El-Hayah

JURNAL BIOLOGI
Journal Homepage: http://ejournal.uin-malang.ac.id/index.php/bio/index
e-ISSN: 2460-7207, p-ISSN: 2086-0064

Original research article

Gecko (Gekko gecko) Captive Breeding Development Strategy In East Jawa

Bugiono[1*], Dadik Raharjo[2], Sri Hidanah[3], Soeharsono[4], Ardianto[5], Boedi Setyawan[6]

[1]*Student in Master Degree of Veterinary Agribusiness, Universitas Airlangga Jawa Timur, Surabaya*
[2]*Veterinary Public Health Division, Universitas Airlangga Jawa Timur, Surabaya*
[3]*Animal Husbandry Division, Universitas Airlangga Jawa Timur, Surabaya*
[4]*Veterinary Anatomy Division, Universitas Airlangga Jawa Timur, Surabaya*
[5]*Accounting Department, Universitas Airlangga Jawa Timur, Surabaya*
[6]*Veterinary Clinical Division, Universitas Airlangga Jawa Timur, Surabaya*

[*]*Corresponding author*
Email: dimas.bugiono@gmail.com
DOI: 10.18860/elha.v9i4.29974

Article Info

Article history:
Received 20 May 2024
Received in revised form
31 August 2024
Accepted 27 September 2024

Key Word:
Gecko,
Captive
Breeding,
Development Strategy

Abstract

Geckos (Gekko gecko) are widely used in traditional Chinese medicine and are reported to have anti-tumor properties. Approximately 93% of reptiles exported from Indonesia come from the wild. The direct and continuous capture of geckos in nature will threaten gecko populations in the future. As an effort to control the possible threat of extinction, the Indonesian government encourages the utilization of this animal through captive breeding activities. The existence of gecko (Gekko gecko) captive breeding units in East Java has not been widely developed and still uses conventional and semi-natural patterns. Periodic evaluations need to be carried out to determine whether or not this breeding activity is feasible and what the development strategy is in the future. This study aims to analyze the strengths, weaknesses, opportunities and threats in order to formulate a business development strategy for gecko breeding in East Java. This research uses a survey method by analyzing and describing the problems in the field, while the technical analysis uses internal factor analysis (IFE matrix), external factor analysis (IFE matrix) and SWOT analysis. Based on the results of the SWOT analysis, the development strategy of the gecko (Gekko gecko) breeding business in East Java includes: maintaining market confidence and maintaining quality and production stability; adjusting government regulations related to gecko trade governance; developing effective breeding methods; adjusting government regulations related to breeding governance; establishing market strategies and production stability to suppress illegal trade; and researching new market potential for gecko trade development.

1. INTRODUCTION

Indonesia is one of the largest wildlife exporting countries in Southeast Asia (Nijman, 2010). Wildlife trade activities, especially exports from Indonesia, reptiles are one of the taxa with large export volumes (Nijman et al., 2012). One of the species that in the last 10 years has a fairly high trade volume is the gecko (*Gekko gecko*). The existence of geckos (*Gekko gecko*) is widely used as a traditional medicine. Gecko is one of the reptiles used as traditional Chinese medicine which is reported to have anti-tumor abilities (Nuryastuti dkk., 2017). Gecko can be used as an additional drug in clinical chemotherapy for malignant tumors, functioning as a tumor inhibitor and enhancing the immune system (You Qi *et al*., 2009). Based on a report from the Ministry of Environment and Forestry, the utilization of dried geckos abroad from 2020 to 2023 is 15,823,800 geckos.

According to Arisnagara (2009), geckos (*Gekko gecko*) are also used as a cure for body itching, eczema, sexual problems, and as a cancer drug. The utilization of this animal is done by consuming gecko meat and can treat types of diseases such as skin diseases and asthma (Sunaryo et al., 2019). The oil content found in the groin of the hind legs of the gecko (*Gekko gecko*) can be used directly for the treatment of eczema.

Geckos (*Gekko gecko*) are one of the species of reptile taxa that have long been utilized as export commodities, with demand tending to increase from year to year. According to Arisnagara (2009) about 93% of reptiles sold by reptile traders from Indonesia come from the wild. The direct and continuous capture of geckos in nature will threaten gecko populations and ecosystems in the future. Such activities have a negative impact on the sustainability of geckos (*Gekko gecko*) in the wild. Excessive hunting of geckos in the wild will threaten gecko populations. As an effort to control the possible threat of extinction, the Indonesian government encourages the utilization of this animal through captive breeding activities.

Captive breeding is an effort to propagate through breeding and enlargement of wild plants and animals while maintaining the purity of their species (Kementerian LHK, 2024). Geckos (*Gekko gecko*) are wildlife that have not been domesticated, so gecko breeding efforts are still relatively low. Captive breeding activities are ex-situ conservation efforts and as a business unit that can be carried out and developed as a source of income in supporting the improvement of community welfare. Optimizing breeding activities is one way to reduce pressure on population utilization in nature.

In East Java, there are 6 geckos captive breeding units. This breeding activity is expected to have a positive impact on the trade and circulation of geckos at home and abroad and to reduce the exploitation of geckos from nature. The existence of gecko breeding units in East Java has not developed much and still uses conventional patterns and is semi-natural and still applies different breeding patterns and stages between captive breeding units with different results. Some of the problems faced in the gecko captive breeding include; 1) high operational costs, 2) long enlargement of geckos, 3) gecko smuggling, and 4) long government regulations. Periodic evaluations need to be carried out to determine whether or not this breeding activity is feasible and what the development strategy is so that this business unit provides benefits for the welfare of the community both ecologically and economically

This research aims to analyze internal and external factors in order to formulate a better gecko captive breeding development strategy in East Java.

2. MATERIALS AND METHODS

The research used a survey method by analyzing and describing the problems in the field. The research sample was carried out by

purposive sampling with the consideration that the breeder was able to breed geckos (*Gekko gecko*). The number of samples was 6 gecko captive breeding units located in East Java Province, that is captive breeding units UD. Andira Alternatif and UD. Dua Saudara in Probolinggo district, captive breeding units of CV. Sri Mulya Jaya and UD. Karya Reptil Sentosa in Sidoarjo District, captive breeding unit CV. Semelo Alam Lestari in Jombang and captive breeding unit UD. Bina Usaha Mandiri in Kediri District.

The research analysis technique consists of two stages. The first is input by analyzing internal and external factors using the IFE (*Internal Factor Evaluation*), EFE (*External Factor Evaluation*), and IE (*Internal-External*) matrix. Second is the SWOT (*Strenght, Weaknesses, Oppurtunity, Threats*) analysis stage to find alternative development strategies. Systematically, the SWOT matrix strategy is carried out with SO, WO, ST and WT strategies. OT strategies are carried out to analyze external/external factors, while S and W identify internal/internal factors of a company organization (Fauzi, 2019)

The Internal Factor Evaluation Matrix is a strategy formulation tool that summarizes and evaluates the main strengths and weaknesses in the functional areas of the business and also provides a basis for identifying and evaluating the relationships between these areas. This matrix is compiled to determine how good the internal state of the company is, seen from the strengths and weaknesses possessed (Umar, 2005).

The External Factor Evaluation Matrix aims to evaluate the company's external factors that are considered opportunities and threats (David, 2013). The External Factor Evaluation Matrix is compiled to determine how well the company responds to the opportunities and threats it faces. This matrix will be used together with the internal factor evaluation matrix in the preparation of the external internal matrix (David, 2013).

SWOT analysis is used to develop company strategies by combining the strengths and weaknesses possessed by the company that are adjusted to the opportunities and threats faced by the company. Determination of SWOT analysis is carried out after knowing the strengths, weaknesses, opportunities, and threats obtained from the identification of the IFE matrix and EFE Matrix (David, 2006).

3. RESULTS and DISCUSSION

Internal Factor Analysis (IFE)

Based on the IFE matrix above, it can be seen that there are 5 strengths and 5 weaknesses owned by gecko captive breeding units in East Java. Internal factor analysis is carried out using the IFE (*Internal Factor Evaluation*) matrix with the following results:.

Table 1. Internal Factors Evaluation of Gecko Captive Breeding Development Strategies in East Java Matrix

No	Description	Weight	Rating	Score
(*Strength* - S)				
1	High egg-laying frequency	0,1130	3,33	0,3766
2	Production stability	0,1073	3,17	0,3399
3	Product quality	0,1243	3,67	0,4557
4	Experience in captive breeding activities	0,1299	3,83	0,4981
(*Weakness* - W)				
1	Long rearing period to maturity	0,1356	4,00	0,5424
2	High tiller mortality	0,1243	3,67	0,4557
3	High operational cost	0,1356	4,00	0,5424
4	Utilization only in dry and puppet form	0,1299	3,83	0,4981
Total		**1,00**		**3,71**

External Factor Analysis (EFE)

The EFE matrix is used to summarize the opportunities and threats to a business, in this case a gecko breeding business. The EFE matrix analysis goes through the same calculations as the IFE matrix, namely the calculation of weights and rating each factor. External factor analysis was carried out using the EFE (*External Factor Evaluation*) matrix for geckos (*Gekko gecko*) in East Java, with the following results:

Tabel 2. External Factors Evaluation of Gecko Captive Breeding Development Strategies in East Java Matrix

No	Description	Weight	Rating	Score
(***Opportunities*** **- O)**				
1	High market potential	0,1131	3,17	0,3581
2	Product advantages	0,1071	3,00	0,3214
3	Low local competition	0,1190	3,33	0,3968
4	Government regulation	0,1310	3,67	0,4802
(***Threat*** **- T)**				
1	Price fluctuations	0,1429	4,00	0,5714
2	Business competition	0,1190	3,33	0,3968
3	Weak Consumer Loya	0,1250	3,50	0,4375
4	Illegal trade	0,1429	4,00	0,5714
	Total	**1,00**		**3,53**

Internal-External Analysis (IFE-EFE)

Identification of altrnative strategies is carried out at this stage, through the stage of matching input information in the form of internal factors and external factors. According to David (2006), identification and matching only use Strengths, Weaknesses, Opportunities, and Threats. The matching stage uses the IE (Internal External) Matrix. The input used in the IE (Internal External) matrix is the total score of the IFE and EFE matrices. The total IFE score is placed on the vertical axis and the total EFE axis score is placed on the horizontal axis. The total value of the IFE score in gecko breeding in East Java is 3.71 and the total EFE score is 3.53. The meeting point of the two axes is in cell - I

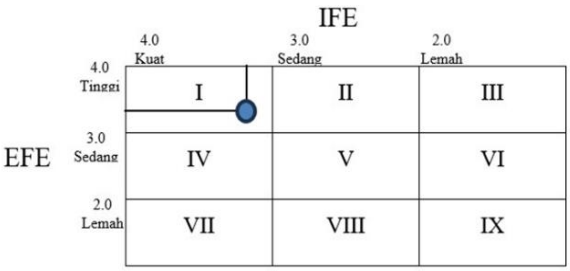

Figure 1. Internal – External Matrix

SWOT Matrix

Alternative strategies for developing captive breeding activities were analyzed using a SWOT matrix. The first step is to identify the Strengths, Weaknesses, Opportunities, and Threats that can occur in the gecko utilization business. The SWOT matrix in table 3.

4. DISCUSSION

Internal Factor Analysis (IFE)

The *Internal Factor Evaluation* (IFE) matrix aims to determine how big the role of internal factors contained in a business (David, 2013). Based on the *Internal Factor Evaluation* (IFE) Matrix, it can be seen that the main strength factor in gecko breeding in East Java is experience in breeding activities with a score of 0.4981. It can be explained that the experience of breeding activities is the basic capital and ability of professionalism in breeding and utilizing the results of gecko (*Gekko gecko*) breeding which includes the length of time trying and the ability to master, breeding methods and markets. Some gekco captive breeding units in Probolinggo have been operating since 2005 or for 19 years and have utilized their nursery products for export.

Teble 3. SWOT Strategy Matrix for Gecko Captive Breeding

		(***Strength*** **- S)**		(***Weakness*** **- W)**	
	Internal Factors	S.1	High reproductive frequency	W.1	The production period from sapling to maturity and ready to harvest is quite long
		S.2	Harvesting and Sale of captive-bred geckos based on the Maximum Utilization Limit (BMP) set annually	W.2	High percentage of pup to adult mortality
		S.3	Quality of geckos for trade is guaranteed (size, health and breeding certified)	W.3	High breeding operational costs
External Factors		S.4	Keeper has good breeding skills and experience (more than 5 years)	W.4	Products sold that are traded are limited to dried geckos in puppet form.
(*Opportunities* - O)		**(*Strengths-Opportunities*)**		**(*Weakness-Opportunities*)**	
O.1	High market potential for Chinese traditional medicine (TCM) needs	1.	Maintain trust and market dominance by maintaining product quality and gecko production stability (S1+S2+S3+S4+O1+O2)	1.	Developing efficient breeding methods, making alternative artificial feeds to reduce operational costs to increase gecko productivity in order to fulfill market needs (W1+W2+O1+O2)
O.2	Product advantages (effective in curing various diseases)	2.	Encourage government regulations that support the management of the gecko trade as a superior commodity so that it can be ecologically and economically beneficial (S3+S4+O3+O4)	2.	Encourage government regulations regarding governance and breeding methods, diversification of gecko products and their derivatives in order to fulfill market needs (W1+W2+W3+W4+O1+O2+O3+O4)
O.3	Competition in local gecko breeding businesses is low				
O.4	Government regulations on gecko breeding and trade management				
(*Threat*- T)		**(*Strengths-Threats*)**		**(*Weakness- Threats*)**	
T.1	Gecko price fluctuations are quite high	1.	Establish market pricing strategies and maintain production stability to face	1.	Research on potential new markets and diversification of gecko

T.2	Competition in the gecko trade from other countries	competition and suppress illegal trade (S1+S2+S3+S4+T1+T2+T3+ T4)	products and their derivatives (W1+W2+W3+W4+T1+T 2+T3+T4)
T.3	Weak customer loyalty		
T.4	Illegal trade		

Second place with a score of 0.4557 is product quality. Product quality is the minimum standard of production of geckos (*Gekko gecko*) used for export, starting from legality and size standards required by consumers and government regulations. Geckos (*Gekko gecko*) are exported in the form of dried geckos in the form of puppets with a minimum Snout-vent Length (SVL) of 15 cm and a minimum chest span of 11 cm. The wider the chest span, the skin is not damaged or torn, and the tail is intact, the more expensive the price. The administration and licensing process is complete with legal origin. As part of this quality assurance, the owner of the company escorted several times to ensure the delivery process was in accordance with the agreement.

The third place is occupied by the frequency of reproduction is quite high with a score of 0.3766. In the reproduction process, house geckos (*Gekko gecko*) in the reproduction process on average in one year lay eggs 5 to 6 times with an average number of eggs of 2 eggs depending on the quality of feed and supplements provided. According to Kurniati (2023), in one year, females produce an average of 12 eggs from six lays. The hatching rate at optimal temperature (28°C-30°C) is 90% within 60 to 90 days. This high egg-laying frequency is a strength for the company to increase the production of gecko pups until maturity (harvest age).

The fourth order of strength in gecko breeding in East Java is Production stability with a score of 0.3399. This strength is the company's ability to produce gecko products (*Gekko gecko*) in accordance with the established plan. Each company unit has compiled and proposed a captive production plan each year which is then determined by the Director General of KSDAE, Ministry of Environment and Forestry on the recommendation of BRIN and forms the Maximum Utilization Limit (BMP). With the establishment of this Maximum Utilization Limit (BMP), the guarantee of production stability for needs will remain available both in quantity and quality.

The main weaknesses of the gecko captive breeding business in East Java are the long production period from pups to adults and the high production costs with a score of 0.5424. According to Fauzi (2022), the average Snout-Vent Length (SVL) growth of geckos (Gekko gecko) in 24-week-old males is 70.77 mm and females are 73.02 mm. Utilization of captive breeding geckos (*Gekko gecko*) is carried out at the age of approximately 13 months with a chest span width of 11 cm and SVL of 15 cm for export needs. The growth of gecko pups from pups to adults based on the results of research by Fauzi and Hamidy (2022) averaged 1 cm in 1 month, so it takes a long time to utilize this captive breeding gecko. This long production period will have an impact on high production costs, especially the need to provide food and labor. The eating behavior of geckos (*Gekko gecko*) requires feed in a live condition and the easiest feed to obtain is crickets at a fairly expensive price in addition to the provision of cage infrastructure and human resource needs that require special skills.

The second weakness is that geckos are sold to fulfill market needs in dry form in the form of puppets with a score of 0.4981. The products needed by the market from this gecko breeding are only in dry form in the

form of puppets of various sizes ranging from 10 cm to 16 cm chest width, the wider the chest span, the more expensive the price. There is no diversification of gecko products and their derivatives so that the gecko trade has not reached more countries and is only limited to China.

The third weakness is that mortality of juveniles to adults is quite high with a score of 0.4557. Gecko deaths are caused by various causes, such as high temperatures, stress, injury, or disease. Susilo and Rahmat (2010) explain that the ideal habitat for geckos is at the required temperature, which is around 32°C. The mortality rate of gecko pups to adults is quite high, especially when there is extreme weather and it is too cold, which can cause the death of pups, especially at the age of 1 to 3 months.

External Factor Analysis (EFE)

The EFE (*External Factor Evaluation*) matrix aims to evaluate the company's external factors that are considered opportunities and threats. (David, 2013). The main opportunity in the gecko captive breeding business in East Java is government regulation with a score of 0.4802. The government has facilitated and provided opportunities for every Indonesian citizen to utilize wild plants and animals in order to improve their welfare through the issuance of various regulations and policies on the utilization of wild plants and animals.

The second order of opportunities for gecko captive breeding is that domestic breeding business competition is still low with a score of 0.3968. The level of competition in the trade of gecko species (*Gekko gecko*) from breeding in Indonesia is still low. This can be conveyed that in Indonesia there are only 11 gecko captive breeding units (*Gekko gecko*) and 7 units are in East Java, but of the 7 units only 6 units have carried out their breeding activities until now.

The third opportunity is high market potential with a score of 0.3581. The main target market for captive breeding geckos (*Gekko gecko*) is China for the needs of traditional Chinese medicine (TCM) which has quite high demand. Based on the report of the Ministry of Environment and Forestry, the utilization of geckos in dried form originating from nature in 2020 to 2023 was 15,823,800 throughout Indonesia and 3,926,400 from East Java or 24.81% of the national quota.

The fourth opportunity is product excellence with a score of 0.3214. Geckos (*Gekko geckos*) are known to have many benefits for curing diseases, especially for asthma, eczema and even for curing tumors, so they are widely known in several countries, especially China. The trade of geckos (*Gekko gecko*) is required by the destination country, namely with the code C (Captive). This code states that the traded commodity is the result of controlled captive breeding and has been technically certified for its breeding. Each breeder must be able to provide products according to the size required by consumers.

The biggest threats to captive breeding are smuggling and price fluctuations with a score of 0.5714 each. The high level of smuggling and illegal trade in animals, especially dried geckos, will affect price fluctuations in the international market, because commodities are traded at lower prices and greatly affect the rate of marketing. Prices are often unstable due to the number of illegal commodities flooding export destination countries.

The second threat is weak consumer loyalty (importers) with a score of 0.4375. There is potential for importers to compare the price of geckos (*Gekko gecko*) from Indonesia with prices from other exporting countries that may offer cheaper prices because they are supported by easy accessibility via land routes to China.

The third threat is business competition with a score of 0.3968. The existence of competitors from neighboring countries that have the same natural resource characteristics as Indonesia and have cheaper and closer access to the destination country (China).

Internal-External Analysis (IFE-EFE)

The results obtained from the IFE and EFE matrices of the gecko captive breeding units state that the total score of the IFE matrix is 3.71 and the EFE matrix is 3.53. This puts the three gecko captive breeding units in cell I or in the high category. Market penetration and product development efforts through expansion of market share, marketing cooperation with importers of destination countries to the development of breeding with community involvement is one form of alternative penetration that can be applied as an alternative strategy in the development of gecko breeding businesses.

SWOT Matrix

The SWOT matrix is a method for formulating strategies and determining alternative strategic choices to be carried out. Not all of these alternatives are determined as a strategic plan that will be implemented (Rangkuti, 2011). The SWOT matrix is an important matching tool that helps managers develop four types of strategies: SO strategy, WO strategy, ST strategy and WT strategy. Matching the key external and internal factors is the most difficult part of developing a SWOT matrix and requires good judgment and there is no single correct mix.

The results of the SWOT matrix analysis of gecko captive breeding units in East Java are as follows:

1) The SO strategy (*Strengths-Opportunities*) utilizes the internal strengths of gecko captive breeding to take advantage of external opportunities. Alternative strategies that can be used are first to maintain trust and market dominance by maintaining product quality and stability of gecko production, Second, encouraging government regulations related to gecko trade governance as a superior and ecologically and economically profitable commodity
2) *The* WO strategy (*Weaknesses-Opportunities*) aims to improve internal weaknesses by taking advantage of external opportunities. Alternative strategies that can be used are first developing efficient breeding methods, making alternative artificial feed to reduce operational costs to increase gecko productivity in order to meet market needs and second encouraging government regulations related to governance and breeding methods, diversification of gecko products and their derivatives in order to meet market needs.
3) *The* ST strategy (*Strengths-Threats*) uses a company's strengths to avoid or reduce the impact of external threats. This does not mean that a strong organization must always face threats directly in the external environment. Alternative strategies that can be used are setting a market price strategy and maintaining production stability to face competition and suppress smuggling.

5. CONCLUSION

Based on the results of the Internal Factor Evaluation and External Factor Evaluation matrix analysis, the highest strength in gecko (Gekko gecko) captive breeding business activities in East Java is experience in the breeding business (score 0.4981) and the biggest weakness is the high production period of pups to adults and high production costs (score 0.5424), while the biggest opportunity is government regulation (score 0.4802) and the biggest threat is smuggling (score 0.5714).

Alternative strategies that can be applied in order to develop gecko captive breeding in East Java include: maintaining market confidence and maintaining quality and production stability; adjusting government regulations related to gecko trade governance; developing effective captive breeding methods; adjusting government regulations related to breeding governance; establishing market strategies and production stability to suppress illegal trade; and researching

potential new markets for gecko trade development.

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