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Review Article

The Origins and Spread of Domestic Chickens in Africa: A Synthesis of Archaeological, Ethnographic, and Genetic Perspectives

Charles Moses Lyimo*

Department of Animal, Aquaculture and Range Sciences, Sokoine University of Agriculture (SUA), Chuo Kikuu, Morogoro, Tanzania

Abstract

The domestic chicken (*Gallus gallus domesticus*) is one of the most widespread livestock species globally, believed to have originated from Southeast Asia and the Indian Subcontinent over the last 10,000 years. Genetic and archaeological evidence supports multiple independent domestication events involving several wild junglefowl species. This review aimed to synthesize multidisciplinary evidence to trace domestic chickens' origin, dispersal, and their impact in Africa. Specifically, it examined the historical, genetic, and cultural pathways of chicken introduction and adaptation on the continent. A comprehensive literature review was conducted using PubMed, Web of Science, and Google Scholar databases. Peer-reviewed archaeological, linguistic, ethnographic, and molecular genetic studies were integrated, emphasizing mitochondrial DNA (mtDNA), microsatellite markers, and archaeological site data. Findings reveal two major introduction waves of chickens into Africa: the first via the Mediterranean route through Egypt during the Ptolemaic period (300 BC), and the second through the Indian Ocean maritime trade networks between the early and mid-1st millennium AD. Subsequent overland dispersals extended chickens across the Sahara, Horn of Africa, and West Africa. Genetic studies highlight the complex admixture of maternal lineages from Asia, Europe, and the Middle East, while ethnographic and linguistic data reveal regional adaptation and cultural integration of chickens in African societies. In conclusion, chickens have played multifaceted roles in African food security, economy, and tradition. The evidence underlines a need for conservation of African indigenous chickens, which harbor valuable genetic traits crucial for adaptability and resilience. It is recommended that future research prioritizes whole-genome sequencing, regional genetic characterization, and community-based conservation strategies to preserve biodiversity and promote sustainable poultry development in Africa.

Keywords

Gallus gallus domesticus, Chicken Domestication, Chicken Dispersal, African Indigenous Chickens

1. Introduction

The domestic chicken (*Gallus gallus domesticus*), a globally significant livestock species, plays a vital role in nutrition, economy, culture, and environmental sustainability. Belonging to the family Phasianidae, its ancestry is predominantly

*Corresponding author: charles@sua.ac.tz (Charles Moses Lyimo)

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traced to the red junglefowl (*Gallus gallus*) of Southeast Asia, particularly within regions such as Thailand, Laos, Cambodia, Vietnam, and Indonesia. Domestication likely began over 8,000 – 10,000 years ago in these areas [46, 67, 86, 93, 113], although genetic and archaeological evidence has increasingly supported the hypothesis of multiple independent domestication events involving other wild species such as the grey junglefowl (*Gallus sonneratii*) of India and the Ceylon junglefowl (*Gallus lafayetii*) of Sri Lanka [29, 51, 108].

Despite the breadth of studies focused on the origins of domestic chickens, there remains considerable ambiguity surrounding the spatial-temporal pathways through which chickens were dispersed into Africa. While it is well-established that chickens reached the continent via multiple introduction events, two main waves are frequently cited: the Mediterranean route through Egypt during the Ptolemaic period (ca. 300 BC) and the Indian Ocean route via maritime trade during the early first millennium AD [12, 62]. Each route was facilitated by human activities, including long-distance trade, migration, colonization, and cultural exchange. Still, these introductions were not homogeneous, and the precise trajectories, timing, and nature of such introductions remain under-researched and poorly characterized.

Furthermore, archaeological records of chicken remained from Egypt, East Africa, and the Horn of Africa suggest early introductions, yet they provide limited resolution in distinguishing between successive waves of introductions or their relative genetic contributions. Similarly, linguistic and ethnographic studies, which document varied terminologies and cultural roles of chickens across African societies, support the notion of complex and regionally differentiated introduction events, but they lack integration with archaeological and genetic data [63, 102].

Recent molecular studies employing mitochondrial DNA (mtDNA), microsatellite markers, and whole-genome sequencing have begun to reveal the diverse genetic make-up of African chickens [58, 110]. These analyses point toward significant admixture events, reflecting multiple maternal lineages from Asia and possibly from Europe and the Middle East [54, 57, 67, 77]. However, the resolution of such studies is often geographically fragmented and limited in scope, with many African countries and ecotypes remaining understudied. Consequently, there exists a major knowledge gap regarding how genetic, archaeological, and ethnolinguistic data converge to explain the patterns of chicken introduction and diversification across the African continent.

Understanding the origin and spread of chickens in Africa is not only of academic interest but also of practical significance. Chickens contribute significantly to food security, rural livelihoods, and cultural heritage. In particular, African indigenous chickens exhibit remarkable resilience to harsh environments, disease tolerance, and adaptability to low-input systems, making them essential to smallholder farming systems. Yet, these populations remain under-characterized in terms of their evolutionary history and conservation status. Ignoring their genetic background may lead to the erosion of invaluable adaptive traits through indiscriminate crossbreeding or genetic dilution from exotic commercial breeds.

Furthermore, chickens have historically played multifunctional roles in African societies beyond food production. They are used in spiritual rituals, religious offerings, divination, and traditional medicine [56, 84]. These cultural functions underscore their deep integration into local belief systems and social structures. Thus, unraveling their introduction history also enriches the understanding of cultural and historical exchanges across Africa and between Africa and other continents.

Despite their significance, a comprehensive synthesis of archaeological, genetic, and ethnolinguistic evidence on chicken origins and dispersal in Africa has been lacking. Previous studies have focused either on specific aspects, such as genetic diversity, archaeological finds, or linguistic patterns, without adequately integrating these disciplines. This fragmentation impedes the construction of a coherent narrative regarding the introduction, adaptation, and diversification of chickens on the continent.

Throughout the time, domestic chickens have become an integral part of African agroecosystems and cultural life; the complexity of their arrival, spread, and genetic transformation remains insufficiently explored. There is a pressing need for an interdisciplinary review that brings together molecular data, archaeological records, and cultural evidence to reconstruct the migratory history of chickens in Africa. Such a synthesis can help clarify unresolved questions about multiple domestication centers, the timing and nature of introduction routes, and the evolutionary implications for indigenous chicken populations. It can also support conservation efforts and guide genetic improvement programs rooted in the continent's unique poultry biodiversity.

2. Methodology

This review employed a multidisciplinary synthesis of peer-reviewed archaeological, genetic, and linguistic literature to reconstruct the domestication and dispersal pathways of domestic chickens into Africa. Databases including PubMed, Web of Science, and Google Scholar were searched for relevant studies. Emphasis was placed on integrating mitochondrial DNA data [54, 67], microsatellite markers [57, 58, 73], archaeological site records [15, 99], and ethnolinguistic evidence [10, 63] to trace migration routes, domestication events, and genetic diversity across African chicken populations.

3. The Origin of Domestic Chickens

The domestic chicken (*Gallus domesticus*) is a domesticated fowl that descends from wild junglefowls native to Southeast Asia, including the southwestern region of China

and the Indian subcontinent. The evolutionary ancestry of domestic chickens is linked to four primary species of wild junglefowl: the Red Junglefowl (*Gallus gallus*), Grey Junglefowl (*Gallus sonneratii*), Ceylon Junglefowl (*Gallus lafayetii*), and possibly the Green Junglefowl (*Gallus varius*). The domestication of chickens is believed to have begun in Southeast Asia, particularly in the Indus Valley, where various wild junglefowl species were present [31, 33, 108, 113]. However, recent research suggests that chicken domestication was not a singular event but rather a complex process occurring over the last 10,000 years [54, 83, 79, 94, 101]. Evidence strongly supports that the primary ancestor of domestic chickens is the Red Junglefowl (*Gallus gallus gallus*), which originated in southeastern Asia. However, hybridization with the Grey Junglefowl (*Gallus sonneratii*) and Ceylon Junglefowl (*Gallus lafayetii*) has also contributed to the genetic makeup of domestic chickens [39, 101]. The genetic relationship between domestic chickens and wild junglefowl remains complex, and it is still unclear how much genetic influence each subspecies has contributed to modern chickens [54].

Modern biological and genetic studies have confirmed that the Red Junglefowl (*Gallus gallus*), native to Southeast Asia, is the principal ancestor of domestic chickens [30]. However, some traits observed in domestic chickens suggest genetic influences from other junglefowl species. For instance, the presence of the yellow skin gene in many domestic chickens is believed to be a result of hybridization with the Grey Junglefowl (*Gallus sonneratii*) in southwestern India [19, 29, 46]. The Cornish Gamebird and Brahma breeds of China provide physical evidence of Grey Junglefowl influence, particularly in body structure and feather morphology [6, 50, 68]. Additionally, the Ceylon Junglefowl (*Gallus lafayetii*), endemic to Sri Lanka, is believed to have contributed to domestic chickens, particularly in tail carriage traits observed in the Sumatra breed [51]. The Green Junglefowl (*Gallus varius*), native to the Malay Peninsula, Java Island, and parts of Indonesia, is a less prominent contributor to the ancestry of domestic chickens. However, some populations exhibit genetic markers suggesting Green Junglefowl influence, particularly in extended black plumage patterns [30].

The domestication of chickens was a gradual process driven by human intervention. Early domestication involved selecting birds with desirable traits such as docility, increased egg-laying ability, larger body size, and specific behaviors, including crowing and fighting [39, 80, 93, 113]. These selective breeding practices were facilitated by keeping chickens in captivity, which allowed humans to control their reproduction and encourage the inheritance of preferred traits. Over time, domesticated chickens developed distinct physical and behavioral differences from their wild ancestors. They evolved smaller skulls, shorter legs, and a less aggressive temperament [5, 6, 89, 94]. Modern breeding programs have further refined these traits, focusing on improving productivity, disease resistance, and feed efficiency. Selective breeding has enabled the development of specialized breeds, such as high-yield egg layers and fast-growing broilers, ensuring optimal production in commercial poultry farming [40]. However, advancements in chicken breeding have significantly shaped the characteristics and performance of domestic chickens. Today, breeding programs use genetic selection techniques to enhance specific traits while maintaining overall health and vitality.

3.1. Evidences of Multiple Domestication of Chickens

Several findings provide strong evidence that chicken domestication occurred in multiple regions and chickens have been an important part of human culture and diet for thousands of years. Numerous findings support the idea that chicken domestication is a complex process that involves multiple and independent domestication events occurring in different regions around Asia. These resulted in the development of different local breeds of chicken. Different breeds of chicken found in various regions around the world exhibit unique morphological traits, also suggest independent domestication events from multiple regions [29]. The combination of archaeological and genetic evidence provides a robust framework for understanding the domestication and spread of chickens. Archaeological findings offer physical evidence of early chickens, while genetic studies trace lineage and adaptation processes.

3.1.1. Archaeological Evidence of Chicken Domestication

The domestication of chickens (*Gallus gallus domesticus*) has been extensively documented through archaeological findings, with evidence suggesting that domesticated chickens have been integral to human societies for thousands of years. Excavations in regions such as China, Southeast Asia, South Asia, Thailand, India, and the Indus Valley Civilization, and Mesopotamia have provided early domestic chicken bones, artifacts, and depictions, indicating the presence and domestication of chickens in ancient societies. Archaeological evidence strongly supports the early domestication of chickens in Southeast Asia and China before 6000 BCE, with their spread westward through South Asia, Mesopotamia, and eventually into Europe and Africa.

The domestication of chickens dates back thousands of years, with archaeological evidence from various regions across Asia, South Asia, and beyond. Some of the earliest evidence comes from China, where domesticated chicken bones have been found at the site of the Hemudu culture, dating back to around 7000 BCE. Similarly, the Neolithic village of Jiahu, also in China, has yielded chicken bones dating to approximately 6000 BCE [112, 114]. West and Zhhou suggested that chicken domestication first occurred in Southeast Asia before 6000 BCE, based on archaeological findings [108]. Supporting this hypothesis, multiple Neolithic

sites in Northern China, dating to before 6000 BCE, have uncovered chicken remains. Excavations at 16 Neolithic sites in Northern China and 13 sites in Europe and Western Asia have revealed older bones than those found in Mohenjo-Daro, an ancient Indus Valley Civilization city [38]. Morphological analysis of these bones suggests a gradual domestication process, as they were larger than those of wild junglefowl but smaller than modern domestic breeds [108]. By around 5000 BCE, archaeological evidence from Thailand and other parts of Southeast Asia suggests the presence of domesticated chickens. Excavations in the Nagsabaran culture in the Philippines have uncovered chicken bones that exhibit distinct morphological changes compared to wild junglefowl [9]. These findings further support the idea that chicken domestication started in the region before spreading westward.

In South Asia, the Indus Valley Civilization (c. 2600 BCE - 1900 BCE) provides substantial evidence of early chicken domestication. Excavations at sites such as Mohenjo-Daro and Harappa in present-day Pakistan, as well as Lothal in western India, have revealed chicken bones and artifacts depicting chickens, indicating their presence in the region [101, 114]. Storey reported the discovery of chicken bones in ancient sites of the Harappan civilization, dating back 5,000 years [99]. The evidence suggests that domesticated chickens were an integral part of these early societies. Beyond the Indian subcontinent, ancient chicken bones have been discovered across Southeast Asia, including Thailand, Vietnam, and the Philippines, dating back to approximately 4,000 years ago [99].

The spread of domesticated chickens continued westward, reaching Mesopotamia before eventually being introduced to Europe and Africa [86]. Seals representing fighting cocks and clay chicken figurines have been found in Mohenjo-Daro, further supporting the role of chickens in ancient cultures. The size of these chicken bones, larger than wild junglefowl, suggests selective breeding for specific traits. It is believed that chickens were initially domesticated for purposes such as leisure and gaming, rather than for meat or eggs. This domestication process likely occurred in agricultural regions where food sources for chickens were readily available without competing with human consumption [101]. This gradual process was likely influenced by both cultural and agricultural factors, shaping the domesticated chickens we have today.

3.1.2. Genetic Evidence of Chicken Domestication

Mitochondrial DNA (mtDNA) and whole-genome sequencing have traced the genetic lineage of domestic chickens back to wild junglefowl populations in Asia. The complex genetic history of the earliest domestication of chickens also suggests that the process may have begun in multiple locations across Asia [107]. Studies of mitochondrial DNA and nuclear DNA have provided insights into the genetic relationships between wild and domesticated chickens. The DNA analyses of ancient chicken bones from Southeast Asia and China revealed the DNA of these ancient chickens was most similar to that of modern-day chickens, suggesting that chicken domestication may have originated in those regions. Genetic evidence has also provided important insights into the origins and spread of chicken domestication and has helped to refine the timing and location of this important event in human history.

Studies suggested that chicken domestication may have occurred as early as 10,000 years ago [54, 86]. The red junglefowl (*Gallus gallus*), the primary ancestor of domestic chickens, is native to multiple regions ranging from Southeast Asia to Southwest China. It has been proposed that red junglefowl were domesticated independently from different populations, leading to distinct lineages of domestic chickens [108]. In India, red junglefowl were domesticated independently from the Chinese population, Southeast Asia and Indian Subcontinent, resulting in a separate lineage [79]. Eda reported that red junglefowl were the main ancestral species of domestic chickens and that the divergence between domestic chickens and their wild ancestors may have occurred between 7,014 and 8,768 years ago, supporting the theory of multiple domestication events [30].

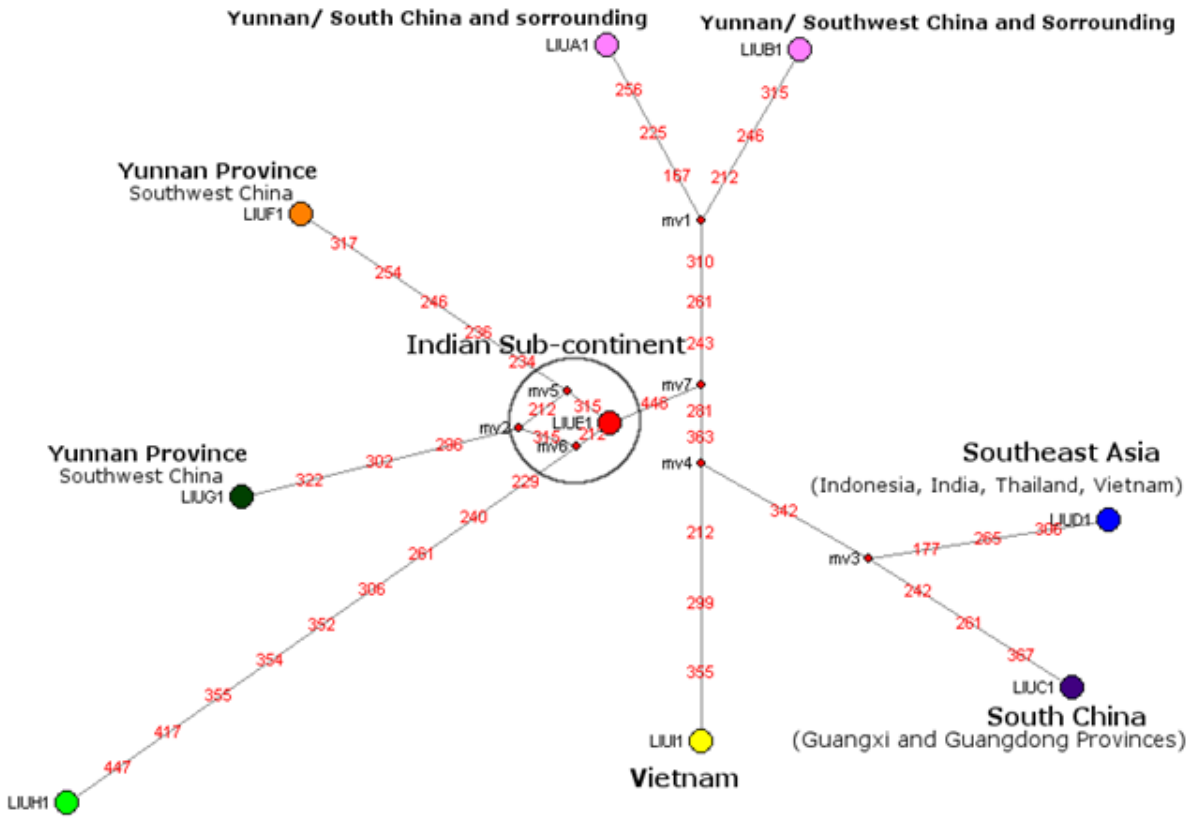
Several genetic studies have provided strong evidence supporting the theory of multiple domestication events of chickens. Understanding the genetic diversity and relationship between wild junglefowl and indigenous chickens is crucial in identifying the geographic origins of chicken domestication and their genome evolution over time. By analyzing mitochondrial DNA (mtDNA) sequences, researchers have uncovered significant genetic variations that suggest chickens were domesticated multiple times across different regions of Asia.

Liu and Oka conducted mtDNA sequence analysis, revealing nine divergent haplogroups (A – I) among wild junglefowl (Figure 1) [54, 83]. The list of haplotypes and their GenBank accession numbers are given in Appendix 1. These haplogroups correspond to specific regions of domestication and geographical diffusion of domestic chickens. Further genetic analysis confirmed that chickens were domesticated in at least eight Asian countries: China, India, Indonesia, Laos, Myanmar, the Philippines, Thailand, and Vietnam [54, 67, 83]. These findings indicate that domestication was not a single event but rather a complex, multi-regional process influenced by local adaptation and human intervention.

To further illustrate the genetic relationships among major haplogroups identified by Liu, a Median-joining network was constructed using the most frequent haplotypes of the nine clades obtained from the NCBI database [54]. The network analysis, implemented in Network 4.6.1.0 software [7], provides a visual representation of the evolutionary connections between different haplogroups. This methodology helps trace the genetic divergence and migration patterns of domesticated chickens, further supporting the hypothesis of multiple domestication events.

Studies highlight the complex genetic landscape of chicken

domestication, demonstrating that multiple regions contributed to the origins and diffusion of domesticated chickens rather than a single domestication center. The integration of genetic data with archaeological findings continues to refine our understanding of how chickens evolved under domestication pressures, leading to the diverse poultry breeds seen today.



(Source, [56])

Figure 1. *The nine most frequent haplotypes of [54] suggest the origins of chickens.*

The genetic diversity of wild red junglefowl (*Gallus gallus*) and their distribution across different haplogroups provide significant insights into the domestication process. *Gallus gallus spadiceus* and *Gallus gallus jabouillei* were predominantly found in clades A, B, and F, while *Gallus gallus gallus* was mainly observed in clades D, H, and I. Among these, clades A – G and I included domestic chickens, suggesting a genetic link between wild and domesticated populations. Notably, clades A, B, and E were widely distributed among Eurasian chickens, whereas other clades were primarily confined to South and Southeast Asian chickens. Clades F and G were mostly restricted to Yunnan, China, while clade C was distributed across southern and southeastern China and Japan. These distinct geographic distributions, along with population expansion patterns, led [54] to propose that different regions contributed to chicken domestication, supporting the hypothesis of multiple independent domestication events. Further supporting this theory, Miao conducted an extensive mtDNA control region analysis involving 4,732 domestic chickens, 206 red junglefowl, and 61 mtDNA genome studies of representative haplotypes [67]. This expanded dataset, including *Gallus gallus murghi* and domestic chickens from India, reinforced the idea that chicken domestication was a complex, multi-regional process rather than a single domestication event.

3.2. Classification and Geographic Distributions of Wild Junglefowl

The classification of wild junglefowl is primarily based on their phenotypic traits and geographical distribution across Asia. The four species of junglefowl inhabit distinct regions (Figure 2), displaying unique morphological characteristics [82, 95, 101]. The Red Junglefowl (*Gallus gallus*), the wild ancestor of domestic chickens, exhibits features resembling Mediterranean egg-type breeds [22]. Males possess long, golden-orange to deep-red crown and neck feathers, a dark metallic-green tail with a white tuft at the base, and underparts of dull black. The upper body is an exquisite blend of glossy blue-green, rich dark red, maroon-red, fiery orange, rufous,

and blackish brown (Figure 3). A striking feature of the male is its complete eclipse plumage in summer and a distinct, abrupt crow. Pure hens lack combs and wattles, and both sexes hold their tails almost horizontally. These distinctive traits contribute to the identification and ecological adaptation of *Gallus gallus* in its natural habitat.

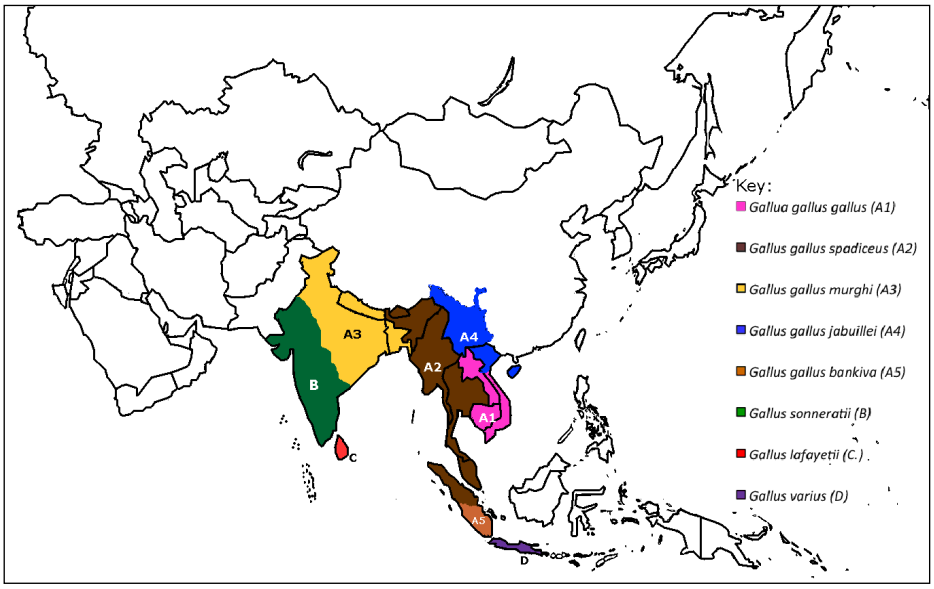


Figure 2. *Origin distribution of the wild junglefowl adopted from [86, 101, 108].*

Source: [66]

Figure 3. *Male Red junglefowl (Gallus gallus), Female Red junglefowl (Gallus gallus).*

Source: [48]

Figure 4. *Male Gray Junglefowl, Female Gray Junglefowl.*

The Gray Junglefowl (*Gallus sonneratii*), endemic to India, is primarily distributed from the southwestern to central regions of the country (Figure 4). It features a striking body plumage with a grey background color, intricately patterned with fine barring [56]. This species plays a crucial role in the genetic ancestry of domestic chickens, particularly in contributing to the distinctive yellow skin trait observed in some breeds.

The Ceylon Junglefowl (*Gallus lafayetii*), found exclusively in Sri Lanka, closely resembles the Red Junglefowl (*Gallus gallus*) but exhibits distinct coloration. Males have an orange-brown breast with a purple spot near the neck, a yellow spot on the comb, yellow skin, and striking red legs (Figure 5). This species is characterized by strong sexual dimorphism and natural variations in feather patterns [105].

Source: [111]

Figure 5. *Male Ceylon Junglefowl, Female Ceylon Junglefowl.*

Source: [102]

Figure 6. *Male Green junglefowl, Female Green junglefowl.*

The Green Junglefowl (*Gallus varius*), native to Java, Bali, and Lombok Islands (Figure 6), is the most primitive of the Gallus species. It possesses sixteen tail feathers and short hackle feathers, unlike other species with fourteen tail feathers and elongated hackles [56]. Main traits include a single three-colored wattle (red, yellow, and blue), a smooth comb lacking indentations, and two additional tail feathers.

The Red Junglefowl (*Gallus gallus*) is a polytypic bird with five recognized subspecies, identified as *Gallus gallus gallus*, *Gallus gallus spadiceus*, *Gallus gallus jabouillei*, *Gallus gallus bankiva*, and *Gallus gallus murghi* [5, 41, 51]. These subspecies vary in morphology, distribution, and genetic traits. Fumihito established a monophyletic relationship between domestic chickens and four Gallus species, highlighting the evolutionary connection between the Red Junglefowl and domesticated chickens [33]. The subspecies of Red Junglefowl can be distinguished by differences in home range, earlobe color, comb size, facial wattles, and the length and coloration of male hackle feathers. The species exhibits strong sexual dimorphism, with males characterized by prominent red fleshy wattles [94].

Gallus gallus gallus, native to South Vietnam, Cambodia, Thailand, and Laos, is distinguished by its striking bright red and orange plumage and white earlobes. This subspecies thrives in tropical and subtropical environments, favoring dense forested regions. *Gallus gallus spadiceus*, found in Myanmar, North Sumatra, Thailand, Malaysia, and Southwest China, exhibits reddish-brown plumage, red earlobes, and remarkable adaptability to diverse habitats, including both forests and open landscapes. *Gallus gallus murghi*, distributed across Northern India, Nepal, Bhutan, and Bangladesh, features vibrant orange-red plumage and white earlobes. Males display extensive bare reddish facial skin, deeply indented fleshy red combs, and are well adapted to both forested and grassland habitats. *Gallus gallus jabouillei*, native to South China and North Vietnam, is characterized by red earlobes and short facial wattles. This subspecies primarily inhabits dense forests, where its plumage provides excellent camouflage. *Gallus gallus bankiva*, found in Java and Sumatra, is known for its stout body, vibrant plumage, and distinctive crowing. It has red earlobes and remains one of the most vocal subspecies. Despite widespread domestication, wild populations of Red Junglefowl still persist in the forests of Southeast Asia. Therefore, domesticated chickens are considered a subspecies of this ancestral wild bird [20, 33, 81, 88].

4. The Introduction and Spread of Domestic Chickens in Africa

The introduction of domestic chickens (*Gallus gallus domesticus*) to Africa is believed to have occurred through multiple trade routes, including the Indian Ocean, Mediterranean Sea, Red Sea, and Arabian Peninsula [13, 59, 62, 65]. Once introduced, chickens likely spread gradually across the continent through trade, cultural exchanges, and human migration. It is widely accepted that Arabian traders and merchants played an important role in introducing chickens to Africa, transporting them along well-established trade routes. While many scholars suggest that chickens were introduced to Africa during the 1st millennium AD, the earliest archaeological evidence of chicken remains in Africa dates back to around 1500 BC in Egypt [64]. Egyptian hieroglyphic art from 1500 BC depicts chickens, such as a rooster illustrated in a tomb scene in Rekhmara's tomb [88]. Additionally, Darby reported the existence of a painted limestone ostracon from the tomb of Tutankhamun, suggesting that chickens were considered exotic in Egypt during the New Kingdom era (1425-1123 BC) [25]. Further south, Chami discovered chicken bones in a Neolithic context in Zanzibar, dated to 800 BC, while Crawford noted that osteological and pictorial evidence for chickens in Africa became more common around 650 BC [15, 21].

Archaeological, linguistic, ethnographic, and genetic evidence strongly suggests that chickens were introduced to Africa through multiple waves from the Mediterranean region, Red Sea, and East Coast of Africa [62, 63, 109]. Gifford-Gonzales and Hanotte reported two main waves of chickens being introduced to Africa [36]. The first main wave was from the Mediterranean Sea via Egypt during the Ptolemaic period (300 B.C.), later spreading through the Nile valley and to the West Africa along the Sudano-Sahelian corridor [32, 62].

Introduction of chickens occurred via the Mediterranean trade routes, particularly through Egypt, from where they spread inland across the continent [36, 61, 105]. Phoenician traders are believed to have introduced chickens to Africa from the Mediterranean around 800 BC [52]. The second

wave occurred across the Indian Ocean, with chickens arriving on the East African coast through long-distance maritime trade. This introduction likely took place between the beginning and middle of the 1st millennium AD [10, 12, 16, 31, 59]. Chami and Kweakason provided archaeological evidence of chicken bones found in East African islands as early as the 8th century BC, reinforcing the idea of maritime dispersal of chickens [15, 17].

Linguistic studies further support the theory of multiple introductions of chickens across Africa. Distinct linguistic traces of chicken-related words found in the Saharan region, among the Berbers, and along the East African coast suggest diverse origins [63]. Unlike cereals and domesticated plants, livestock names tend to be more linguistically stable in Africa. Chickens, introduced over 3,000 years ago, left a complex trail of loanwords that reveal their diffusion across the continent [10]. Williamson provided linguistic and ethnographic evidence indicating that chickens spread from East to West Africa [109]. Additionally, Johnston and Johnston analyzed Bantu language words for chickens, concluding that they were not originally part of Proto-Bantu vocabulary [45]. Instead, irregular linguistic patterns suggest chickens were introduced from the East African coast into Bantu-speaking regions. Further insights come from the linguistic history of chicken names in Madagascar and the Comorian languages. Interestingly, the Malagasy term for chickens lacks Western Austronesian roots, while Comorian linguistic patterns align with Bantu languages, indicating that chickens were likely introduced from coastal East Africa [2, 10].

The global dispersal of domestic chickens (*Gallus gallus domesticus*) is closely linked to human movement and trade networks, as chickens are non-migratory birds [98, 101, 108]. The introduction of chickens to Africa is a multifaceted process influenced by human migration, trade, agricultural development, and European exploration. While many details remain uncertain, researchers agree that chickens were introduced through multiple, gradual waves rather than a single event. One of the key drivers in the spread of domestic chickens to Africa was the movement of people across the continent. As civilizations evolved, human populations expanded and migrated in search of new resources and opportunities, facilitating the exchange of goods and domesticated animals, including chickens.

Trade networks also played a crucial role. Throughout history, extensive trade routes connected Asia, the Middle East, and Africa, allowing the introduction of domesticated animals, including chickens [10, 12, 32, 59]. During the early centuries BCE, the Indian Ocean trade networks were significantly shaped by the discovery of monsoon wind patterns, which facilitated long-distance maritime navigation. This discovery accelerated the movement of goods, including livestock, between Asia, the Arabian Peninsula, and Africa. By the 1st century AD, the islands of Unguja and Pemba were major trade hubs linking the Middle East, India, and Africa [16, 106]. However, the earliest physical evidence of chickens on the East African coast appears more than a millennium later, coinciding with the arrival of black rats, rice, and mung bean from the Indian subcontinent. By 750-900 CE, poultry farming had expanded into interior Africa, the Comoro Islands, and Madagascar [86].

Some scholars propose that Middle Eastern trade routes played a crucial role in the introduction of chickens to Africa. Evidence of chicken bones dating to the 7th century AD has been found in Aksum, Ethiopia, a major trading hub, suggesting that chickens arrived from the Middle East [36]. Additionally, studies indicate that the spread of chickens into sub-Saharan Africa occurred relatively recently, possibly after the 7th century AD, through contact with the Islamic world. Archaeological remains from Kilwa Kisiwani, an ancient trading city on Tanzania's coast, indicate that chickens were first introduced to the area in the 10th century AD, likely via Arab traders [42]. Historical records suggest that European explorers and colonizers also introduced chickens to Africa. The Portuguese, for instance, are known to have brought chickens to the Cape Verde Islands in the 15th century, which may have contributed to their further spread across the continent [10]. Blench further explained that Portuguese explorers and traders carried chickens on their voyages during the 15th and 16th centuries, introducing them to various parts of Africa where they established colonies [10].

Genetic evidence also supports this theory. [43] found a close genetic relationship between Malagasy and East African chickens, reinforcing the historical links between Madagascar and the African mainland. While the specific routes and timing of chicken movements from East Africa to West Africa remain uncertain, studies suggest that the spread was influenced by human migration and trade networks. Using genomic data, Mwacharo investigated the origins and spread of chickens in Africa [78]. Their study found evidence of multiple independent introductions, with major events occurring in East and North Africa. The research also highlighted genetic similarities between East and West African chickens, suggesting some level of gene flow between the two regions.

However, Peters proposed an alternative perspective [86]. Their zooarchaeological research indicated that chickens were already present in West Africa's Mande-speaking territories before they arrived in the northern Sahel. Phoenician seafarers (around 500 BCE) and Roman merchants established trade posts along the Moroccan Atlantic coast, leading to the maritime introduction of chickens into Berber-speaking North Africa. From there, chickens likely spread southward into West Africa, following river basins such as the Senegal and Gambia rivers, explaining their presence in Mande-speaking regions during the mid 1st millennium BCE.

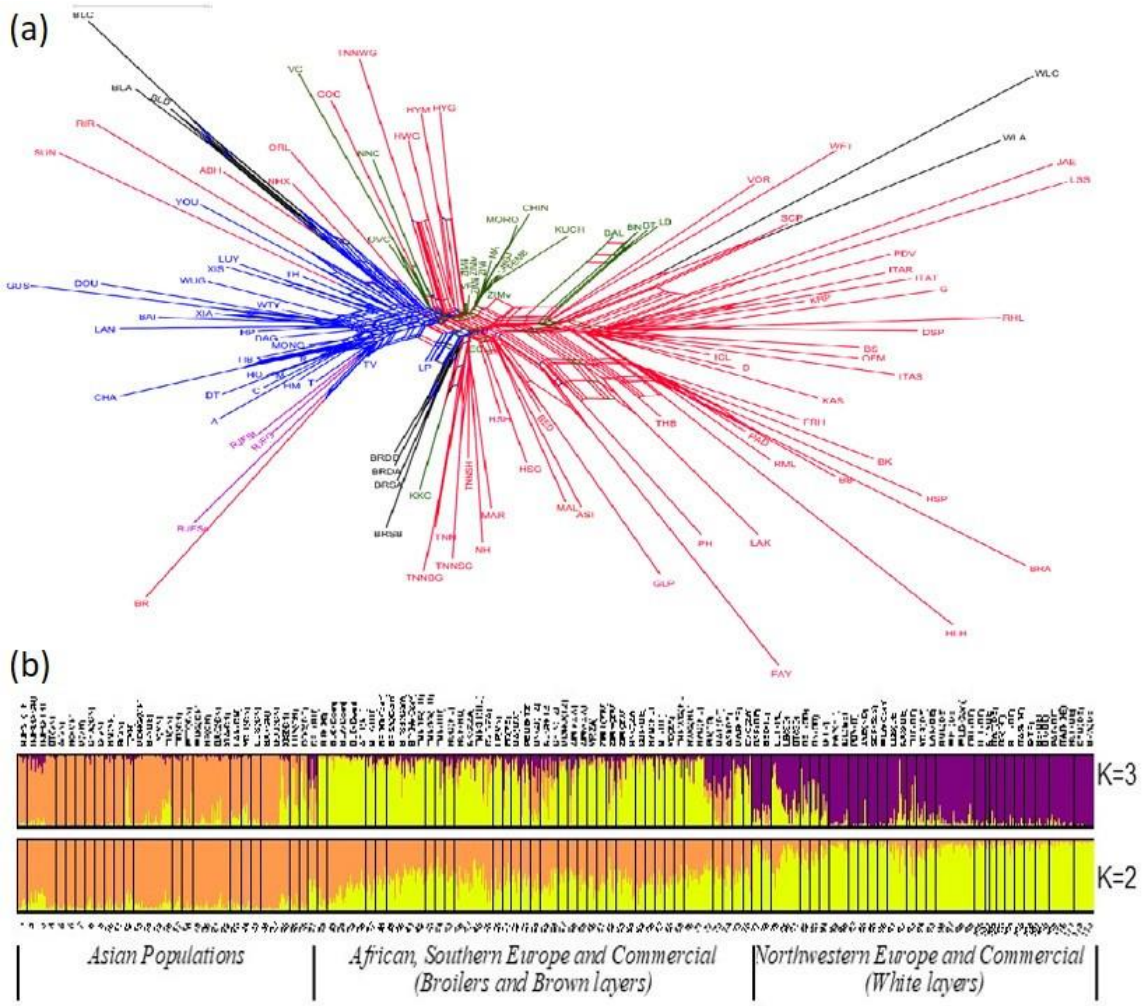
4.1. Multiple Origins of African Domesticated Chickens

Several genetic studies have provided strong evidence supporting the multiple origins of African domesticated

chickens. Mitochondrial DNA (mtDNA) analysis has played a crucial role in tracing their genetic ancestry. Mwacharo identified five distinct haplogroups of different maternal origins, suggesting multiple introductions of chickens into East Africa [76]. Similarly, Muchadeyi found two distinct haplogroups in Zimbabwe village chickens, indicating genetic contributions from southern Asia and the Indian subcontinent [74]. Further studies in South Africa revealed that conserved and field chickens shared three major haplotypes, likely originating from China, Southeast Asia, and the Indian subcontinent [72]. Additionally, Lyimo reported that Tanzanian indigenous chickens share mtDNA haplogroups with those from the Indian subcontinent and Southeast Asia, supporting the hypothesis of multiple introductions [57]. Haplotype network analysis of Tanzanian chickens suggests they likely originated from the Indian subcontinent and Southeast Asia. The two maternal lineages identified among five Tanzanian populations further reinforce the evidence of gene flow and genetic admixture across regions.

4.2. Genetic Admixture and Historical Influences

Africa and Asia exhibit extensive phenotypic variation within and between different chicken populations [18, 23, 24, 53, 57, 70, 71, 73, 76, 90]. This diversity is partly due to traditional management practices, characterized by the absence of selective breeding and uncontrolled mating, contributing to higher genetic variation [1, 37, 90]. Moreover, genetic studies suggest that chickens in East and West Africa share genetic similarities, indicating gene flow between these regions. The admixture of African, Mediterranean, and Southeast European chicken populations can be attributed to the geographical intersection of Asia, Southern Europe, and North Africa. This genetic blending is further influenced by early colonization, cross-regional trade, and prehistoric migration routes.



Source [58]

Figure 7. *(a) Phylogenetic network tree of the chicken populations derived from marker-estimated kinship of 113 chicken populations from various origins; (b) population structure at K = 2 and K = 3 of 113 chicken populations from various origins (descriptions of the different breeds found in Appendix 2).*

Moreover, genetic studies utilizing 29 microsatellite mark-ers suggest significant genetic similarities between chickens in East and West Africa, indicating gene flow and historical connections between these regions. The genetic admixture observed in African, Mediterranean, and Southeast European chicken populations can be attributed to the geographical intersection of Asia, Southern Europe, and North Africa. This blending was further shaped by early colonization, cross-regional trade, and prehistoric migration routes [58]. A STRUCTURE membership coefficient analysis (K = 3) revealed that North African chickens share a higher proportion of ancestral genes with European breeds compared to Asian chicken populations (Figure 7). This finding aligns with historical records suggesting that chickens were introduced to Africa from Europe via Egypt, through both overland trade routes and maritime exchanges across the Mediterranean Sea [21]. Additionally, Mwacharo reported strong genetic links between North African chickens and those from the Arabian Peninsula, likely facilitated by historical terrestrial trade routes [76]. These findings highlight the complex migratory history and genetic diversity of African indigenous chickens, shaped by centuries of movement, trade, and human intervention.

5. African Indigenous Chickens

Although chickens were introduced to Africa relatively recently, they have undergone significant diversification and adaptation. Through migration, mutation, selection, and management practices, chickens have been modified from their wild ancestors to thrive in diverse African habitats. These evolutionary processes have driven remarkable changes in their morphology, physiology, and behavior [89, 92, 94]. African chickens exhibit general traits that make them well-suited for scavenging and extensive farming systems. The continent is home to a wide range of indigenous chicken ecotypes, each with unique adaptations. The continent boasts a wide range of indigenous chickens, each with unique adaptations and peculiar traits. Naked neck, multicolor, frizzled feathers, disease resistance, foraging abilities, sizes, tolerance to limited resources, dual-purpose traits, and cultural significance are general features of African chickens.

Africa is home to numerous indigenous chicken varieties, each possessing distinct genetic traits and adaptive features [58]. Due to their rich genetic variation, these chickens display significant performance differences across various ecotypes. Unfortunately, limited research efforts have been made to fully characterize African indigenous chickens and their production environments [26]. One well-known example is the Kienyeji chicken, a common term in East Africa referring to indigenous chickens. Kienyeji chickens include all local ecotypes native to specific regions. They are typically small to medium-sized, exhibit varied color patterns, and are valued for their hardiness, ability to forage, and adaptability to local climates. Their resilience to environmental stress and minimal husbandry practices makes them ideal for extensive scavenging production systems. Kienyeji chickens are widely reared in smallholder farming systems and are highly prized for their flavorful meat and nutrient-rich eggs, contributing to food security and rural livelihoods. However, selective breeding by humans has led to the development of many different breeds of chickens with varying traits such as size, color, and egg-laying ability.

At present, Africa is home to several unique indigenous chicken breeds that have been raised for centuries, each adapted to local environmental conditions and traditional farming systems. One of the most renowned African breeds is the Fayoumi chicken from Egypt, which has been raised along the River Nile for centuries. Fayoumi chickens are believed to date back to the era of the Egyptian Pharaohs. These ancient birds are attractively marked, featuring silvery white hackles and white bars on a black background across their plumage. They have large, bright dark eyes, red earlobes, and a single comb (Figure 8). Their upright tails stand nearly vertical, and their legs can be either willow green or slate blue.

Fayoumi chickens are prized for their exceptional foraging skills, resistance to diseases, and adaptability to various climates, including hot and humid conditions [26, 44, 47]. They are naturally resistant to Marek's disease and other poultry diseases, making them a valuable breed for smallholder farmers. Ethiopia is also home to Horro and Jarso chickens, which are known for their hardiness, disease resistance, and ability to thrive in harsh environments [27, 35, 100]. These birds are well-adapted to the Ethiopian highlands, valued for their foraging ability, and suitable for both meat and egg production.

Source: [66]

Figure 8. *Male Fayoumi chicken, Female Fayoumi chicken.*

Fulani chicken, commonly found in West Africa, particularly in Nigeria. Fulani chickens are valued for their ability to withstand extreme heat and harsh environmental conditions [34, 97]. They are dual-purpose, raised for both meat and egg production, making them an essential part of local poultry farming systems. Another significant breed in West Africa is the Nera ecotype, a popular variety in Nigeria and surround-

ing countries. Nera chickens exhibit strong disease resistance, excellent foraging abilities, and adaptability to local conditions [49]. Like Fulani chickens, they are dual-purpose, providing both meat and eggs, and are widely preferred by smallholder farmers for their hardiness and productivity.

The Naked Neck chicken, also known as Transylvanian Naked Neck or Turken, is another distinctive African breed. These birds are characterized by their bare necks and partially featherless bodies, which enhance heat tolerance, making them highly suitable for Africa's hot climates [14, 60, 71, 104]. Naked Neck chickens are found in various African countries, including Cameroon, Nigeria, Ghana, and South Africa. Their resilience, adaptability, and efficient feed conversion make them a valuable breed for backyard and small-scale poultry farming. These chickens come in various sizes and color patterns, including both standard-sized and bantam varieties [3, 28, 96]. Their docile nature and ease of management further contribute to their popularity among African farmers.

Africa's island ecosystems are home to several unique indigenous chicken breeds, which have adapted to local climatic conditions and traditional management systems. Among them, the Giant Malagasy Naked Neck Fowl, also known as the Madagascar Jungle Fowl or Madagascar Naked Neck (*Malgache*), is a distinctive breed found in Madagascar and the Comoros Islands. These birds are believed to have been introduced to the islands by Austronesians, an ancient seafaring group that spread across the Pacific and Indian Oceans, establishing settlements in East African Islands. By 500 CE, Austronesians were present in Madagascar and may have arrived with chickens [8].

The Giant Malagasy Naked Neck Fowl is characterized by its naked neck (devoid of feathers), large size, and robust build (Figure 9), making it well-adapted to Madagascar's unique ecosystem [4, 85, 91]. The naked neck trait is believed to provide an advantage in hot and humid climates, allowing these birds to regulate their body temperature more efficiently than fully feathered chickens [28, 43, 96].

Source: [66]

Figure 9. *Male Madagascar Naked Neck, Female Madagascar Naked Neck.*

Another island-adapted indigenous breed is the Pemba ecotype, found on Pemba Island, which is part of the Zanzibar archipelago in Tanzania [57, 59]. These chickens are known for their upright posture, small to medium body size, and multicolored plumage (Figure 10). Both male and female Pemba chickens hold their tails almost horizontally, a distinguishing feature. They are valued for their hardiness and ability to thrive in challenging environments, making them an important poultry resource in coastal and island ecosystems.

Source: Lyimo, C.M. (Author)

Figure 10. *Male Pemba chicken, Female Pemba chicken.*

Ching'wekwe is a Tanzanian inland indigenous chicken ecotype of the Bankiva type, closely resembling ancient and primitive chicken breeds. These birds are well adapted to mountainous regions, displaying short shanks that enhance their agility in rugged terrains (Figure 11) [57, 70]. Ching'wekwe hens are known for their exceptional brooding tendencies, displaying a strong inclination to incubate eggs and hatch chicks. They possess excellent mothering abilities, demonstrating protective instincts to safeguard their chicks from predators. Additionally, Ching'wekwe chickens are efficient foragers, thriving in free-range systems where they actively scavenge for insects, seeds, and natural food sources. Their hardiness and adaptability make them a valuable poultry resource for smallholder farmers in Tanzania.

Source: Lyimo, C.M. (Author)

Figure 11. *Male Ching'wekwe chicken, Female Chingwekwe chicken.*

The Ovambo chicken, named after the Ovambo people of Namibia and Angola, is a small-sized, resilient breed known for its distinctive black and white feathers (Figure 12). Well-suited to hot and arid climates, this breed thrives in the

semi-desert regions of southern Africa. Its strong foraging abilities make it highly adaptable to free-range farming systems, allowing it to survive on minimal feed inputs [60, 104, 105]. Ovambo chickens are notably aggressive and agile, with a unique behavior of hunting and eating small rodents such as mice and rats, a rare trait among poultry.

The Venda chicken is an indigenous South African breed, originating from the Venda region. It is characterized by its glossy, mottled feathers, displaying a mix of white, black, and red, along with a prominent red comb and wattles (Figure 12). Some Venda chickens also exhibit the rare five-toed trait. This breed is valued for its adaptability to diverse environmental conditions, strong disease resistance, excellent brooding ability, and high-quality meat [60, 69, 103]. These traits make both Ovambo and Venda chickens essential for sustainable poultry production in rural African communities.

Source: [66]

Figure 12. *Ovambo chickens, Venda chickens.*

The Kuchi ecotype, a Tanzanian game bird, is known for its compact, agile body, allowing it to efficiently navigate diverse terrains. Kuchi chickens exhibit an upright posture, strong legs and feet, and a larger body size than most indigenous breeds (Figure 13). They retain game bird characteristics, including a pronounced parrot-like beak, giving them a distinctive appearance [55, 57, 70, 75]. While not widely distributed or well known, the Kuchi chicken is gaining popularity in Kenya, where its hardiness and adaptability are increasingly recognized by farmers.

Source: Lyimo, C.M. (Author)

Figure 13. *Male Kuchi chicken, Female Kuchi chicken.*

The Frizzle chicken is easily identified by its unique feather curling, a genetic trait caused by a mutation in the frizzle gene. Unlike standard chicken feathers, those of Frizzle chickens twist and curl outward, creating a fluffy, frizzled appearance. This distinctive feathering is observed in various local breeds across Africa, enhancing their ability to withstand high temperatures [11, 60]. The frizzled trait improves heat dissipation, making these birds well-suited to tropical and humid climates.

Frizzle chickens display a variety of colors and patterns, depending on their genetic lineage. This frizzled feather trait can be introduced into other chicken breeds through crossbreeding. When two birds carrying the frizzle gene are bred together, the offspring inherit this unique adaptation, enhancing their heat tolerance and resilience in harsh environments.

6. Conclusion and Recommendations

6.1. Conclusion

The domestication of chickens was a gradual process that occurred through multiple independent events in Southeast Asia, including southwestern China and the Indian Subcontinent. Through human migration and trade, chickens spread globally, with archaeological and genetic evidence indicating their arrival in Africa via multiple waves. Two major introductions are evident: the first via Egypt during the Ptolemaic period (300 BC), spreading through the Nile Valley and into West Africa; and the second through Indian Ocean trade routes, bringing chickens to the East African coast during the early to mid-1st millennium AD.

Domestic chickens are now widespread across Africa, providing food, income, and cultural value. Indigenous chickens exhibit resilience, adaptability, and unique traits shaped by natural selection and human breeding. Their genetic diversity reflects both historical evolution and recent management. Key influences on their genetic makeup include migration, gene flow, mutation, recombination, drift, selection, and breeding practices. These factors have produced ecologically adapted chicken ecotypes across the continent, making their genetic diversity a crucial resource for sustainable breeding, conservation, and improvement efforts in African poultry systems.

Despite their importance, African chickens remain under-characterized. Detailed genetic and phenotypic studies are needed to support the conservation of rare and endangered breeds. Characterization enhances biodiversity conservation and facilitates the development of improved breeds suited to local conditions. Preserving African Indigenous chickens is vital for sustainable agriculture, rural livelihoods, and the protection of valuable genetic resources with economic, cultural, and scientific significance.

6.2. Recommendation

This manuscript provides a comprehensive review of the

current state of knowledge on the origin and dissemination of domestic chickens, highlighting the interdisciplinary nature of the research and the need for further investigation in certain areas. Further genetic studies, especially using advanced sequencing technologies, can provide deeper insights into the domestication and adaptation processes.

Abbreviations

AD	Anno Domini (Year of the Lord)
BC	Before Christ
BCE	Before Common Era
CE	Common Era
DNA	Deoxyribonucleic Acid
mtDNA	Mitochondrial DNA
NCBI	National Center for Biotechnology Information

Author Contributions

Charles Moses Lyimo is the sole author. The author read and approved the final manuscript.

Conflicts of Interest

The author declares no conflicts of interest.

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