and drink
3	Economic	Access to KUB breed
		Price Stability & Feed Quality
		Price stability and DOC supply
		Market Demand Stability
		The influence of DOC purity
4	Social	Community support
		Ratio of counseling and training
		Social conflict
		Level of local economic contribution
5	Institutional	The role of extension workers in Partnership institutions
		Regional regulations
		The Role of Extension Workers
		Partnership Institutions
		Capital Institutions
6	Technological	Technology for the use of probiotics
		Productivity system
		Alternative feed processing technology
		Adoption of Modern Technology
		Farm Waste Treatment Technology
		Recording System

MDS, sustainability attributes are transformed into ordination space using Euclidean distance in n-dimensional attribute space. The ordination process aims to minimize the discrepancy between the original dissimilarity matrix and the reduced-dimensional configuration. The squared distance between objects i and j in ordination space is expressed as:

$$d_{ij}^2 = \sum_{k=1}^{m} (x_{ik} - x_{jk})\ 2$$

where $x_{ik}\ and\ x_{jk}$ represent the scoresof object I and j ondimension k and m is the number of ordination dimensions.

The goodness-of-fit of the MDS configuration was assessed using S-stress, which measures the discrepancy between the squared distances in the ordination space and the squared distances of the original input data. Lower S-stress values indicate a better fit, with values below 0.25 considered acceptable. Additionally, the coefficient of determination (R^2) greater than 0.80 was used to assess how well the ordination represents the original data structure.

$$\text{S-stress} = \sqrt{\sum(d_{ij}^2 - d_{ij}^2)2\ / \sum d_{ij}^4}$$

Monte Carlo was used to evaluate the reliability and uncertainty levels of the RAP-MDS analysis results by repeatedly randomizing attribute scores within a predetermined range of values. Monte Carlo validity was evaluated by comparing the sustainability index values generated from the initial MDS ordination with the average sustainability index values from the Monte Carlo simulation results. A difference in index values of less than 5% indicates that the model has good stability and a low level of sensitivity to variations in attribute assessments.

The analysis steps included a) identifying 29 sustainability attributes across six dimensions, b) scoring each attribute using a Likert scale ranging from 1 to 5 (poor to good), c) conducting MDS to calculate the sustainability index values. Sustainability indices and status were categorized as follows: not sustainable (0.00−25.00), less sustainable (25.01−50.00), moderately sustainable (50.01−75.00), and highly sustainable (75.01−100.00), according to (Prabowo et al. 2024). Next step is e) validating the model through stress values and the coefficient of determination (R^2) >0.08, f) applying Monte Carlo simulation to evaluate uncertainty in a difference of less than 5% between the two results indicates acceptable model stability and low sensitivity to scoring errors, g) visualizing results using kite diagrams and classifying sustainability levels, and the last is h) conducting leverage analysis to identify the most sensitive attributes.

RESULTS AND DISCUSSION

The sustainability status indicators of breeding stock availability for KUB native chickens in Malang Raya were analyzed using RAP-Analysis, Monte Carlo, and the Coefficient of Determination (R^2). The Standardized Residual Sum of Squares (Stress) value was also used to determine the percentage of deviation from the initial characteristics, where the smaller the stress value, the smaller the level of deviation (Allaily et al. 2024).

Based on the analysis results shown in Table 1, a comparison of index values between the RAP-MDS and Monte Carlo methods shows a difference of less than 3% in all dimensions. This indicates that the analysis process is free from systematic bias uncertainty with a difference of less than 5%, and the results are stable despite random noise in the data (Kifaf et al. 2023). The Squared Correlation (R^2) value in all dimensions is above 0.91 (R^2 > 0.90) which is close to the maximum number of 1. This indicates that the RAP-MDS model has a very high explanatory ability of the initial data structure, in other words the results of the sustainability mapping are very representative of real conditions in the field. The results of the analysis can be said to explain the level of sustainability of breeding stock availability for KUB native chickens in Malang Raya. The level of deviation of the distance characteristics after ordination, compared to the distance before ordination, measured using stress, shows that all dimensions have a stress value <0.2, with an average ranging from 0.15 to 0.18, which indicates a very low level of data distortion. The stress value measures the extent of the difference between the distance configuration in the input and output of the MDS analysis. A standard stress value <0.25 indicates that the mapping result configuration is valid and can be interpreted, while a value <0.15 is considered very good (Pitcher & Preikshot 2001). Overall, the sustainability index status of breeding stock availability for KUB native chickens in Malang Raya, as depicted in each dimension, is illustrated using a kite chart (Figure 1).

Ecological dimension sustainability index

The ecological dimension obtained an index value of 55.42 (Table 2), placing it in the moderately sustainable category (score 50–75). This value indicates that the ecological aspects of the KUB livestock breeding business have been addressed but have not yet achieved optimal sustainability. Previous related research has been carried out; ecology is one dimension that needs to be considered in implementing sustainable development of KUB chicken businesses in Cianjur Regency (Antikasari et al. 2023).

Attributes considered sensitive to the ecological dimension's sustainability index are shown in Table 2. These include breeding productivity (3.19%), feed management patterns (3.06%), and the influence of climate conditions (3,00%). While the attribute that is not sensitive is availability of local feed and water sources (2,60). KUB chicken breeding productivity is the most sensitive attribute, meaning that breeding productivity has a significant impact on the stability of overall ecology sustainability. This finding aligns with previous research that emphasizes the role of productivity in ecology efficiency (Depison et al. 2022). Low productivity can indicate environmental pressures, such as poor feed quality, inadequate chicken health, or suboptimal rearing conditions. In the context of this study, feed management patterns are a contributing factor to ecological inefficiency. Feed management patterns play a crucial role in ecological impact. Inappropriate feeding frequency, inadequate ratio composition, and the use of environmentally harmful feed materials may increase waste and reduce sustainability. The dominant activity of KUB chickens is feeding; it was identified as the dominant activity among 20-week-old KUB chickens during both morning and evening periods. The proportion of feeding activity was 21.8% in the morning and 21.4% in the evening (Sutanto 2021). This consistent feeding pattern must be effectively managed to avoid feed wastage and negative ecological impacts in Malang Raya area.

Table 2. Sustainability Index Scores, Monte Carlo Validation, Coefficient of Determination (R^2), and Stress Values

Dimensions	Rap Analysis	Monte Carlo	R2	Stress
Ecological	55.42	54.99	0.92	0.19
Animal Welfare	56.31	56.03	0.93	0.17
Economic	70.77	68.77	0.94	0.15
Social	49.92	48.89	0.93	0.16
Institutional	50.24	49.91	0.93	0.17
Technological	49.05	48.88	0.94	0.16
Average	55.29	54.58	0.93	0.17

Source: Prepared by the researcher based on the questionnaire data

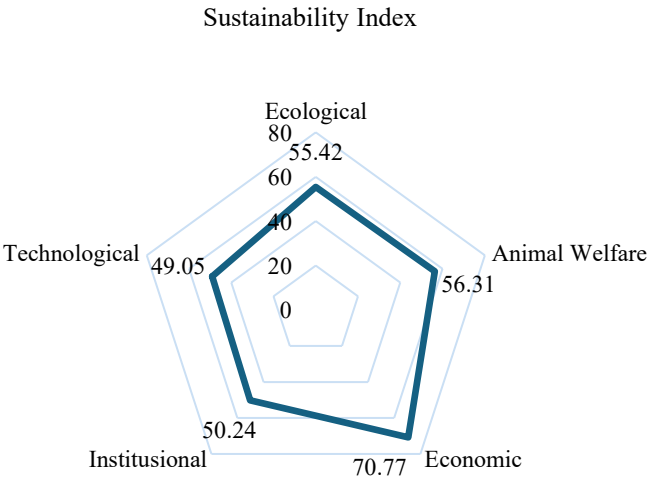

Figure 1. Sustainability Index Kite Diagram

Chicken feed patterns such as feed intake and FCR are affected by climate as chickens are highly sensitive to environmental changes, especially temperature and humidity as chickens have to adapt to heat stress (Kim et al. 2024). Farmers must make feed formulas according to the availability of local feed that changes according to the seasons so that egg production is not disrupted.

Moreover, climate change remains an undeniable factor. A range of previous studies have reported declines in livestock productivity due to rising temperatures, extreme humidity, or seasonal shifts (Osuji et al. 2024; Attia et al. 2024; Alhassan et al. 2024). Therefore, developing climate adaptation strategies remains a critical challenge in enhancing the ecological sustainability of KUB chicken breeding operations. The report from (Wibawa and Pamungkas 2022) on climate change in the Malang Raya area is mainly in terms of temperature, humidity, and rainfall per month during 2014 – 2020 which affects the time of fruit harvest, but there have been no reports of changes in chicken productivity. Climate change causes heat stress that affects the physiological of livestock, water and feed consumption, and immune system thereby reducing chicken production (Attia et al. 2024).

Animal welfare dimension sustainability index

The animal welfare dimension received a sustainability index score of 56.31 (Table 2), placing it in the moderately sustainable category (score 50-75). This score indicates that efforts to implement animal welfare principles have been made, but several challenges remain that need to be addressed to further support sustainability. Animal welfare is closely related to meeting the basic needs of living creatures. Welfare in poultry farming encompasses physical and mental health needs (Silvera et al. 2017; Pasteur et al. 2024).

Attributes considered sensitive are shown in Table 3. include biosecurity protocols (3.66%), vaccination programs (2.95%), and access to feed and water (2.87%). The non-sensitive attributes were Cage System (2.86) and Expressing Natural Behaviors (2.62). Biosecurity protocols rank highest as the most influential attribute.

Weak biosecurity implementation increases the risk of disease and a decline in the physiological condition of chickens, which directly impacts welfare aspects. Biosecurity can be implemented by starting with timely cage cleaning, as it can affect air Insensitive attributes were Cage System (2.86) and Expressing Natural Behaviors (2.62)quality and animal health. To support the sustainability of livestock businesses, monitoring and routine implementation of cage cleaning must be carried out promptly to help prevent the spread of disease, maintain environmental quality, and ensure animal welfare (Subedi et al. 2023; Khattak et al. 2025).

In addition to biosecurity attributes, vaccination programs are also one of the leverage attributes; this is due to the uneven or non-standardization of vaccination programs, which threatens the quality of chicken health and breeding results. Meanwhile, the vaccination program in the KUB chicken breeding farm environment in the Malang Raya area remains inconsistent, and information on its benefits is not fully understood by farmers, despite BRMP providing information and free ND vaccines to farmers who purchase day-old chicks (DOC). In Indonesia, Newcastle disease (ND) remains endemic, as indicated by the discovery of cases throughout the year, due to several factors, including poor vaccine quality, inadequate vaccine storage conditions, and vaccinator errors (Silvera et al. 2017).

Access to feed and water are environmental factors that affect the stress level of KUB chickens. Access to feed and water at KUB breeding farms continues to fall short of meeting the chickens' welfare needs, primarily due to the lack of automated cage systems. This limitation confines feeding and watering to fixed schedules, thereby restricting the chickens' ability to freely satisfy their nutritional and hydration needs. A recent ethological study on KUB chickens revealed that feeding and drinking are the predominant behaviors in both the morning and evening. These patterns reflect the animals' intrinsic drive to achieve welfare fulfillment and physiologically prepare for peak productivity (Sutanto 2021).

Economic dimension sustainability index

The economic dimension achieved a sustainability index value of 70.77 (Table 2). This value places the economic dimension in the category of moderately sustainable towards sustainable, or the upper spectrum of the moderately sustainable value range (50–75). This value indicates that, economically, the KUB chicken breeding business is relatively stable and has the potential to continue developing further. However, several challenges remain to be addressed to achieve optimal economic sustainability. The native chicken farming enterprise is expected to have a beneficial socio-economic impact, considering the relatively small flock size (Asnawi et al. 2023). In a recent study, the analysis of the sustainability of the KUB chicken business, the economic dimension has a high sustainability index of 52.89, which indicates that the economic dimension and its attributes are categorized as sufficiently sustainable, providing a higher opportunity for development to support the sustainability of the KUB chicken business (Antikasari et al. 2023). Attributes that are considered sensitive are shown in Table 3. They include the stability of the DOC price and supply (10.00%), market demand stability (7.37%), and the influence of DOC purity (5.33%). The non-sensitive attributes were price stability and feed quality (0.92) and access to DOC of KUB chickens (3.43).

The stability of the DOC price and supply is the most dominant economic attribute. Its fluctuations have a massive impact on the economic dimension. The breeding farming to produce DOC KUB is the most profitable in the Malang area (Setiasih et al. 2021). The price of DOC KUB is stable at Rp. 7000-7500 in Malang Raya. Supply instability or high prices will disrupt the cash flow of farmers, reduce profits, and increase the risk of loss. Stated that accessibility of breeding stock at stable prices is an essential factor in increasing farmer productivity (Kalangi et al. 2025). The high price of DOC was due to farmers not having direct access to the company, which set several requirements that they had not satisfied, such as deposits and minimum purchase requirements (Kalangi et al. 2025). BRMP has carried out efforts to stabilize the price and supply of KUB chicks through empowering KUB chick farmer groups or breeding centers in several areas of Malang Raya to meet the demand for KUB chicks. In Sukabumi Regency, the multiplication of KUB breeding stock can be done by building breeding centers in each region (Rusdiana 2019).

The stability of market demand also plays a key role. The demand for breeding stock of KUB in the Malang Raya area is relatively high. Farmers have to wait in a long queue to get a DOC. This is because there are not many business actors operating in the DOC breeding sector (Wantasen et al. 2024; Prawiranegara & Mulijanti 2024) The issue of DOC purity's influence is directly related to market perception and trust. As the market continues to doubt the purity of breeding stock, breeders tend to refrain from repeat purchases, switch to other breed stock suppliers, and spread negative perceptions that can systematically reduce demand. Factors influencing the sustainability of KUB chicken business development include the consumer's perspective on purity, variety, egg, and meat quality (Sirajuddin 2007).

Social dimension sustainability index

The social dimension obtained a sustainability index value of 49.92 (Table 2). This value is included in the less

sustainable category (score 26-49), All of attributes that are considered sensitive, as shown in Table 3. include community support (12.16%), social conflict (11.97%), the ratio of counseling and training (10.01%), and the level of local economic contribution (9.75%). Community support is a crucial factor, as community involvement in groups, collaboration between communities, and the exchange of information regarding KUB native chicken breeding have a significant impact on the sustainability status of the social dimension. Cooperation between farmers and groups within a forum or region can increase work productivity, as seen in the case of the KUB chicken breeding business, through the exchange of information, collaboration, and motivation (Prawiranegara & Mulijanti 2024).

Social conflict indicates that social dynamics, such as the presence of farms near residential areas, internal disputes within breeding groups, and conflicts between groups and government agencies, disrupt social cohesion and reduce mutual trust. Based on the questionnaire data, social strife is primarily related to the presence of farms near residential areas, as the breeding farm KUB is a small-scale operation. The negative impact of the KUB chicken business in Cianjur Regency was pollution in the business environment, which disrupted the comfort of the surrounding community (Antikasari, et al. 2023). The ratio attribute of extension and training for breeding reflects that although extension and training activities have been carried out, their coverage is not evenly distributed and has not reached all breeders. Meanwhile, the contribution to the local economy suggests that although breeding activities have benefited the local economy, the benefits have not been evenly distributed throughout the community.

Institutional dimension sustainability index

The institutional dimension achieved a sustainability index score of 50.24 (Table 2). This value is right at the bottom limit of the sustainable category (score 50-75). This score indicates that, although there is a functioning institutional framework, its effectiveness in ensuring the continuity of breeding activities remains weak. Attributes that are considered sensitive are shown in Table 3. They include partnership institutions (3.37%) and regional regulations (3.01%). Insensitive attributes include the role of extension workers in partnership institutions (0.29), the role of extension workers (0.49), and capital institutions (0.01). The availability and effectiveness of partnership institutions (such as the BRMP East Java partner farmer groups) greatly determine the sustainability of the institutional dimension. The productivity of KUB's breeding stock can be sustainable if suppliers or partner farmers are involved in providing DOC and feed at affordable prices through stable and sustainable partnerships (Prawiranegara & Mulijanti 2024). Some forms of partnership that can be carried out are Core plasma, Subcontract, Franchise, agency, or operational agribusiness cooperation in agriculture (Sirajuddin 2007). The regional regulatory institutions share similar values with partnership institutions; however, there is a lack of regional regulations or local policies governing the KUB native chicken breeding process (Apriliyanti et al. 2024). It is still considered insufficiently supportive or not yet implemented, resulting in suboptimal availability of chicks in Malang Raya. There is no pressure from other chicken breeding programs (such as broiler, layer, Arab chickens, etc.) but because KUB chickens are new innovative chickens, it still needs time to be widely disseminated in the Malang Raya area. The breeding of local chickens (Arab and joper chickens) is carried out by small, medium breeders while broiler and layer chicken breeds are carried out by companies (Nugroho 2023).

Technological dimension sustainability index

The technological dimension obtained a sustainability index value of 49.05 (Table 2). This value falls into the less sustainable category (score 26-49); technology in the KUB chicken breeding system is not optimal and has not been able to support overall sustainability. Attributes that are considered sensitive are shown in Table 3. They include technology for the use of prebiotics and probiotics (5.54%), and the productivity recording system (3.07%). Insensitive attributes are alternative feed processing technology (0.59), adoption of modern technology (0.36), farm waste treatment technology farm waste treatment technology (2.37) and recording system (0.36).

The low adoption of this technology has an impact on feed efficiency and makes it difficult to identify factors causing production declines, leading to a reliance on the subjective experience of farmers (Lokman Ali et al. 2020). This technology plays a vital role in increasing chicken endurance, reducing the need for antibiotics, and improving performance naturally (Putra & Humaidah 2022). Probiotics serve as an alternative to antibiotics in a variety of poultry feed ingredients. The provision of immune herbal probiotics in drinking water affects the economic value of KUB2 chicken feed rations (Younas et al. 2025).

The technological dimension in this study emphasizes the adoption of applicable farmer-level technologies, rather than upstream genetic improvement. Although genetic factors influence productivity, they are excluded because KUB native chickens are nationally standardized local chickens, and genetic management is carried out by official breeding centers. Therefore, technology attributes focus on operational practices, including probiotic application, productivity recording,

Table 3. Leverage analysis (The sensitive attributes)

No	Dimension	Attributes	RMS
1	Ecology	Breeding productivity	3.19
		Feed Management Patterns	3.05
		The influence of climate conditions	3.00
2	Animal Welfare	Biosecurity protocol	3.66
		Vaccination program	2.95
		Access to food and drink	2.87
3	Economic	Price stability and DOC supply	10.00
		Market Demand Stability	7.37
		The influence of DOC purity	5.33
4	Social	Community support	12.16
		Ratio of KUB chicken breeding, counseling, and training	10.00
		Social conflict	11.75
		Level of local economic contribution	9.97
5	Institutional	The role of extension workers in Partnership institutions	3.37
		Regional regulations	3.01
6	Technological	Technology for the use of probiotics	5.54
		Productivity recording system	3.07
		Alternative feed and waste processing technology	2.37

Source: Prepared by the researcher based on the questionnaire data

Table 4. The overall sustainability index

Dimensions	Sustainability Index		
	Weight	Dimension Status	Mark
Ecological	0.188	55.42	10.4
Animal Welfare	0.205	56.31	11.5
Economic	0.181	70.77	12.8
Social	0.13	49.92	6.49
Institutional	0.145	50.24	7.28
Technological	0.152	49.05	7.46
Overall Sustainability Index		56.00	

Source: Prepared by the researcher based on the questionnaire data

alternative feed processing, adoption of modern technologies, waste management, and record-keeping systems. Low sustainability scores on the technology dimension indicate that these technologies have not been widely adopted, likely due to limited technical assistance and inadequate training, rather than genetic improvement technologies.

The overall sustainability index value for the dimensions is in the sufficiently sustainable category (56.00), as shown in Table 3, indicating that the availability of KUB chicken seeds in Malang Raya will continue to be sustainable and has potential for further development.

The relatively high sustainability index value for the economic dimension reflects strong market demand, price stability, and the adaptability of KUB native chickens. This makes them economically attractive to farmers. Conversely, the social and technological

dimensions show lower sustainability index values due to limited farmer participation in collective activities, inadequate access to ongoing training, and low technology adoption. Furthermore, in general, farmers still operate with substandard technology. These results indicate that economic viability has developed more rapidly than social readiness and technological capacity. Without strengthening social capital and accelerating the adoption of appropriate technology, the long-term sustainability of KUB parent stock availability may be at risk, even despite favorable economic conditions.

CONCLUSION

Based on the analysis of the sustainability status of breeding stock availability, the KUB native chicken use in Malang Raya falls into a sufficiently sustainable category (56.00). The dimensions of a reasonably sustainable status of breeding stock availability for KUB native chickens in Malang Raya are the economic dimension (70.77%), animal welfare (56.31%), ecological (55.42%), and institutional dimension (50.24%). The dimensions social (49.92) and technological (49.05) are in the less sustainable category. Several sensitive attributes identified as priorities for improvement include biosecurity, vaccination, increasing access to training, and adopting technologies such as probiotics and productivity recording systems, as well as community support and considering regional regulations.

Based on these findings, the following recommendations are proposed to improve the sustainability of KUB chicken breeding systems in Malang Raya. The government should stabilize the market through formal partnerships and supportive regional regulations. Farmers should adopt modern technologies such as comprehensive recording systems, probiotics, prebiotics, and alternative feeds to enhance productivity and flock health. Extension services need to expand their training to focus on biosecurity, vaccination, and reproductive management, addressing social and technological limitations. BRMP can increase the number of satellite farm partners or community-based plasma breeders in the Malang Raya area and develop standardized certification and distribution systems to ensure the quality and availability of breeding stock. Suggestions for future research are the need to include the productivity attributes of nursery in the technological dimension rather than the ecological dimension.

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