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Review Article

Evolution and History of Domestication of Livestock, Livestock Population, and Livestock Development Trend in the World and in Ethiopia: Review

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Abstract

The aim of this study is to review the literature and provide a technical brief about history of domestication of livestock, livestock population and livestock development on the world as well as in Ethiopia. Animal domestication started in an ancient time and it needs further investigation till now. Genetic processes are involved in the evolution of animals during domestication. The time of domestication animal is different from each other. Animal domestication was conducted by different alternative path ways. Among those path way direct path way was the most deliberate path way of animal domestication. Again there are certain consequences of domestication. Among those comparison of wild and domestic livestock, longitudinal analysis of wild animals kept in captivity, results brought by molecular genetics are the main one. The population of the livestock in world is increasing from time to time. The world human population is being increasing by high amount of number; to feed those huge numbers of population giving attention for livestock development trend and production system is very essential. Additionally, in the case of our country the number of livestock is high by a number. But the production and productivity is very small compared with the livestock we have. Finally, there are certain modifiers of future livestock production and consumption for resource; socio cultural modifiers and ethical concern are the main one.

Keywords

Domestication, Evolution, Livestock Development Trend and Livestock Population

1. Introduction

Domestication is an evolutionary process by which animals are artificially selected and undergo huge phenotypic behavioral and physiological alterations [1]. Animals' adaptation to humans and captivity is a protracted and never-ending process Local agroecological factors are closely related to domestication sites and conventional production methods [2]. No matter if they are referring to plants or animals, all definitions of domestication acknowledge that it entails a link between humans and the target plant or animal populations [59]. The amount of emphasis placed on either the human side of the equation or the plant/animal side is the main distinction between various definitions of domestication. Some definitions, particularly those that emphasize the domestication of animals, place humans in the role of the dominant partner. Although domestication shares many features with mutualistic relationships in nature, there are, nevertheless, critical differences

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that distinguish domestication from any symbiosis found in nature.

According to [57] the domestication of plants and animals was a significant change in the way of life of an increasing number of human societies, along with significant social and spiritual changes. These transformations, known as the Neolithic transition, happened at the same time in several regions and had a significant impact on human societies. The majority of modern agriculture is based on the culture or farming of a small number of alien domesticated species that have been gradually introduced across all continents. This is one of the other significant effects of domestication. This has facilitated broad uniformity of the fauna and flora [39]. The human side of the equation bears the scars of domestication. Growing data suggests that domestication has had reciprocal genotypic effects on humans and their domestic companions [18]. However, the most significant and distinctive impacts of domestication on humans are cultural. The act of tending plants and animals, whose productive capacity and output can be controlled, has played a major role in reshaping the organization of human societies. Notions of ownership and access to resources are transformed with the shift from free-living to managed plant and animal resources and modes of production are altered.

The total Bovine population (Cattle, Buffalo, Mithun and Yak) is 302.79 Million in 2019 which shows an increase of 1.0% over the previous census. In 2019, there were 192.49 million cattle in the country as a whole. With approximately 63 million cattle, more than 31 million sheep, 33 million goats, and 61 million chickens in 2018, Ethiopia has the most livestock in Africa 40 percent of agricultural output is made up of livestock production, which also has a significant impact on the national economy because it accounts for 1316 percent of GDP [43]. The growth and production rates of livestock are extremely low and lagging behind those of the human population; The consumption of livestock products per person decreases as a result. According to a survey by [48], Ethiopia consumes the least amount of milk, meat, eggs, fish, and honey per capita among its neighbors, with estimates of 19 liters, 8 kg, 1.23 kg, 0.25 kg, and 0.29 kg, respectively.

Objective

To review the evolution and history of the domestication of livestock

To review livestock population and livestock development trends in the world as well as in Ethiopia

2. Literature Reviews

2.1. Evolution and Domestication

According to [60], characteristics that improve an organism's ability to survive or reproduce are exposed to selection and passed down to the following generation in order to increase population prevalence. This process is known as domestication. Due to its significance as a paradigm of evolutionary and demographic change, domestication has intrigued academics from a variety of domains [50]. Discovering the species' predecessors and pinpointing the approximate local domestication are essential steps in figuring out the species' domestication origins. For instance, dogs were domesticated from gray wolves prior to the advent of agriculture [24]. Inbreeding and genetic drift were two uncontrolled processes, natural selection in captivity and relaxation of natural selection were two partially controlled processes, and active selection was one controlled procedure. There were a total of five main genetic processes at play during domestication, according to [54].

2.2. Animal Domestication

Animal domestication, which has changed the Earth's ecosystem over the past 11,500 years, modified human evolution, and affected the number of the human population, is the process of a quick, artificial, and intensive selection of wild animals [24]. The transition from hunting to farming in Neolithic-era ancient civilizations is considered the origin of domestication. Archeological evidence was used to define the phases of animal domestication, which indicated selection pressures brought on by human activity and ecosystems that were tailored to human habitation [42].

2.2.1. Dogs

Dogs were the first animals to be domesticated by humans more than 15,000 years ago. According to [12], they were the first domesticated animals, and they differ from other species in terms of the place and time of domestication. According [37], a new genomic investigation the Near East was the earliest location of dog domestication.

2.2.2. Cattle

The relationship between humans and wild cattle dates back thousands of years, and five domesticated bovine species have been discovered in that time [59]. Meat and milk from drought-stricken animals have human benefits, according to [31]. Recently, domestic breeds have used wild cattle as a genetic resource to adapt to shifting climatic and infectious disease challenges.

2.2.3. Sheep

The mouflon (Ovis musimon) and the urial Ovis orientalism are most likely the wild relatives of domestic sheep [47]. Around 4000-5000 years ago, sheep were primarily farmed for their meat, but they were gradually bred for other purposes. Modern sheep breeds have developed as a result of advances in animal husbandry and the use of direct mating techniques. These breeds are not only the most climate-adaptable but also specialize in the production of milk, meat, and wool [9].

2.2.4. Goat

The domestication of goats has a significant role in human society by providing valued products such as milk, meat, furs, and fiber, predominantly China and other developing countries [1]. The analysis of goat fossil samples from an archaeological site (Baume d'Oullen) located in Southern France, dating from about 7,500 years ago, and corresponds to the front of the Neolithic expansion in this region. Such fossils allowed us to test the sequential domestication process.

2.2.5. Horses

The date of horse domestication is conceived from the definition of domestications [11]. There are two main theories of domestication: the first describes human control over breeding as changes in the size and variability of ancient skeletal samples from ancient horse populations, and the second includes broader evidence of skeletal and dental activity as well as patterns of human lifestyles and weapons, arts, and spiritual artifacts [35]. Evidence claim horses were kept as meat animals before trained as working animals [22].

2.2.6. Chicken

Three historical eras can be used to discuss the history of domestic chicken species. The longest span is the evolutionary history, which is shared with other species both before and after speciation. According to [25], the chicken and quail's most recent common ancestor lived 40 years ago. The second phase of species domestication, which began several thousand years ago, resulted in a diversification of domestic species. Only a few decades have passed since a subset of these breeds underwent thorough production trait selection [6]

2.3. The Alternative Pathway of Animal Domestication

2.3.1. The Commensal Pathway

The commensal pathway is traveled by animals that feed on refuse around human habitats, or by animals that prey on other animals drawn to anthropogenic environments [6]. The first step in the domestication process for these animals is to form a commensal relationship with humans, in which one partner benefits and the other experiences little to no harm or profit. At some point in this association with humans and anthropogenic environments, these animals develop closer social or economic bonds with their human hosts, who begin to derive some tangible benefit from the association. This new reciprocity sets the former commensal and its human host on a pathway to a domestic relationship. The dog is a well-known illustration of a domestic animal that most likely evolved through commensalism. According to popular belief, the domestication of dogs started when wolves were attracted to human settlements to forage on human waste [13]. Therefore, the early commensal stage on this domestication pathway probably functions as a sort of pre-selection for people with characteristics that make them better candidates for domestication, such as a lessened flight response and a higher stress threshold.

2.3.2. The Prey Pathway

Commensal pathway is necessarily not dependent upon human intentionality; the prey pathway does begin with human action [38]. The main human goal was to improve the effectiveness of resource management, not to domesticate. Medium to large herbivores were hunted as prey and followed this course. They were therefore constantly afraid of people and would never have been drawn to the waste materials produced by the human niche. Instead, it's likely that humans changed their hunting techniques to increase the amount of available game. Thus, as people transitioned from managing game to managing herds, to having more total control over the animals' diet and reproduction, these selection pressures favoring qualities like docility would have been strong [46].

2.3.3. The Directed Pathway

The only pathway that began with a careful objective to domesticate a species is the directed pathway [59]. Humans already had domesticated plants and animals and were dependent on them before these taxa were targeted. Upon holding the final goods, consumers were able to see domesticated forms of wild creatures. First paradigm allowing for a thorough analysis of unintentional and intentional selecting pressures related to the context of how different species entered the human niche is the establishment of commensal, prey, and directed pathways. The process of domesticating a free-living animal in order to gain a particular resource or collection of resources of interest is known as the "final pathway to domestication," which is started by humans and is more purposeful and directed. This “directed pathway” probably only came into being once people were familiar with either commensal or prey-pathway domesticated animals. Pets that have undergone this purposeful, guided domestication process are unlikely to have many, if any, of the essential behavioral traits that help some species become pre-dominant. Because of this, domesticating these animals necessitates more conscious human effort to deal with (or get around) behaviors that are opposed to domestication; many of the species that are domesticated in this manner also require greater technology aid. This is likely the pathway that horses took into domestication. While they did have domestic animals (particularly sheep and goats), it is believed that humans who focused mostly on hunting wild horses brought horses into domestication numerous times across the Eurasian steppe [58].

2.4. Genetic Basis of Livestock Domestication

2.4.1. Genetic Basis

Three main genetic processes are involved in the evolution of animals during domestication: inbreeding, genetic drift and selection. The first two are dispersive processes that cause random fluctuations in gene frequencies due to the small size of the population [10]. On the other extreme, artificial selection is a managed procedure. Humans have some influence over natural selection relaxations and natural selection in captivity by regulating environmental factors. Artificial selection is a method unique to domestic species in which people choose the breeding animals. As a result, various breeds have been developed [32].

2.4.2. Resource Allocation Theory

According to the resource allocation theory, an animal's resources are best distributed among the critical features for reproduction and productivity in a given habitat during selection. This suggests that any further selection-mediated improvement in a production-related trait's performance, in the absence of a corresponding increase in resources, must result in the reallocation of resources, which in turn must cause reductions in other traits. According to [33], the amount of resources allocated to production as opposed to fitness determines the heritability of the allocation factor, which is correlated with the decline in these qualities.

2.5. Methods to Investigate Consequences of Domestication

2.5.1. Comparisons of Wild and Domestic Stocks

Comparing captive and wild members of the same species in both their native habitat and captivity is the most often used method for studying the impacts of domestication on animals. However, it can often be difficult to find wild counterparts or variations—fish being the one example in which it is more difficult to find the tamed species than the wild one. For instance, in sheep the wild big horn is thought to represent the remainder of formerly domesticated she that have escaped from humans [23].

2.5.2. Longitudinal Analysis of Wild Animals Kept in Captivity

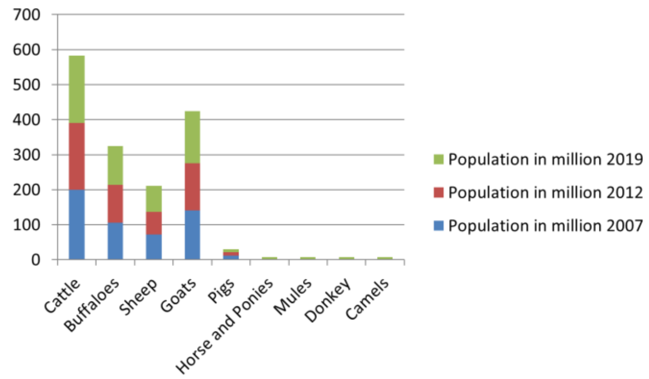
A method called longitudinal analysis involves observing phenotypic changes in wild populations that are housed in captivity [28]. When comparing breeds, the representativeness of the natural reference is more crucial, but in this case, the goal is to measure the pace of development through time.

2.5.3. Results Brought by Molecular Genetics

Information from molecular genetics helps us comprehend the history of domestication better [32]. In recent times, the field of molecular genetics has been employed to examine the degree of variation in gene frequencies between domestic and wild animals. Sources of genetic variability can be investigated by identifying quantitative trait loci (QTL) implicated in the determinism of traits associated to the potential for adaptability. When possible, studying a cross between wild and domestic animals will allow investigation of the effects of domestication.

3. World Livestock Population

The global Livestock population is increasing from time to time as the number of population increasing in order to fulfill the demand of international societies. According to livestock Census 2019 the livestock population of the world seems the below graph.



Livestock Census 2019

Figure 1. *Livestock Population, Major Species during 2007-2019.*

World Livestock Development Trend and Production System

Globally, livestock production is the largest user of agricultural land. The livestock sector globally is highly dynamic. The global cattle industry is distinguished by differences between industrialized and developing nations. According to [53], it is changing in developing nations in response to the quickly rising demand for animal products. In contrast, landless livestock systems that only produce a little amount of feed locally have substantially higher stocking densities [45]. They include ruminant, pig, and poultry production systems. Approximately equally divided between higher-income and lower- to middle-income countries, landless (referring to the livestock production units and not the crops required to feed them) intensified systems produce more than half of the world's pork and 70% of the world's poultry meat. The global food industry is primarily propelled by the growing trend of consuming more live-stock products and changing dietary habits. Between 1980 and 2002, the amount of meat produced in developing countries increased thrice, from 45 to 134 million tons. Much of this growth was concentrated in countries that experienced rapid economic growth, particularly in East Asia, and revolved around poultry and pigs. On the other hand, although still at high levels, the production and consumption of cattle products are currently rising either slowly or stalling in affluent nations. Even still, 53% of the agricultural GDP in developed nations comes from the production and sale of animals. Since local production meets the majority of demand in developing nations, the combination of rising need in these regions and stagnant demand in industrialized nations gives a significant opportunity for livestock keepers in these regions. This trend is anticipated to continue for the foreseeable future. Once more in developing nations, it is changing in response to the sharply rising market for cattle products. The demand for cattle products is declining in industrialized nations, despite the fact that many production systems are becoming more environmentally sustainable and efficient. The historical rise in human population, affluence, and urbanization have been the main drivers of changes in the demand for livestock products. Science and technology, along with an increase in animal population, have been linked to the production response in various livestock systems. According to [45], livestock systems make up around 30% of the planet's ice-free terrestrial surface area and represent a valuable global resource worth at least $1.4 trillion. According to [51], the livestock industry is becoming more and more structured into extensive supply chains that directly sustain the livelihoods of 600 million impoverished smallholder farmers in developing nations and employ at least 1.3 billion people worldwide. Keeping livestock is an important risk reduction strategy for vulnerable communities, and livestock are important providers of nutrients and traction for growing crops in smallholder systems. Livestock products contribute 17 per cent to kilocalorie consumption and 33 per cent to protein consumption globally, but there are large differences between rich and poor countries [41].

4. Ethiopian Livestock Population

Ethiopia has the largest livestock population in Africa, with 65 million cattle, 40 million sheep, 51 million goats, 8 million camels and 49 million chickens in 2020 (Central Statistics Agency). The gross production value average growth rate during the same period was 4.5% also twice the continental median of 2.2% (FAO, 2019). The national herd supports, at least in part, the livelihoods of more than 11.3 million rural households, including 27– 35% of the highland livestock keepers, and a large proportion of the lowland herders, who live below the Government of Ethiopia established poverty line [44]. Major sources of animal protein, energy for growing crops, transportation, export goods, manure for agriculture and household energy, safety in the event of crop failure, and a way to accumulate wealth are all provided by livestock.

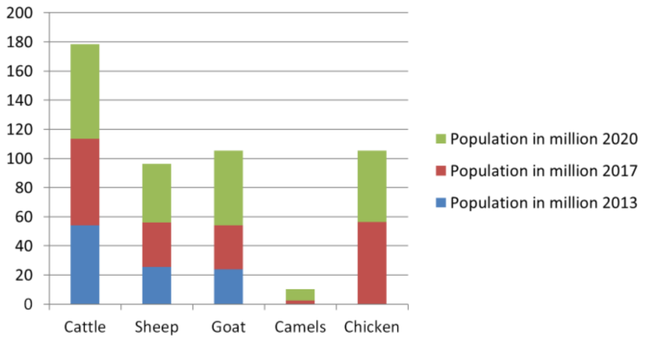


Figure 2. Ethiopian Livestock Population Major Species in 2013, 2017 and 2020.

4.1. Livestock development trend and Production System in Ethiopia

Livestock Production System in Ethiopia

The livestock production system is predominantly extensive, with indigenous breeds and low-input/low-output husbandry practices. Numerous obstacles, such as poor genetics, poor reproductive performance, poor feed quality and seasonal variations, high disease incidence and parasite issues, and limited accessibility to services and inputs, limit the productivity of this industry. The average amount of milk produced by a cow is 1.35 liters per day, while a camel produces 5.16 liters per day. For rural women, small ruminants are a significant source of monetary income [5].

(i). Intensive Management

In urban and peri-urban regions, market-oriented dairy and poultry farms use the intensive management system; these farms primarily keep exotic breeds or crossbred animals for their excellent performance [49]. Milk output in this system is driven by the market and primarily comes from crossbreeds with local cows or high yielding upgraded foreign breeds. Intensive management requires a lot of technology and inputs.

(ii). Mixed Crop Livestock

The mixed crop-livestock farming system is the dominant livestock production system in the Ethiopian highlands. In this system, crops and livestock play interdependent roles, with livestock providing draught power and manure for crop agriculture while crop residues provide feed for the livestock [4]. Livestock comes second to crops as a source of income in a mixed farming system [49]. For example, livestock contributes 25–41% and 33–36%, respectively, to household livelihoods in the Diga district [17] and Sinana district (Bale Zone) of southeast Ethiopia [30]. In Dandi, central Ethiopia, only 2.6% of survey participants identified livestock as their primary source of income [15]. The primary livestock species in this system are cattle, as they are employed for threshing crops, plowing, and producing manure.

(iii). Pastoral and Agro-pastoral

The second most prevalent livestock production methods in Ethiopia are pastoral and agro-pastoral, and they are primarily found in the southern and eastern regions of the nation, in Afar, Somalia, Southern Oromia (Borana), Kereyouin East Shoa, and South Omo in the SNNPR. While agro-pastoralism is characterized by minimal crop production and a dominance of livestock husbandry, the pastoral system lacks agricultural production [19]. Agro-pastoral systems also include transhumant systems that entail the seasonal movement of animals from mixed crop livestock systems to highland and lowland rangelands, like in the Amhara and western Tigray regions [30]. These production systems fall within the category of low-input, low-output systems for large livestock management.

4.2. Trends in Livestock Production and Livestock Systems Evolution

4.2.1. The Increasing Demand for Livestock Products

Human population in 2050 is estimated to be 9.15 billion, with a range of 7.96–10.46 billion [52]. Most of the increase is projected to take place in developing countries. East Asia will have shifted to negative population growth by the late 2040s [3]. In contrast, population in Sub-Saharan Africa (SSA) will still be growing at 1.2 per cent per year. Even if global population growth stops at some point in the current century, rapid population expansion may still provide a significant obstacle to gains in food security in some nations. Urbanization is a significant element that influences food demand. The demand for animal products in particular and patterns of food consumption in general are significantly impacted by urbanization. This is because urbanization frequently leads to improvements in infrastructure, such as cold chains, which facilitate the wider trading of perishable goods [20]. Growth in income is a third factor driving the demand for livestock products. Global per capita income increased by 2.1% year between 1950 and 2000 [27]. The amount spent on livestock products increases together with income [45]. It is anticipated that economic growth will persist in the future, generally at rates of 1.0 to 3.1 percent [56]. According to [41], growth in industrialized nations is expected to be slower than in developing economies.

(i). Global Trends in Meat Consumption

Global meat consumption increased by 58% over the 20 years to 2018 to reach 360 million tonnes. Growth in per capita consumption made up the remaining 54% of this rise, whereas population growth was the primary cause. According to [14], rising wealth and shifting consumer tastes had the biggest effects on per capita consumption.

(ii). Trends in Meat Industry Production

Even though meat is considered a luxury by most people worldwide, there has been a noticeable increase in the production of meat in most countries. The rising living standards in developing nations have contributed significantly to the increase in global meat production and consumption. It is anticipated that the world's meat trade will be influenced by cattle productivity. Due to economies of scale, a few industrialized nations have comparative productivity advantages [55].

4.2.2. The Production Response

Global livestock production has increased substantially since the 1960s. Beef production has more than doubled, while over the same time chicken meat production has increased by a factor of nearly 10, made up of increases in both the number of animals and productivity. On the other hand, the number of cattle worldwide might rise from 1.5 billion to 2.6 billion between 2000 and 2050, while the number of goats and sheep worldwide could rise from 1.7 billion to 2.7 billion [41]. It is anticipated that ruminant grazing intensity in rangelands will rise, leading to a significant increase in livestock production in the world's humid and subhumid grazing systems.

5. Possible Modifiers of Future Livestock Production and Consumption Trends

5.1. Competition for Resources

5.1.1. Land

In the more arid semiarid areas, livestock are a key mechanism for managing risk, but population increases are fragmenting rangelands in many places, making it increasingly difficult for pastoralists to gain access to the feed and water resources that they have traditionally been able to access. Recent assessments expect little increase in pasture land [7], When it is practical, some production intensification through the use of better pastures and efficient management is expected to take place in the humid–subhumid zones on the most suitable land. It's unclear how future cattle output from these systems may be impacted, but grazing systems will likely offer more traded ecosystem goods and services in the future. Given that two-thirds of the world's population live in mixed crop-livestock systems, these systems will remain essential to future food security. Resource constraints are already present in some of the higher potential mixed systems in Africa and Asia, although there are a number of potential solutions, such as intensification and efficiency improvements [29].

5.1.2. Water

Freshwater resources make up only 2.5 percent of all water resources worldwide, making them comparatively rare. Between 1.5 and 3 billion people rely on groundwater for drinking, and in some areas, water levels are steadily dropping. Groundwater is therefore crucial to the provision of water [40]. Future increases in the quantity of animals will undoubtedly increase the need for water, especially in the manufacturing of animal feed.

5.1.3. Climate Change

Climate change may have substantial effects on the global livestock sector. Systems for producing livestock will be impacted in a number of ways. There is little doubt that hazards associated with livestock production will rise with increased climate unpredictability, and that farmers' capacity to manage these risks will also decline. According to [8], cattle food chains also contribute significantly to greenhouse gas emissions, making up around 18% of all anthropogenic emissions.

5.1.4. Socio-cultural Modifiers

Social and cultural drivers of change are having profound effects on livestock systems in particular places, although it is often unclear how these drivers play out in relation to impacts on livestock and livestock systems. Animals play a variety of roles in human culture. They have a significant and direct impact on both human health and food security. Incorporating little amounts of cattle products into the diets of undernourished and impoverished individuals, especially children, can yield significant benefits. Local breeds are important components of cultural networks for both physical and mental health [34], and have frequently been the drivers of particular physical landscapes [52].

5.1.5. Ethical Concerns as a Driver of Change

Ethical concerns may play an increasing role in affecting the production and consumption of livestock products. There is still more work to be done in this area. Recent high-profile calls to embrace global vegetarianism, supported by inflated claims of livestock's contribution to anthropogenic global greenhouse gas emissions, primarily serve to emphasize the need for thorough analysis and reliable data that can help inform public debate about these issues. In recent times, European government strategies have tended to focus more on collective action on behalf of all parties with an interest in animal welfare, including consumers, rather than legislation as the primary instrument for supporting advances in animal welfare [21].

5.2. Livestock Science and Technology as a Driver of Change

5.2.1. Breeding and Genetics

The advances in livestock product production that have been noted in recent decades have historically been mostly attributed to domestication and the application of traditional livestock breeding practices [52]. The makeup of cattle products has undergone significant modifications concurrently. Future changes in the demand for livestock products are probably going to be more and more satisfied by new approaches if previous changes have been satisfied by a combination of traditional techniques, like breed substitution, cross-breeding, and within-breed selection.

The most suitable breed or breed cross can be selected using one of the traditional methods, which involves selecting individual breeds or breed hybrids. However, selection within the population is the only way to achieve additional progress [58]. Pigs and poultry have increased the most, whereas dairy cattle have gained less, especially in wealthy nations and in certain developing nations with more industrialized production systems. Breed substitution has been utilized extensively, which tends to favor a small number of highly specialized breeds that may have narrowly focused genetic selection aims. This has helped achieve some of the goals of genetic selection. Even if wealthy nations have seen the majority of the benefits, developing nations have a lot of room to grow in terms of production. Due in part to the lack of the necessary infrastructure (such as genetic evaluation systems and performance records), within-breed selection has not been used very often. Future livestock breeding in many industrialized countries will continue to emphasize traits other than productivity and production, like improving animal welfare, decreasing environmental impact, producing high-quality products, and resisting disease. In the future, molecular genetics methods are expected to have a significant impact.

5.2.2. Nutrition

The nutritional needs of farm animals with respect to energy, protein, minerals and vitamins have long been known, and these have been refined in recent decades. For both ruminants and non-ruminants, several requirement determination methods are utilized in different nations. These systems were initially created to evaluate the nutritional and productive effects of various feeds for the animal after intake was known. Nonetheless, a large amount of research has been done on the dynamics of digestion, and it is now reasonable to forecast feed intake related animal performance with a high degree of correctness for a wide range of livestock species. There is still a lot of work to be done in order to accurately anticipate animal development, body composition, feed requirements, animal waste product outputs, and production costs. Such efforts could significantly enhance animal production's efficiency and assist satisfy both regulatory bodies' and consumers' expectations. The fields of animal nutrition and growth and development predictions are going to continue to benefit from advances in genomes, transcriptomics, proteomics, and metabolomics [16].

5.2.3. Disease

Animal diseases generate a wide range of biophysical and socio-economic impacts that may be both direct and indirect, and may vary from localized to global [36]. Throughout the past 20 years, there have been comparatively minor changes in the distribution, frequency, and effects of numerous endemic and epidemic livestock illnesses throughout the developing world, especially in Africa. Additionally, the standard of veterinary care has generally declined during this time. The absence of data in many developing nations makes it difficult to evaluate how disease status is changing. This is a crucial area where development is needed for disease diagnostics, monitoring, and impact assessment to become sustainable and successful. Because the effects of disease reach far beyond animal illness and mortality in a globalized and highly interconnected world, the direct impacts of livestock diseases are declining globally, but the total impacts may actually be growing [Mackenzie *et al*., 2013].

6. Conclusion

This paper tries to explain the history of domestication, domestication path way, and livestock population on the world and in our country. Again it tries to explain livestock development trend and production system. The domestication of animals is the mutual relationship between animals and the humans who have influence on their care and reproduction. Again Domestication is probably still occurring and population of domestic animals is still evolving. The beginnings of animal domestication involved a protracted evolutionary process with multiple stages along different pathways. Importantly, humans did not intend to domesticate animals by either the commensal or prey pathways. Developments in nutrition and animal health will continue to contribute to increasing potential production and further efficiency and genetic gains. Global livestock population is increasing highly from time to time, however, the increasing rate is different from world to world, from country to country as well as from animal species to animal species. Ethiopia holds the first rank by the number of livestock population from Africa. However, the production and productivity is very less when compared with the number of livestock population; this may due to genetic base, nutrition, disease and other factors.

Abbreviations

QTL	Quantitative Trait Loci
GDP	Gross Domestic Product
SSA	Sub-Saharan Africa

Author Contributions

Segni Giza: Conceptualization, Formal Analysis, Methodology, Writing – review & editing

Conflicts of Interest

The authors declare no conflicts of interest.

References

[1] Ahmad, H. I., Ahmad, M. J., Jabbir, F., Ahmar, S., Ahmad, N., Elokil, A. A. and Chen, J., 2020. The domestication makeup: Evolution, survival, and challenges. *Frontiers in Ecology andvoltion*, *8*, p. 103. https://doi.org/10.3389/fevo.2020.00103

[2] Alders, R. G., Campbell, A., Costa, R., Guèye, E. F., Ahasanul Hoque, M., Perezgrovas-Garza, R., Rota, A. and Wingett, K., 2021. Livestock across the world: diverse animal species with complex roles in human societies and ecosystem services. *Animal Frontiers*, *11*(5), pp. 20-29. https://doi.org/10.1093/af/vfab047

[3] Alexandratos, N. and Bruinsma, J., 2012. World agriculture towards 2030/2050: the 2012 revision. https://ageconsearch.umn.edu/record/288998

[4] Banda, L. J. and Tanganyika, J., 2021. Livestock provide more than food in smallholder production systems of developing countries. *Animal Frontiers*, *11*(2), pp. 7-14. https://doi.org/10.1093/af/vfab001

[5] Biffa, D., Jobre, Y., and Chakka, H. 2006. Ovine helminthosis, a major health constraint to productivity of sheep in Ethiopia. Animal Health Research Reviews. 7(1-2): 107-118. https://doi.org/10.1017/S1466252307001132

[6] Bortoluzzi, C., Crooijmans, R. P., Bosse, M., Hiemstra, S. J., Groenen, M. A. and Megens, H. J., 2018. The effects of recent changes in breeding preferences on maintaining traditional Dutch chicken genomic diversity. *Heredity*, *121*(6), pp. 564-578. https://doi.org/10.1038/s41437-018-0072-3

[7] Bruinsma J. 2003 World agriculture: towards 2015. FAO perspective. Rome, Italy: Earthscan, FAO.

[8] Caro, D., Davis, S. J., Bastianoni, S. and Caldeira, K., 2014. Global and regional trends in greenhouse gas emissions from livestock. *Climatic change*, *126*, pp. 203-216. https://doi.org/10.1007/s10584-014-1197-x

[9] Chessa, B., Pereira, F., Arnaud, F., Amorim, A., Goyache, F., Mainland, I., 2009. Revealing the history of sheep domestication using retrovirus integrations. Science 324, 532–536. https://doi.org/10.1126/science.1170587

[10] Chikhi, L., Nichols, R. A., Barbujani, G. and Beaumont, M. A., 2002. Y genetic data support the Neolithic demic diffusion model. *Proceedings of the National Academy of Sciences*, *99*(17), pp. 1100811013. https://doi.org/10.1073/pnas.162158799

[11] Cieslak, M., Pruvost, M., Benecke, N., Hofreiter, M., Morales, A., Reissmann, M., e 2010. Origin and history of mitochondrial DNA lineages in domestic horses. PLoS One 5: e15311. https://doi.org/10.1371/journal.pone.0015311

[12] Cieslak, M., Reissmann, M., Hofreiter, M. and Ludwig, A., 2011. Colours of domestication. *Biological Reviews*, *86*(4), pp. 885-899.

[13] Coppinger, R. and Coppinger, L., 2001. *Dogs: A startling new understanding of canine origin, behavior & evolution*. Simon and Schuster.

[14] Dagevos, H., 2021. Finding flexitarians: Current studies on meat eaters and meat reducers. *Trends in Food Science & Tecnoogy*, *114*, pp. 530539. https://doi.org/10.1016/j.tifs.2021.06.021

[15] Duguma, R., Tasew, S., Olani, A., Damena, D., Alemu, D., Mulatu, T., Alemayehu, Y., Yohannes, M., Bekana, M., and Hoppenheit, A. 2015. Spatial distribution of Glossina sp. and Trypanosoma sp. https://doi.org/10.1186/s13071-015-1041-9

[16] Dumas A., Dijkstra J., France J.2008. Mathematical modelling in animal nutrition: a centenary review. J. Agric. Sci. 146, 123142.https://doi.org/10.1017/S0021859608007703

[17] Duressa, D., Kenea, D., Keba, W., Desta, Z., Berki, G., Leta, G., and Tolera, A. 2014. Assessment of livestock production system and feed resources availability in three villages of Diga district Ethiopia. ILRI: Addis Ababa, Ethiopia.

[18] Fischer, R., 2017. *Personality, values, culture: An evolutionary approach*. Cambridge University Press.

[19] Gizaw, Solomon, Megersa Abera, Melku Muluye, Dirk Hoekstra, Berhanu Gebremedhin, and Azage Tegegne. 2016."Smallholder dairy farming systems in the highlands of Ethiopia: System-specific constraints and intervention options." *LIVES Working Paper*.

[20] Gulati, A., Minot, N., Delgado, C. and Bora, S., 2007. Growth in high-value agriculture in Asia and the emergence of vertical links with farmers. In *Global supply chains, standards and the poor: How the globalization of food systems and standards affects rural development and poverty* (pp.91-108). WallingfordUK: CABI. https://doi.org/10.1079/9781845931858.0091

[21] Harvey, D. and Hubbard, C., 2013. Reconsidering the political economy of farm animal welfare: An anatomy of market failure. *Food policy*, *38*, pp. 105-114. https://doi.org/10.1016/j.foodpol.2012.11.006

[22] Hausberger, M., Roche, H., Henry, S., and Visser, E. K. 2008. A review of the human–horse relationship. Appl. Anim. Behav. Sci. 109, 1–24. https://doi.org/10.1016/j.applanim.2007.04.015

[23] Jones, K. R., 2002. *Wolf mountains: A history of wolves along the Great Divide* (No. 6). University of Calgary Press.

[24] Larson, G. and Fuller, D. Q., 2014. The evolution of animal domestication. *Annual Review of Ecology, Evolution, and Systematics*, *45*, pp. 115-136. https://doi.org/10.1146/annurev-ecolsys-110512-135813

[25] Lawal, R. A., Martin, S. H., Vanmechelen, K., Vereijken, A., Silva, P., Al-Atiyat, R. M., Aljumaah, R. S., Mwacharo, J. M., Wu, D. D., Zhang, Y. P. and Hocking, P. M., 2020. The wild species genome ancestry of domestic chickens. *BMC biology*, *18*(1), pp. 1-18.

[26] Mackenzie, J. S., Jeggo, M., Daszak, P. and Richt, J. A. eds., 2013. *One Health: The human-animal-environment interfaces in emerging infectious diseases* (Vol. 366). Berlin: Springer. https://doi.org/10.1007/978-3-642-36889-9

[27] Maddison A. 2003. The world economy: historical statistics. Paris, France: OECD.

[28] Mason, G., Burn, C. C., Dallaire, J. A., Kroshko, J., Kinkaid, H. M. and Jeschke, J. M., 2013. Plastic animals in cages: behavioural flexibility and responses to captivity. *Animal Behaviour*, *85*(5), pp. 1113-1126. https://doi.org/10.1016/j.anbehav.2013.02.002

[29] McDermott, J. J., Staal, S. J., Freeman, H. A., Herrero, M. and Van de Steeg, J. A., 2010. Sustaining intensification of smallholder livestock systems in the tropics. *Livestock science*, *130*(1-3), pp. 95-109.

[30] Mekuriaw, Zeleke, and Lacey Harris-Coble. "Ethiopia's livestock systems: Overview and areas of inquiry." (2021).

[31] Melletti, M., and Burton, J. 2014. Ecology, Evolution And Behaviour Of Wild Cattle: Implications For Conservation. Cambridge: Cambridge University Press.

[32] Mignon-Grasteau S, Boissy A, Bouix J, Faure J-M, Fisher AD, Hinch GN, 2005. Genetics of adaptation and domestication in livestock. Livestock Production Science.; 9 3: 3-14. https://doi.org/10.1016/j.livprodsci.2004.11.001

[33] Mirkena, Tadele, Gemeda Duguma, Aynalem Haile, Markos Tibbo, A. M. Okeyo, Maria Wurzinger, and Johann Sölkner. "Genetics of adaptation in domestic farm animals: A review." *Livestock Science* 132, no. 1-3 (2010): 1-12. https://doi.org/10.1016/j.livsci.2010.05.003

[34] Neumann C. G., et al. 2003. Animal source foods improve dietary quality, micronutrient status, growth and cognitive function in Kenyan school children: background, study design and baseline findings. J. Nutr. 133, 3941S–3949. https://doi.org/10.1093/jn/133.11.3941S

[35] Olsen, Sandra. 2006."Early horse domestication on the Eurasian steppe," in documenting domestication: New genetic and archaeological paradigms. Edited by Melinda A. Zeder, Eve Emshwiller, Bruce D. Smith, and Daniel G. Bradley, pp. 245–69. Berkeley: University of California Press.

[36] Perry B., Sones K.2009. Global livestock disease dynamics over the last quarter century: drivers, impacts and implications. Rome, Italy: FAO.

[37] Pilot, M., Pilot, M., Greco, C., Vonholdt, B. M., Jędrzejewska, B., Randi, E., Jędrzejewski, W., Sidorovich, V. E., Ostrander, E. A. and Wayne, R. K., 2014. Genome-wide signatures of population bottlenecks and diversifying selection in Europeawolves. *Herety*,*112*(4), pp. 428442. http://dx.doi.org/10.1038/hdy.2013.122

[38] Price, M. and Hongo, H., 2020. The archaeology of pig domestication in Eurasia. *Journal of Archaeological Research*, *28*, pp. 557-615.

[39] Rahel, F. J., 2010. Homogenization, differentiation, and the widespread alteration of fish faunas. In *American Fisheries Society Symposium* (Vol. 73, pp. 311-326).

[40] Richey, A. S., Thomas, B. F., Lo, M. H., Reager, J. T., Famiglietti, J. S., Voss, K., Swenson, S. and Rodell, M., 2015. Quantifying renewable groundwater stress with GRACE. *Water resourcesresearch*, *51*(7), pp. 52175238. https://doi.org/10.1002/2015WR017349

[41] Rosegrant M. W., 2009. Looking into the future for agriculture and AKST (Agricultural Knowledge Science and Technology). In Agriculture at a crossroads (eds McIntyre B. D., Herren H. R., Wakhungu J., Watson R. T.), pp. 307–376 Washington, DC: Island Press.

[42] Scott, J. C., 2017. *Against the grain: A deep history of the earliest states*. Yale University Press.

[43] Seifu, K. 2000. Opening address proceedings of the 8th annual conference of the Ethiopian Society of Animal Production (ESAP) held in Addis Ababa, Ethiopia.

[44] Shapiro, B. I., Gebru, G., Desta, S., Negassa, A., Nigussie, K., Aboset G. and Mechale. H. 2017. Ethiopia livestock sector analysis. ILRI Project Report. Nairobi, Kenya: *International Livestock Research Institute* (ILRI). https://creativecommons.org/licenses/by/4.0

[45] Steinfeld, H., 2006. *Livestock's long shadow: environmental issues and options*. Food & Agriculture Org.

[46] Svizzero, S., 2016. Hunting strategies with cultivated plants as bait and the prey pathway to animal domestication. *International Journal of Research in Sociology and Anthropology*, *2*(2), pp. 53-68. https://dx.doi.org/10.20431/2454-8677.0202007

[47] Taberlet P, Valentini A, Rezaei HR, Naderi S, Pompanon F, Negrini R, 2008. Are cattle, sheep, and goats endangered spcies. MoleculrEcoogy.; 17: 275284. https://doi.org/10.1111/j.1365-294X.2007.03475.x

[48] Tegegne, A. and Feye, G., 2020. Study of Selected Livestock Innovations in Ethiopia. *zef Center for Development Research University of Bonn, Working Paper*, *192*.

[49] Tegegne, A., Gebremedhin, B., Hoekstra, D., Belay, B., and Mekasha, Y. 2013. Smallholder dairy production and marketing systems in Ethiopia: IPMS experiences and opportunities for market-oriented development. Working Paper No. 31. ILRI: Addis, Ababa, Ethiopia.

[50] Thomas, J. and Kirby, S., 2018. Self-domestication and the evolution of language. *Biology & philosophy*, *33*, pp. 1-30.

[51] Thornton P. K., *et al*. 2006. Mapping climate vulnerability and poverty in Africa. Nairobi, Kenya:

[52] Thornton, P. K., 2010. Livestock production: recent trends, future prospects. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *365*(1554), pp. 2853-2867. https://doi.org/10.1098/rstb.2010.0134

[53] Thornton, P. K., van de Steeg, J., Notenbaert, A. and Herrero, M., 2009. The impacts of climate change on livestock and livestock systems in developing countries: A review of what we know and what we need to know. *Agricultural systems*, *101*(3), pp. 113127. https://doi.org/10.1016/j.agsy.2009.05.002

[54] Tymchuk, W., Sakhrani, D. and Devlin, R., 2009. Domestication causes large-scale effects on gene expression in rainbow trout: analysis of muscle, liver and brain transcriptomes. *General and comparative endocrinology*, *164*(2-3), pp. 175-183. https://doi.org/10.1016/j.ygcen.2009.05.015

[55] Uçak, Harun. "Trends in Meat Industry–Production, Consumption and Trade 2007." *Acta Scientiarum Polonorum. Oeconomia* 6.4: 125-131.

[56] Van Vuuren D. P., et al. 2009. Outlook on agricultural change and its drivers. In Agriculture at a crossroads (eds McIntyre B. D., Herren H. R., Wakhungu J., Watson R. T.), pp. 255–305 Washington, DC: Island Press. https://orcid.org/0000-0002-8266-0488

[57] Vigne J-D. 2011. The origins of animal domestication and husbandry: a major change in the history of humanity and the biosphere. Comptes Rendus Biol. 334: 171–81. https://doi.org/10.1016/j.crvi.2010.12.009

[58] Villanueva, B., Pong-Wong, R., Woolliams, J. A. and Avendaño, S., 2004. Managing genetic resources in selected and conserved populations. *BSAP Occasional Publication*, *30*, pp. 113-132. https://doi.org/10.1017/S0263967X00041987

[59] Zeder, M. A., 2012. Pathways to animal domestication. *Biodiversity in agriculture: domestication, evolution, and sustainability*, *10*, pp.227-259.

[60] Zeder MA. 2006. Archaeological approaches to documenting animal domestication. In Documenting Domestication: New Genetic and Archaeological Paradigms, ed. M Zeder, DG Bradley, E Emshwiller, BD Smith, pp. 209–27. Berkeley: Univ. Calif. Press. https://doi.org/10.1525/9780520932425016