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Guinea Fowl Production in Africa: Economic Importance and Constraints

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Abstract

THIS REVIEW explores the role of guinea fowl production in addressing poverty, food security, economic growth, and infrastructure development in rural African communities as well as the constraints to guinea fowl production in the African continent. The unique characteristics of guinea fowls, such as their adaptability and efficient foraging abilities, make them a cost-effective and sustainable option for poultry production. The nutritional value of guinea fowl meat and eggs can significantly contribute to combating protein deficiency and malnutrition in underprivileged communities. The integration of guinea fowl farming into agro-pastoral practices can create employment opportunities and improve the financial standing of low-income households. However, major constraints to guinea fowl production is a barrier for commercialization and sustainable development of this sector. In this review, it was revealed that the majority of farmers in Africa keep guinea fowls as backyard poultry or for small-scale production with limited production inputs. Poor nutrition, choice of production method, and poor housing structures are the major constraints to guinea fowl production. The extensive scavenging method is the most common production method for guinea fowls, with cereals and kitchen waste used as supplements when necessary. Guinea fowls are mostly housed in traditional poultry shelters, while some birds roost on trees and other structures. Egg losses, predation, diseases, and parasite infestation are common issues with indigenous guinea fowls. Indigenous guinea fowls are characterized by lower egg production, poor fertility and hatchability, longer duration of sexual maturity, poor growth and development, and longer production periods.
This review therefore aims to investigate the importance and constraints to guinea fowl production in Africa.

Keywords: Africa, Constraint, Food security, Guinea fowl production, Rural development, Sustainable development goals.

Introduction

Sustainable Development Goals (SDGs) 1 and 2 aim to eradicate poverty and ensure zero hunger, respectively. In the African context, achieving these goals is a complex and ongoing struggle, with agriculture playing a pivotal role. Despite some progress, a significant portion of Africa's population still lives below the global poverty line, making poverty reduction (SDG 1) a key challenge. Social and economic sustainability efforts, as outlined in corporate social responsibility (CSR) plans-such as creating employment, improving access to basic services, and promoting education and skills development-are essential for alleviating poverty [1]. However, persistent challenges hinder the realization of SDG 1.

Agriculture is a central sector in the fight against hunger and malnutrition, which aligns with SDG 2. Yet, climate change poses a significant threat to agricultural systems, impacting food production and availability [2]. Africa's struggle to address these climate-induced challenges further complicates efforts to achieve zero hunger, as poverty and food insecurity are often deeply intertwined [3]. Rural communities, in particular, face greater vulnerability, exacerbating these challenges.

To address these intertwined issues of poverty and hunger, sustainable agricultural practices, alongside education and technology, are vital. Beyond SDGs 1 and 2, agriculture also promotes improved health (SDG 3) by providing nutritious food, reducing malnutrition, and enhancing overall

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well-being [4]. In rural Africa, integrating agricultural development with SDGs 1, 2, 8, and 9 underscores the close relationship between poverty, food insecurity, and economic growth. Rural communities, especially in low-income countries, experience limited economic opportunities, unemployment, income inequality, and infrastructure deficits. With agriculture constituting 21% of Africa's GDP, it remains a critical driver of employment and rural development [5].

Sustainable agricultural practices can foster long-term poverty reduction by improving soil health, water management, and biodiversity preservation [7]. Increased agricultural productivity leads to greater access to nutritious food, which helps address hunger and malnutrition, key factors contributing to overall health and well-being.

Within agriculture, poultry production—particularly guinea fowl farming—emerges as an essential contributor to food security and nutrition. Despite the persistence of malnutrition and protein deficiency across Africa, guinea fowl farming offers a solution by providing high-quality protein, essential vitamins, and minerals, crucial for combating undernutrition and stunted growth [8, 9, 10]. Additionally, guinea fowl farming generates employment opportunities, fostering economic growth in rural areas (SDG 8) [9, 10]. Due to its relatively low investment requirements, guinea fowl farming is accessible to small-scale farmers and resource-limited communities, making it a sustainable option for improving food security with smaller ecological footprints and shorter breeding cycles [8, 11].

Recent years have seen the poultry industry, including guinea fowl production, drive technological innovations and infrastructure improvements in farming communities [12]. Guinea fowl farming has become recognized as a viable solution for addressing protein deficiency in Africa, with its production systems praised for their potential to reduce poverty, empower women, and improve food security [14]. These birds are not only adaptable and resilient but also cost-effective to raise, offering a sustainable source of nutrition for rural households [17].

Guinea fowl farming directly contributes to SDG 1 (Zero Poverty) by providing a source of income for rural households, thereby reducing poverty levels [18, 19]. In line with SDG 2 (Zero Hunger), guinea fowl meat and eggs can significantly improve nutrition and food security, especially in resource-limited regions [20, 21]. Furthermore, the expansion of guinea fowl farming supports SDG 8 (Decent Work and Economic Growth) by improving the financial standing of low-income households [21, 22], while contributing to SDG 9 (Industry, Innovation, and Infrastructure) by promoting the development of the poultry industry in vulnerable communities [18].

Guinea fowl's adaptability and high nutritional value make them a key asset in both domestic and international poultry markets. Their cost-effectiveness, seasonal reproductive patterns, and disease resistance set them apart from other poultry species [19]. Small-scale guinea fowl production has the potential to improve the financial, nutritional, and health status of low-income households in Sub-Saharan Africa [24].

Globally, non-chicken poultry species, including guinea fowl, account for 2% of global poultry meat production, with Africa leading in their production [107]. Guinea fowl farming plays a crucial role in the nutrition and livelihoods of rural populations across Africa, particularly in countries like Zimbabwe, Ghana, South Africa, Nigeria, Togo, and Benin. Production is typically small-scale, involving cage, semi-intensive, or free-range systems, which contribute approximately 37% to the GDP and over 85% of the earnings in many developing economies [25]. Additionally, guinea fowl plays a central role in cultural practices, such as dowries and ceremonial offerings, further embedding its socio-economic significance in African societies.

Despite the growing demand for guinea fowl meat in several African countries, challenges persist, hindering the sustainable development and large-scale commercialization of guinea fowl production. This review aims to comprehensively examine the economic relevance of guinea fowl farming in Africa, highlighting both its opportunities and the constraints that impede its growth.

Adaptability

Guinea fowls, known for their adaptability to diverse climatic conditions, emerge as a resilient and economically significant poultry option. Dong Xuan et al. [40] emphasize the adaptability of guinea fowl, highlighting their suitability for various environments. The ability of guinea fowls to thrive without sophisticated housing structures positions them as a practical choice, particularly in resource-limited settings. A key aspect of guinea fowl adaptability lies in their foraging behavior, allowing them to scavenge freely and utilize their natural instincts for food procurement [41]. This behavior significantly contributes to the cost-effectiveness of raising guinea fowl, making them an economically viable option. The versatility of guinea fowl's diet further enhances their economic importance. Their ability to consume a wide range of plants and animals available in their surroundings reduces dependence on commercial feed sources, making them an optimal choice for individuals with limited resources [24]. This adaptability aligns seamlessly with the integration of guinea fowl into crop-livestock farming systems, promoting holistic and

sustainable agricultural practices [24]. In addition to their dietary flexibility, Guinea fowl exhibit remarkable resistance to common poultry illnesses, particularly viral diseases. This resilience, substantiated by empirical evidence in agricultural studies [42], solidifies guinea fowl's reputation as hardy birds, meaning they are more resilient to common poultry diseases. in the poultry industry. The documented resistance contributes to their sustainability and value in poultry farming systems.

The economic attractiveness of guinea fowl is further emphasized by their rusticity, precocity, and low production costs, making them an appealing option for meat production [43]. This economic advantage positions guinea fowls as a more profitable alternative compared to other poultry, underlining the pivotal role of their resistance and adaptability in ensuring profitability in guinea fowl production.

Poverty Reduction through Commercialization

Guinea fowl production, with its economic significance, plays a crucial role in poverty reduction through commercialization. The multifaceted contributions of guinea fowl farming to income generation, livelihood enhancement, and economic resilience cannot be understated. Guinea fowl serves as a vital source of income for rural households, providing financial stability, particularly during the dry season [44]. The practice of small-scale poultry production, notably guinea fowl, is prevalent among low-income households in sub-Saharan African countries, offering an accessible means to diversify dietary options [28]. In resource-limited settings, guinea fowl production emerges as a commercial opportunity, significantly contributing to total rural poultry income [45, 46]. In Northern Ghana, guinea fowl farming proves sustainable, making substantial strides in poverty reduction [28]. The meat and eggs of guinea fowl contribute not only to local food security but also address nutritional needs, mitigating poverty-related vulnerabilities [47]. Rural intervention programs, exemplified in Northern Ghana, underscore the efficacy of guinea fowl farming in poverty alleviation initiatives [48]. Additionally, the growth of guinea fowl farming stimulates economic development, fostering entrepreneurship and creating employment opportunities in promoted regions [48].

Guinea fowl farming emerges as a powerful tool in the fight against poverty, showcasing its potential through income generation, livelihood diversification, and contributions to local economies. The evidence presented in this literature review emphasizes the need for continued support and promotion of guinea fowl production for sustained economic development in resource-constrained regions.

Resilience via Diversification and Cash Generation

In regions with tropical climates, such as Benin, guinea fowls have become economically advantageous due to their ability to thrive in traditional farming systems [49]. By raising guinea fowls, farmers can supplement their income by selling eggs and, to a lesser extent, meat [18, 50]. Guinea fowl production serves as a source of ready cash for investment in crops production and the purchase of grains to bridge the gap in food shortages [51]. There is evidence that suggests that guinea fowls are used as watchdogs on plantations, contributing to individual and social wealth generation [20]. This diversification, especially in rural communities, provides a buffer against fluctuations in other agricultural sectors [52]. Guinea fowls are known for their prolific egg-laying abilities, and the sale of eggs can become a significant source of cash income for farmers [18]. The consistent egg production contributes to a stable and reliable cash flow, thereby enhancing the financial stability of farming households [53]. While egg production is the primary focus, guinea fowl meat is an additional income source, though less frequently [39]. Guinea Fowl production has an economic efficiency level in constrained environmental conditions, which implies that they are more resilient than chickens and are less likely to make farmers bankrupt [54]. Farmers can take advantage of the sale of guinea fowl meat during specific periods, providing a supplementary source of cash when needed [55]. Farmers can benefit from a diverse range of income sources by engaging in guinea fowl production, thereby improving their overall financial well-being.

Undervalued but Nutritionally Important

Protein deficiency is a prevalent issue in African populations, with overall protein intake falling below 10% of energy intake in most sub regions, except for North Africa [56, 57, 58]. Studies indicate that Africa has the highest prevalence of protein deficiency globally, leading to increased child malnutrition. Policymakers are focusing on promoting short-cycle animals such as poultry to address this issue [56]. Guinea fowl meat is a nutritionally superior alternative to other poultry meats, with a higher protein content (23%) and lower fat content (4%) compared to chicken meat (21% fat) [59, 60, 61]. Additionally, guinea fowl meat is more edible after cooking (80%) compared to chicken meat (65%) [59, 60, 61]. Therefore, guinea fowl meat offers a valuable solution to protein intake deficiency in Africa. In West Africa, rural family farmers dominate poultry farming, which includes small flocks of various species, such as guinea fowls, which plays a significant role in livelihoods and income generation [28]. Integrating the sustainable harvest of wild guinea fowl into local diets can enhance protein intake and address malnutrition [62]. Promoting domesticated guinea fowl production also

aligns with sustainable agriculture and contributes to food security and improved nutrition [48].

Potential Economic Importance of Guinea Fowl

Guinea fowl production is a vital economic activity in Africa that aligns with the principal objectives of diversification, food security, poverty reduction, sustainability, and economic growth.

Diversification of Livelihoods: Guinea fowl farming provides sustainable income diversification in many African regions. This is a best practice in reducing economic vulnerability by avoiding over-reliance on a single income source.

Indigenous Knowledge Utilization: This practice frequently employs indigenous knowledge, reflecting the best practice in sustainable resource utilization. Local communities incorporate traditional wisdom into guinea fowl production, which enhances resilience in environmental and economic challenges.

Food Security Promotion: Guinea fowl plays a significant role in local food security by providing meat and eggs as a valuable source of food. This aligns with the best practice of addressing nutritional needs and improving overall community well-being.

Evidence-Based Decision-Making: Rigorous studies on guinea fowl production offer valuable insights into productivity, challenges, and socioeconomic impact. This evidence-based approach supports informed decision-making at both the local and national levels.

Inclusive Development: Guinea fowl production promotes inclusive economic development by reducing poverty, empowering local communities, and creating opportunities for entrepreneurship and employment.

Monitoring and Reporting: Continuous monitoring and reporting on guinea fowl farming's progress are necessary for tracking its economic contributions. This aligns with the best practice of strategic progress reporting, ensuring accountability and transparency in the sector.

Constraints to Guinea Fowl Production in Africa

In Africa, the problems faced by guinea fowl owners are enormous to the extent that it deters farmers from transitioning into large-scale commercial production as well as deterring investors. The growth and carcass traits, reproductive and hatching traits of the indigenous African guinea fowls are affected by factors such as inadequate nutrition, housing, and environmental stimuli, serving as a greater barrier to sustainable commercial guinea fowl production.

Production, and Performance Traits of Indigenous African Guinea Fowls

The age at which guinea fowls attain sexual maturity is influenced by several factors, including genetic strain and prevailing climatic conditions. [28].

In Burkina Faso, males typically reach sexual maturity at around 26 weeks, while females reach it at approximately 30 weeks [63, 64]. However, in Niger, Moussa Amadou et al. [65] reported that the age of sexual maturity was 32 weeks. In traditional systems in Benin, Nigeria, and Algeria, the age at sexual maturity has been reported to vary between 32, 36, and 37 weeks, respectively [66, 67, 68]. According to Zvakare et al. [22], in the Chipinge district of Zimbabwe, guinea fowls started laying eggs at 39 weeks. Soara et al. [38] also reported that in the Dry Savannah and Atakora agroecological zones of northern Togo, the age of sexual maturity was 7.1 ± 1.3 months and 7.2 ± 1.3 months for males and females, respectively. Similarly, Saina [37] reported that the age of sexual maturity for guinea fowls in the Guruve District of Zimbabwe was 9 ± 2 months.

In Ghana, [69] observed that guinea fowls started egg-laying at 24 weeks of age, with fertility and hatching rates of 59.6% and 82.2%, respectively. Konlan et al. [70] reported that during October, November, and December, the hatchability of guinea fowl eggs was 69%, 66%, and 18%, respectively. Other authors reported hatchability rates of 64%, 68%, 70%, or 88% [37, 71, 72, 73]. Furthermore, the fertility rate was observed to be 84.4%, with embryonic mortality varying between 11.2% and 17.3% [74]. The incubation duration was reported to vary between 26–28 days [29, 63, 67, 69], with hatching rates between 80–93% [66, 67].

Orounladji et al. [36] confirmed that in Benin, the age at sexual maturity for guinea fowls ranged between 6–7 months, and the incubation period varied between 26–29 days, with an average hatchability of 74%. Another survey during the 2001/2002 breeding season revealed that the fertility of guinea fowls in Zimbabwe was 89%, with a hatchability of 64% [75]. In DR Congo, [76] reported an interesting scenario where the hatchability of guinea fowl eggs incubated by local chickens was 71.15%, while the hatchability of those incubated artificially was 57.86%. In Ghana, the fertility of guinea fowl eggs from the Upper West, Upper East, and Northern regions was 82%, 77.4%, and 80.4%, respectively [77]. Atawalna et al. [78] reported that in the Kumasi region of Ghana from 2011–2018, the fertility rate, total hatchability, hatchability of fertile eggs, and embryonic mortality of indigenous guinea fowls were 50.7%, 30.5%, 50.4%, and 22%, respectively.

Saina et al. [73] observed that during the 2000–2003 breeding season in Zimbabwe, the hatchability of guinea fowl eggs was 71.2%, and the egg-laying period lasted 5 ± 1 months. Yakubu et al. [79]

reported that the hatchability of indigenous guinea fowl eggs in the South, Central, and West Nasarawa agricultural zones of Nigeria was 57.9%, 47.4%, and 62.7%, respectively.

It is reasonable to conclude that environmental conditions in Africa significantly impact the reproductive performance of local guinea fowl. For instance, sperm quality, hatchability, fertility, and ovarian and oviduct development are affected by harsh environmental conditions such as high temperatures [80, 81]. High environmental temperatures disrupt hypothalamic-pituitary-gonadal functions by inhibiting the secretion of luteinizing and follicle-stimulating hormones in laying birds [82]. Additionally, indigenous guinea fowls in Africa rely on natural daylight to enhance reproductive performance. However, in West Africa and other regions, the day length variation of only 12 hours is insufficient for optimal reproductive outcomes. According to Lien et al. [83], adequate light management is required for year-round egg production, as guinea fowls need 14 hours of photophase for optimal egg production [84].

Severe ambient temperature conditions and diseases also impact the birds' welfare, subsequently affecting reproductive traits. Teye and Adam [85] identified a lack of quality hatching eggs as a major constraint in the Damango area of Ghana. Furthermore, Houndonougbo et al. [28] noted that guinea fowls are highly monogamous and require a high sex ratio for better fertility compared to other poultry species. Atawalna et al. [78] suggested that a male-to-female ratio of 1:4 is better for reproductive traits than higher ratios (e.g., 1:6 or 1:10).

In Africa, guinea fowl egg production is significantly lower than that of commercial laying hens. For instance, 97, 72, and 68 eggs per production cycle were reported in Nigeria and Benin [29, 66, 67]. In Burkina Faso and Algeria, Sanfo et al. [63] and Halbouche et al. [68] reported averages of 70–107 eggs per cycle. In Nigeria, [86] reported that guinea fowls could lay up to 90 eggs during a production cycle lasting 2–3 years. Orounladji et al. [36] noted an average of 71 ± 16 eggs per cycle in Benin. Similarly, authors [22, 64, 65, 75] reported annual egg quantities ranging from 80–120 eggs across several African countries.

Yakubu et al. [79] observed egg production of 80.2, 67.6, and 87.8 eggs per year in the South, Central, and West Nasarawa zones, respectively. Soara et al. [38] reported an average annual egg production of 128.5 ± 51.2 in northern Togo, while Saina et al. [73] reported lower egg production of 42 ± 26 eggs per breeding season in Zimbabwe from 2000–2003. Lower egg production remains a major constraint, as highlighted in South Africa [89]. Agbolosu et al. [77] recorded higher egg production cycles in Ghana's Northern (362 eggs), Upper East (301 eggs), and Upper West (266 eggs) regions compared to other countries.

In traditional systems, egg sizes range between 25–50 g [69, 74]. Female guinea fowls exhibit poor mothering abilities, often necessitating incubation by ducks or hens under natural conditions due to a lack of hatchery facilities. However, environmental challenges, including inbreeding, adverse conditions, and predators, exacerbate reproductive inefficiencies. For instance, free-range guinea fowls lay eggs in scattered locations, leading to collection delays, reduced hatchability, and increased embryonic mortality [22]. Farmers across Ghana, Nigeria, and Zimbabwe also cited taming difficulties as a significant production barrier [85, 91, 93].

While indigenous African guinea fowls face challenges such as poor growth, low productivity, and inefficient reproductive traits, addressing these constraints through better management practices, breeding programs, and environmental modifications could improve their production potential.

The African guinea fowl is an unimproved breed that exhibits poor post-hatch development, characterized by low feed conversion efficiency, growth rate, live weight, and daily weight gain. They also have a longer production period than commercial broiler chickens or meat-type quails. On average, the slaughter age ranges from 11 to 16 weeks, and birds may weigh less than 2 kg of live weight during that period. For instance, Laudadio et al. [92] reported an average live weight of 1975 g, a feed conversion ratio of 2.8, feed consumption of 66.9 g/d, and an average daily gain of 23 g/d in guinea fowls reared for 12 weeks. Similarly, Singh et al. [93] reported live weights ranging from 1220 to 1266 g in guinea fowls at 12 weeks of age, along with poor feed conversion efficiency greater than 3. Sauveur and Plouzeau [94] also observed poor feed conversion efficiency of about 2.74 in domesticated African guinea fowls. Moreover, at 9 weeks of age, Nahashon et al. [95] reported an average live weight of 1300 g in guinea fowls. In Nigeria, an unimproved guinea fowl breed had an average live weight of 1280 g at 52 weeks of age, as reported by Oke et al. [96]. In Botswana, Seabo et al. [97] observed an average weight of 1210–1470 g in 12-week-old guinea fowls. n a study conducted by [89], the growth and carcass characteristics of the grower (4-8 months old) and adult (1-year-old) guinea fowls in the Wedza district of Zimbabwe were evaluated. The authors observed that the cold carcass weights for the adult and grower guinea fowls were 673.1 ± 11.40 g/kg BW and 630.5 ± 12.34 g/kg BW, respectively, with a dressing percentage of 69.3% for the adult and 64.7% for the grower guinea fowl. Other authors [98] also reported that the live weights of indigenous guinea fowl in three different regions of Ghana (Upper East, Northern Region, and Upper West Region) at 11 weeks of age were 369.05 ± 19.44 g,

353.52 ± 14.07 g, and 367.39 ± 13.65 g, respectively. Furthermore, in Benin, at 16 weeks of age, the average slaughter weights for the Common, Bonaparte, White, Grey, and Black guinea fowl varieties were 965 g, 955 g, 892 g, 887 g, and 876 g, respectively [28]. In a different study conducted by Musundire et al. [99], the average live weight of adult (male + female) and grower (male + female) guinea fowls were reported to be 1646 g and 947.3 g, respectively. The authors further reported that the average shot carcass weights for the adult (male + female) and grower (male + female) guinea fowls were 694.3 and 647.5 g/kg BW, respectively. The average cold carcass and breast muscle weights for the growers were 629.5 g/kg BW and 182.35 g/kg BW, whereas the cold carcass and breast muscle weights for the adults were 673.5 g/kg BW and 1105.5 g/kg BW, respectively. Another study by Agbolosu et al. [77] revealed that local guinea fowls in the Upper East and Upper West regions of Ghana at 8 weeks of age had lower feed intake (78.3 g/bird/day vs. 62.9 g/bird/day and 74.4 g/bird/day for Northern, Upper West, and Upper East, respectively) compared to those in the Northern region, with an average live weight of 1148.0 g, 1054.0 g, and 1248.0 g for guinea fowls in the Northern, Upper West, and Upper East regions, respectively. Although the authors observed higher daily weight gain (7.1 g/bird/day vs. 6.8 g/bird/day and 6.2 g/bird/day for Upper East, Upper West, and Northern regions, respectively) in local guinea fowls from the Upper East, the feed conversion ratio (1.02, 1.03, and 0.82 for Upper East, Upper West, and Northern regions, respectively) was better in the local guinea fowls from the Northern region. Moreover, Adu-Aboagye et al. [69] also reported an average live weight of 1877 g in guinea fowls from the Accra Plains of southern Ghana at 24 weeks of age. Saina et al. [73] also observed that in Zimbabwe during the 2000-2003 breeding season, the average live weight of guinea fowls at 16 weeks of age was 1480 g.

The differences in the performance and carcass traits of guinea fowls observed in this review could be related to age, breed type, nutrition, and regional environmental factors and management conditions. However, comparing these birds to commercial broiler chickens or quails, it was deduced that the indigenous African guinea fowls have an extremely long rearing period coupled with poor performance and carcass traits, which serves as a strong barrier preventing farmers from engaging in large-scale commercial guinea fowl production. In a survey conducted by Orounladji et al. [36] and Kouassi et al. [47], respondents (farmers) complained about poor growth and development, as well as poor egg-laying performance, among the factors limiting guinea fowl production.

Nutrition, Production Systems and Housing Management

Poultry (chickens, guinea fowls, ducks, etc.) production in many parts of Africa is practiced in rural or remote areas/villages, with major preferences in terms of diet formulation given to chickens compared to guinea fowls. Guinea fowls are reared as backyard poultry in many parts of Africa, often without formulated/compound feeds to aid their development. Mostly, they are provided with human waste as food and are allowed to scavenge for their feed. Very few farmers provide their guinea fowls with formulated commercial diets (either personally formulated or purchased) rich in energy and nutrients for proper development. It has been reported that the feed of scavenging guinea fowls typically consists of leftover rice, kitchen waste, sorghum, millet, groundnut shells, bran, corn, beans, termites, fruits, salt, and green fodder [36, 67]. Musundire [89] further reported that guinea fowl owners in the Republic of South Africa supplemented their birds with grains, groundnut shells, and drinking water; however, a small percentage of the farmers did not provide drinking water, and guinea fowls were allowed to search for it themselves. Houndonougbo et al. [28] reported that small-scale guinea fowl producers in Benin allowed their birds to scavenge for herbaceous plants and insects and were sometimes provided with grain supplements. The authors further noted that adult guinea fowls were given whole grain supplements, while the keets received ground cereal grains. Kusina et al. [75] also reported that in Zimbabwe, guinea fowls scavenged for their feed, although random feedstuffs such as sorghum, maize, and millet were supplemented when available. In the Tolon-Kumbungu District of Ghana, [100] also reported that guinea fowls were fed 80% maize and 20% millet during the rearing cycle, whereas 20% maize and 80% millet were used during the egg-laying cycle, mainly because farmers believed that maize enhanced performance traits while millet improved production traits. Soara et al. [38] confirmed that in northern Togo, guinea fowl farmers supplemented keets, as well as scavenging young and adult guinea fowls, with termites, maize rice, sorghum, and soybean either twice, thrice, or ad libitum. Gono et al. [93] reported that in the Mberengwa and Gokwe districts of the Midlands Province in Zimbabwe, smallholder guinea fowl producers allowed their birds to scavenge for feed, with 70% of farmers providing supplements in the form of millet and sorghum for keets and whole grains for grower and breeder guinea fowls. The authors further revealed that the majority of the farmers complained about inadequate feed supply as a major hindrance to guinea fowl production, with only 63% providing drinking water to their birds. Kouassi et al. [47] also reported that guinea fowl farmers in the Ivory Coast complained about the lack of commercially prepared diets specifically for guinea fowls, as well as the lack of information on the nutritional requirements of guinea fowls, which

were major barriers to guinea fowl production. Similarly, [85] reported that in the Damongo area of Ghana, guinea fowl farmers complained that the lack of information on the nutritional requirements of local guinea fowls served as a major barrier to their production. Orounladji et al. [36] evaluated the feeding systems used by guinea fowl farmers in ten different regions of Togo (Alibori, Atacora, Atlantique, Borgou, Collines, Couffo, Donga, Mono, Plateau, Zou) and reported that only 4.2% of the respondents fed full diets (compound), while 11.4%, 58.1%, 21.2%, and 5.1% fed only cereals, cereals + supplements, kitchen waste, and other types of feeds, respectively. In this study, the farmers rated nutrition (feeding) as the second most important area that needed improvement. In seven different regions (Douroum, Figuil, Garoua III, Guider, Mayo-oulo, Tcheboa, and Touroua) of Cameroon, Massawa et al. [21] reported that 87.5% of guinea fowl farmers provided their birds with cereals, while 12.5% used kitchen waste as feed. The authors further reported that 83.33% of the farmers used river water as drinking water for their guinea fowls, while 16.67% used water from wells. Ayeni [101] also evaluated the crop content of scavenging guinea fowls in the Kainji Lake Basin Area of Nigeria and observed that it contained 1.9±0.8% pebbles, 9.9±2.8% vegetable matter and leaves, 11.3±3.0% fruit of dicotyledons, 17.4±5.1% cyperus bulbs, 21.6±5.1% insects, and 35±5.5% grass seeds. Yakubu et al. [79] reported that 19.7% of the farmers in the Nasarawa agricultural zone (South, West, and Central) of Nigeria did not provide any supplements to their indigenous guinea fowls. However, 79.5% of farmers provided partial supplementation, and 0.85% provided full supplementation. The authors further reported that feeding was the third most important issue (18.8%) faced by guinea fowl owners in those regions. Zvakare et al. [22] reported that in the Chipinge district of Zimbabwe, maize was provided by 42.9% of farmers as a supplement, while 45.2% provided sorghum, and 86.9% used kitchen waste, with supplements offered once a day in the morning. In the Guruve District of Zimbabwe, Saina [37] observed that only 42% of guinea fowl owners provided ground maize, millet, or sorghum for keets, while whole grain supplements were given to grower and breeder guinea fowls. The authors further reported that some farmers (12%) provided high-protein feeds like soybeans, sunflower, or commercial compound feeds.

Moreki and Radikara [91] also reported that there is inadequate compounded guinea fowl feed in the market due to the relatively small number of farmers involved in guinea fowl production in Africa. However, some farmers use commercial diets formulated for broiler chickens or layer hens, which do not meet the nutritional requirements of guinea fowls due to their higher nutritional (protein) needs compared to chickens [34, 91]. For instance, in an experimental study where guinea fowls were fed commercial diets formulated for broiler chickens and turkeys up to 14 weeks, the authors reported an average slaughter weight of 2345 g and an average carcass yield of 77.71%, and suggested that commercial broiler and turkey diets could be used to improve the performance and carcass traits of guinea fowls [43]. Musundire [87] also reported the lack of feedstuffs as one of the major problems in guinea fowl production in the Republic of South Africa. In a different study, Baimbill-Johnson et al. [20] evaluated the resource efficiency of guinea fowl production in the Savelegu-Nanton District of the Northern Region of Ghana, where the high cost of feed was ranked as the second most important constraint to guinea fowl production. These higher prices for guinea fowl feeds could be attributed to the lack of animal feed companies directly involved in producing specific compound feeds for guinea fowls. This is because the poultry sector in Africa is dominated by commercial laying hens and broiler chickens due to their shorter production period, better performance, and marketing value, as well as being relatively cheaper compared to guinea fowls (live or carcass). Consequently, many companies only produce feeds for broilers and layers due to the higher demand for chicken feed compared to other poultry species.

According to the literature reviewed, a significant number of African farmers allow guinea fowls to forage for their food, and some may provide additional feeds such as cereals, grains, and kitchen waste when available. However, Dahouda et al. [45] reported that providing additional feeds does not meet the nutritional requirements of guinea fowls and is only used as a taming measure. As guinea fowl production is mostly carried out on a small scale in households, the feed industry does not invest much in manufacturing specific compound feeds for guinea fowls, leaving farmers to rely on cereals, grains, and kitchen waste as the primary source of feed. To ensure sustainable production of meat and eggs, it is essential to provide guinea fowls with a well-balanced diet. Inadequate nutrition has been reported as one of the major constraints to guinea fowl production [102]. The growth performance of poultry species depends on the energy and protein levels in their diet, as noted by [28], and poor or insufficient feeding, as well as malnutrition, can result in mortality, poor growth, and reproduction traits, as highlighted by [22, 73, 85, 91, 103]. This review revealed that guinea fowls, especially those reared in extensive and semi-intensive systems, sometimes lack quality drinking water and are sometimes provided with water from rivers, which may have high levels of pathogens. This contributes to the lower production traits observed in indigenous guinea fowls in Africa [93]. For instance, high keet mortality has been associated with the ingestion of poisonous substances [85]. Moreover, age at sexual

maturity or point of lay has been greatly influenced by nutrition and growth rate [22]. Poor nutrition has contributed to the poor growth rates of guinea fowls, delaying their sexual maturity, making it a major issue in guinea fowl production in most parts of Africa.

Conclusion

Guinea fowl production holds significant potential to contribute to SDGs 1, 2, 8, and 9 in Africa by addressing protein deficiency, malnutrition, and rural economic growth through their adaptability, disease resistance, and high-quality meat and egg production. Despite these benefits, production is predominantly small-scale and faces challenges such as high mortality rates due to diseases, predation, poor weather, theft, and inadequate nutrition. Limited access to formulated feeds, suboptimal housing, and traditional production methods further hinder productivity, resulting in poor growth, fertility, and hatchability. Overcoming these barriers is crucial to realizing the full potential of guinea fowl in sustainable development.

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Declaration of Conflict of Interest

The authors declare that there is no conflict of interest.

Ethical of approval

Not applicable.

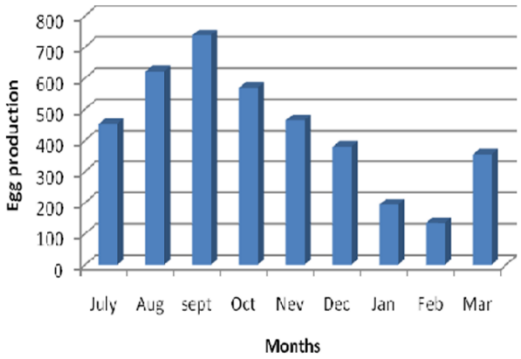

Fig.1. Monthly guinea fowl egg production (70)

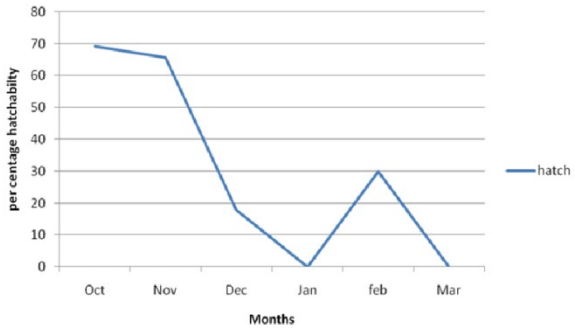

Fig.2. Hatachability of Guinea fowl egg per month [70].

TABLE 1. Summary of some of the findings reporting some reproductive traits of local guinea fowls in different African countries

Reference	Country	Reproductive trait
22, 37	Zimbabwe	AS 39 wk. 89±50 eggs per year
38	Togo	AS 31 wk. 128.5±51.2 eggs per year
48	Ghana	252-300 eggs per year
63, 64	Burkina Faso	AS 26 to 36 wk.
65	Niger	AS 32 wk.
66	Nigeria	AS 36 wk.
67	Benin	AS 32 wk.
68	Algeria	AS 37 wk.
69	Ghana	AS 24 wk.
73	Zimbabwe	HTC 71.2%
74	Burkina Faso	FT 74%
75	Zimbabwe	HTC 64%
76	Dr. Congo	HTC of GE was 71.15% using local hens and HTC of 57.86% with incubators.
77	Ghana	HTC of GE in Upper West, Upper East, and Northern region were 82%, 77.4% and 80.4% respectively. Northern 362 eggs, Upper East 301 eggs, and Upper West 266 eggs.
78	Ghana	FT was 50.7%, TTH was 30.5%, and HFE was 50.4%
79	Nigeria	Number of GE in South, Central, and West Nasarawa agricultural zones was 80.2, 67.6, and 87.8 respectively.
86	Nigeria	90 eggs per production cycle.
108	Ghana	IP 26-30 d.
109	Chad	92-117 eggs per season. HTC 80-92%. AS 30 and 3w wk for male and female, respectively.

AS (Age at sexual maturity), wk (Weeks), HTC (Hatchability), GE (Guinea fowl egg), FT (Fertility rate), TTH (Total hatchability), HFE (Hatchability of fertile eggs), IP (Incubation period).

TABLE 2. Summary of the findings reporting some of the growth performance traits of local guinea fowls in different African countries

Reference	Country	Growth performance trait
28	Benin	The LW of Common, Bonaparte, White, Grey, and Black GF at 16 WOA were 965 g, 955 g, 892 g, 887 g, and 876 g respectively.
69	Ghana	LW of 1877 g in GF from Accra Plains of southern Ghana at 24 WOA.
73	Zimbabwe	During the 2000-2003 BS, the LW of GF at 16 WOA was 1480 g
77	Ghana	GF in the Upper East and Upper West at 8 WOA had ↓FI (78.3 g/bird/day vs 62.9 g/bird/day and 74.4 g/bird/day for Northern, Upper West and Upper East respectively) than to those in the Northern region. LW weight of 1148.0 g, 1054.0 g and 1248.0 g for guinea fowls in Northern, Upper west and Upper East region respectively. DWG was 7.1 g/bird/day vs 6.8 g/bird/day and 6.2 g/bird/day for GF in Upper East, Upper West, and Northern region respectively FCR was 1.02, 1.03 and 0.82 for GF in Upper East, Upper West, and Northern region respectively.
89	Zimbabwe	CCW for the adult (1-year-old) and grower guinea fowls were 673.1 ± 11.40, and 630.5 ± 12.34 g/kg BW respectively, with a DP of 69.3% for the adult and 64.7% for the grower guinea fowl.
96	Nigeria	LW was 1280 g at 52 WOA.
97	Botswana	LW was 1210-1470g at 12 WOA.
98	Ghana	LW of GF in Upper East, Northern Region, and Upper West Region at 11 WOA were 369.05±19.44, 353.52±14.07, and 367.39± 13.65g respectively.
99	Zimbabwe	LW of adult (male+female) and grower (male+female) GF were 1646 g and 947.3 g respectively.

LW (Live weight), WOA (Weeks of age), GF (Guinea fowl), BS (Breeding season), ↓ (decrease), FI (Feed intake), DWG (Daily weight gain), FCR (Feed conversion ratio), BW (Body weight), DP (Dressing percentage), CCW (Cold carcass weight).

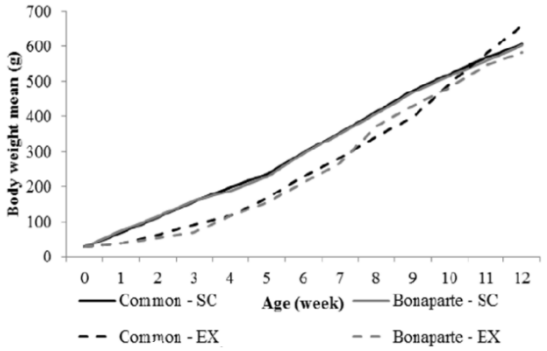

Fig.3. Common and Bonaparte Guinea fowls growth performance means raised under semi confinement (SC) and extensive (EX) systems [111]

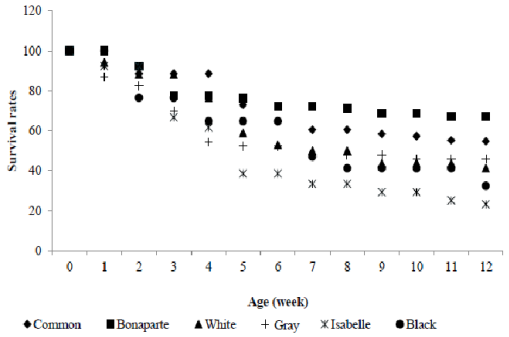

Fig.4. Survival rate of different Guinea fowl breeds [111]

TABLE 3. Summary of the findings reporting some of the nutrition, production systems and housing management of guinea fowls in different African countries

Reference	Country	Nutrition, method of production and housing
21	Cameroon	87.50% of the GF farmers provided their birds with cereals while 12.5% used kitchen waste as feed. Drinking water was provided by farmers. 95.83% GF owners uses traditional shelter houses (unimproved houses made of mud) while 4.17% used modern or structured shelter/poultry houses
22	Zimbabwe	GF housed in houses made from local materials. 11.9% reared their GF in battery cages however, 26.2% of the farmers did not provide any shelter
28	Benin	Scavenging system. Provision of supplement
34	Botswana	Intensive system of housing is the most by GF
36	Togo	Only 4.2% of farmers fed full diet (compound) with 11.4%, 58.1%, 21.2% and 5.1% feeding only cereals, cereals + supplements, kitchen waste and other types of feeds to GF respectively
37	Zimbabwe	32% GF owners used deep litter, 17% used fowl runs with shades and 8% did not provide any
38	Togo	Scavenging system (semi-intensive system). Supplementation of keets young and adult GF with termites, maize rice, sorghum, and soybean either twice, thrice, or *ad libitum*
47		61% of GF owners used the extensive system while 18% each either used the semi-intensive or the intensive system respectively
75	Zimbabwe	Main GF housing systems are the extensive and semi-intensive systems. Grains such as sorghum, maize, and millet were supplemented when available
79	Nigeria	19.7% of the farmers provided no supplement. 79.5% provided partial supplementation. 0.85% provided full supplementation.
89	South Africa	Provision of supplement such as groundnut shells, grains and drinking water. 88.1% of the farmers used the extensive system, while 10.6% and 1.3% used semi-intensive and intensive systems.
93	Zimbabwe	Scavenging system. 70% of the farmers providing supplements in the form of millet and sorghum for keets and whole grains for grower and breeder GF.
100	Ghana	GF were fed with 80% maize and 20% millet during the rearing cycle however, 20% maize and 80% millet was used during the egg-laying cycle
104	Benin	98% of GF owners used the semi-intensive system with only 2% using the extensive.
108	Ghana	Mud houses provided.
110 (35)	Benin	Mud houses provided.

-GF (Guinea fowl

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