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MINISTRY OF AGRICULTURE

National Equine Breeding Strategy

JANUARY, 2026
ADDIS ABABA

National Animal Genetic Improvement Institute (NAGII) 2021

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The LFSDP's support in preparing and printing these policy documents establishes a definitive "genetic roadmap" for Ethiopia's livestock and fisheries transformation. These formalized strategies act as vital safeguards against disorganized breeding, preventing inbreeding, the erosion of indigenous traits, and the inefficient use of resources. Without such frameworks, a nation is essentially driving in the dark; these manuals provide the "headlights" and "GPS" required to reach a productive, climate-resilient destination. By institutionalizing these guidelines, the Ministry ensures livestock resources are managed with scientific precision and sustainable foresight. Ultimately, these documents bridge the gap between traditional smallholders and a modern, commercialized industry, guaranteeing inclusive and enduring growth.

Message

It is with great pleasure that I present the National Equine Breeding Strategy, a landmark initiative aimed at guiding the sustainable development, conservation, and utilization of Ethiopia's equine genetic resources. Ethiopia is home to one of the largest populations of horses, donkeys, and mules in Africa, and these animals play a vital role in supporting livelihoods, agricultural productivity, transport services, sport, culture, and the broader rural and urban economy. To ensure proper utilization, conservation and improvement of genetic resources, a livestock master plan has been developed. Further, Ethiopian council of Ministers has enacted breeding policy. In response to this, the Ministry of Agriculture has developed livestock breeding strategy for most farm animals to translate this policy into action.

Despite their importance, the equine sector has not received commensurate strategic attention in the past. Breeding practices have largely remained traditional and uncoordinated, limiting genetic improvement, reproductive efficiency, and overall performance, while welfare challenges continue to affect productivity and longevity. This strategy has therefore been developed to provide a coherent national framework that aligns breeding objectives with animal health, welfare, adaptability, and the diverse uses of equines in Ethiopia, including working equids and sport horses.

The strategy emphasizes evidence-based planning, stakeholder engagement, and institutional coordination across federal and regional levels. It promotes capacity building, improved breeding management, conservation of indigenous equine breeds, and the responsible application of modern reproductive technologies. Importantly, the strategy recognizes that improving equine breeding is not only an animal production issue, but also a poverty reduction, resilience, and development priority.

I call upon all stakeholders regional bureaus, research institutions, universities, professional associations, development partners, and equine owners to take shared ownership of this strategy and work collaboratively towards its effective implementation. With sustained commitment and partnership, this strategy will contribute to improved equine productivity, enhanced welfare, strengthened sport and performance sectors, and lasting

socio-economic benefits for our nation. Taking this opportunity, I would like to extend my appreciation for LDI leadership and experts from different institutions who have immensely contributed to the development of this document.

Firku Regassa (PhD)

State Minister, Ministry of Agriculture
Federal Democratic Republic of Ethiopia

Forward

Equines—horses, donkeys, and mules—are integral to Ethiopia's history, culture, and socio-economic development. With one of the largest equine populations in Africa, Ethiopia relies on these animals not only for transport, traction, and livelihoods of millions of rural and urban households, but increasingly for sport, recreation, tourism, and national pride. Despite their immense contribution, equine breeding in Ethiopia has long been characterized by limited coordination, low genetic improvement, and insufficient integration of health, welfare, and productivity considerations. These challenges have constrained the full potential of the equine sector to contribute to the national economy and sustainable development.

To ensure proper utilization, conservation and improvement of genetic resources, Ethiopian council of Ministers has enacted breeding policy. Established by regulation (Council of Ministers Regulation No. 506/2022), building on the National Artificial Insemination Center (NAIC) and National Animal Genetic Improvement Institute (NAGII), LDI is mandated with the primary goal of ensuring equitable and environmentally sustainable breed productivity, product quality, and market competitiveness in Ethiopia's livestock sector. LDI addresses the issues of inherent low productivity and limited access to quality genetics by focusing on genetic improvement and sustainable breeding practices. Translating the breeding policy into action requires development of breeding strategies and programs. The National Equine Breeding Strategy has been developed to address these gaps through a coherent, evidence-based, and forward-looking framework. The strategy aims to guide the systematic improvement, conservation, and sustainable utilization of Ethiopia's diverse equine genetic resources. It emphasizes balanced breeding objectives that integrate performance, reproductive efficiency, adaptability, animal welfare, and resilience, while recognizing the distinct roles of working equids and sport horses. The strategy also promotes institutional coordination, stakeholder participation, capacity building, and the application of appropriate technologies to support informed breeding decisions.

This document reflects the need for collective efforts of government institutions, researchers, veterinary professionals, equine owners, and development partners who share a common vision for a stronger and more sustainable equine sector.

Its successful implementation will require sustained commitment, adequate resources, and effective collaboration at national and regional levels. By investing in strategic equine breeding today, Ethiopia will safeguard livelihoods, enhance equine welfare, strengthen sport and performance sectors, and ensure that equines continue to serve as a cornerstone of economic and social well-being for generations to come.

On behalf of the Livestock Development Institute, I would like to extend my appreciation to the sponsor's name can be put here..... for playing lead role in supporting the process. My sincere gratitude also goes to the contributors of this document who were actively involved in the process of developing this breeding strategy.

Asrat Tera (PhD)

Director General, LDI, 2025

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Executive Summary

Background and Rationale: Ethiopia possesses one of the largest equine populations in the world, with donkeys, horses, and mules playing critical roles in agriculture, transport, and livelihoods, particularly in rural communities. Despite their economic and social importance, the equine sector faces challenges such as inadequate absence breeding programs, poor nutrition, limited veterinary services, and lack of policy support. Developing a national equine breeding strategy is essential to unlock the full potential of these animals, ensuring genetic diversity, improved productivity, and sustainable livelihoods.

Key challenges as strategic issues include:

- Lack of institutional support and ownership for equine programs.
- Traditional breeding practices leading to poor low genetic diversity improvement and productivity.
- Poor access to veterinary services and technical expertise.
- Limited market access and economic incentives for breeders
- Threats to indigenous breeds from urbanization and mechanization.

Vision: To establish a sustainable, productive, and welfare-oriented equine breeding system that enhances livelihoods and supports Ethiopia's national economy by 2030.

Mission: To efficiently utilize Ethiopia's equine genetic resources through selection, sound genetic improvement, breed conservation, and sustainable practices, thereby improving livelihoods and increasing the sector's contribution to the national economy.

Objectives: The National Equine Breeding Strategy is designed to achieve the following:

- Enhance the contribution of equines to the national and household and national economies of Ethiopia.

- Improve equine breeds, breeding practices, and reproductive efficiency.
- Establish a genetic improvement program tailored to different production systems and agro-ecologies.
- Preserve Ethiopia's indigenous equine breeds and safeguard their genetic diversity
- Strengthen professional and institutional capacity in academics, research, development, while establishing a supportive policy framework for sustainable equine breeding and management, extension services.
- Actively engage the private sector and Public-Private partnership in advancing the equine industry.
- Foster social behaviour change and provide extension services for equine producers and the general public.

Identified Strategic Interventions:

- Institutional reforms to establish coordinated efforts for equine breeding and management. The need to bridge between ministries of agriculture and transport.
- Enhancement of indigenous genetic resources through characterization, selection, and conservation.
- Promotion of genetic improvement via community-based breeding programs, artificial insemination, and crossbreeding.
- Establishment of equine breeding and multiplication centers in key agro-ecological zones.
- Equine breeds conservation
- Advocacy and capacity building to improve public awareness, education, and policy alignment.
- Development of regulatory frameworks for the trade and management of equines and genetic material.

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Expected Outputs

- Enhanced public and institutional capacity to sustain equine-focused initiatives and policy support for equine breeding. This involves developing skills, infrastructure, and knowledge systems necessary to support the growth and sustainability of the equine sector
- Establishment of well-defined national equine breeding strategy targeting productivity and genetic diversity.
- Established sound equine breeding stock and identified equine breeds for specialized production traits contributing to household and national economy
- Availability of improve equine breeds from multiplication centers for equine breeders and equestrian society
- Positive social behavioral change of equine breeding community and the general public
- Improved market systems and incentives for breeders, including export opportunities.
- Conservation of indigenous equine breeds and their genetic resources.
- Enhanced public and institutional capacity to sustain equine-focused initiatives. This involves developing skills, infrastructure, and knowledge systems necessary to support the growth and sustainability of the equine sector

Conclusions and way forward: The national equine breeding strategy serves as a roadmap for revitalizing Ethiopia's equine sector. By implementing targeted the designed interventions, the strategy aims to enhance equine productivity, preserve genetic diversity, and improve rural livelihoods and contribute to the national economy. The way forward includes ensuring adequate policy support, funding, fostering public-private partnerships, and continuously monitoring and evaluation of the strategy's impact. With Ethiopia's favourable agroclimatic conditions, this collaborative and inclusive approach will establish the country as a leader in sustainable equine production across East Africa.

NATIONAL EQUINE BREEDING STRATEGY

1. Background

Equines generally constitute approximately 112 million of the global livestock population in developing countries. It is estimated that working equines help close to 600 million people globally, very often in the poor and marginalized communities. They are the power engine of the rural society all over the world, yet, their role and contribution remain unacknowledged in national and global policies. Although working equines are classified as livestock, they are often neglected by policy makers primarily because they do not produce food for human consumption and, therefore, are not perceived as a critical element of people's livelihoods (Delphine, 2015).

According to the Central Statistics Services (CSS) 2023 report, Ethiopia is home to a total of over 12.5 million working equines including 10 million donkeys, 2 million horses, and 360,000 mules. While the donkey population is steadily increasing, the populations of mules and horses have remained stagnant, with ownership of horses and mules declining over time (Norris et al, 2021). Equines in Ethiopia, particularly donkeys, inhabit diverse agro-ecological zones inimitably contributing to the livelihood of both rural and urban communities. Most of the equines are found in high human population areas; with 30% of all equines being found in only 8% of the central highland (Svendsen, 1997). They support people's livelihood in a wide range of sectors including agriculture, transport, construction, mining, and to some extent tourism. As described by Delphine (2015), in the livelihood framework, working equines contribute to the human capital through providing access to education and health care, natural capital being natural resources by themselves and through providing draft power to the agricultural sector, physical capital through providing transportation and draft power services, financial capital being financial assets and serving as sources of direct or indirect income, and social capital through supporting women and other members the society in carrying out social functions. ESS, 2019 showed that more than 93% of equine owners used equines for transportation and draft purpose

while about 40% of rural households own at least one of the equines (mainly donkey). Around 300 thousand (15.5%) of horses, and 2.4% (close to 3 million) donkeys are used for pulling carts. The rest are used for agriculture and pack transport. More equines means more economic activity in rural community. Equine owners have larger family size (5.4 vs 4.6) and farming land (1.5 vs 0.8 Ha). Within owners, horse owners are educated compared to donkey owners. Relative importance of equines to the total livestock is 0.24.

Equines have been an important component of all types of farming systems mainly as source of animal power (Astatke and Mohamed Saleem, 1996). Therefore, their production is part of mainly the agricultural economic sector. Therefore, the main purpose/objective of producing equines in Ethiopia is to provide draft power to agricultural practices. Equines are sources of draft power to transport agricultural tools, seeds, harvests, livestock feed and people involved in agricultural practices; provide traction power for tillage, land preparation and harvest of agricultural products; and play critical role in transporting water to the farming or pastoralist households. Equines are also supporting the urban economic activities like transportation (pulling carts), marketing and construction through giving transportation services. The equine population in urban areas originates mainly from rural areas where most of the equine production takes place.

Equine production in Ethiopia remains to be traditional characterized by very low input. The major feed resources are unimproved pastures in communal grazing lands, range-lands and fallow lands that are subject to seasonal climatic variation. The long dry condition and low precipitation, which occur frequently in Ethiopia, greatly reduce both the quality and quantity of the pasture available (Svendsen, 1997). In most of the cases, equines are left to scavenge around homesteads and leftovers of feeds from other livestock species. There are limited practices of supplementing concentrates to horses and mules in urban areas, where these animals are used for transportation businesses. Equines are not housed properly and hence they suffer from extreme weather conditions and pests/insects and,

in most of the cases, spend nights in the open unprotected from predators. Equines also suffer from poor harnessing, which is the cause of most of the work-related wounds, stress and welfare problems.

Ethiopia has diverse equine genetic resources. However, breeding practices are purely traditional with very little practice of merit/performance-based selection except in some areas where they are used for special purposes such as breeding mules or hinny. There are more than ten breeds of donkeys identified worldwide but the one believed widespread in Ethiopia is the Abyssinian donkey (also known as Ethiopian) (Mason, 1996). Kefena et al (2012) classified Ethiopian donkeys based on average size and coat color in to six major types namely Abyssinian, Afar, Hararghe, Ogaden, Omo and Sennar. The Sennar donkey is by far the largest and the only one reputed for producing good mules. Horse types present in Ethiopia were found to be difficult to classify due to crossing among the various breeds for a long time. Nevertheless, some workers designate these horses as the Abyssinian horse and are believed to be pony/light horse crosses (Mason, 1996; Anonymous, 2003). Sennar Donkeys are mainly bred in Jida in Oromia, North Gondar in Amhara and Assosa in Benshangul-Gumuz Region. According to Fesseha et al (1997), the genera classification of horses in Ethiopia falls in two major types: the Oromo horse and the Dongola horse. However, a more comprehensive report by Kefena et al (2012) identified seven distinct domestic and one feral horse populations in Ethiopia: Abyssinian, Bale, Boran, Horro, Ogaden, Kafa, Selale and Kundido feral horse with great deal of variability in color, size and conformation.

Major horse breeding areas in Ethiopia are Awi Zone (Enjibara) in Amhara Region and Selale, Bale and Arsi highlands in Oromia Region. Equine production in Ethiopia is also constrained by the poor reproductive performance related to the poor management practices accorded to them. The foaling age, conception rate, and foaling interval are in general far below normally expected. Protracted chronic under-nourishment has been the

major problem especially in donkeys during the dry season, which coincides with the time of farm operations that require high output (Alemayehu, 2004). Severe climatic conditions (temperature, rainfall and humidity) coupled with poor housing conditions have inhibitory effects on reproduction, either directly by influencing physiological functions under diverse weather conditions or indirectly by suppression of feed intake. The reproductive cycle of equines is generally subject to greatest variability in comparison to all other domestic animals. This is more pronounced in female than in male animals. High embryonic losses (40%), low fertility and limited annual reproductive windows are known to occur in mares. Much work has been done in temperate regions but information is scarce for both horses and donkeys in tropical areas. Few scientific reports for equines under the traditional system indicate the presence of very low fertility, late maturity (4 years), long foaling interval (2-3 years) and some degree of inbreeding. A period of increased sexual activities has also been associated with the rainy seasons (Fesseha et al, 1997, Lemma et al 2006, Kebede et al.2012).

The geographical difference in breeding seasons, the variation in timing and in length of the annual breeding peaks suggests that local environmental factors such as climate, quality and quantity of the rain-fed pasture, nutrition, and management are essential factors that determine their annual patterns of breeding. Both jennies and mares are known to reach puberty in 1-3 years (Asa, 2002), however, some reports confirm that jennies in Ethiopia reach puberty at a later age of 3-5 years (Mohammed, 1991; Fesseha et al, 1997). The gestation period in both species has been reported to vary between 330 and 400 days (McDonnell 1998; Löfstedt, 2001). The length of gestation is more variable in mares than in any other domestic animals and it may be as short as 305 days or as long as 400 days. Gestation in donkeys is equally variable ranging from 335 and 390 days. The duration of hinny and mule pregnancies have been reported as 350 to 355 days, but are probably quite variable as well (Löfstedt, 2001).

1.1. Rationale for developing equine breeding Strategy

Economic Contribution: Equines provide agricultural support and transport services, 365 days. By aiding in agricultural productivity, equines contribute to food security by increasing the efficiency of crop production. They contribute to the informal economy through the sale and trade of equines and related products and have opportunities to export high-quality equines to regional markets, generating foreign exchange

Livelihood and self - employment: According to CSS, 2023, about 4 millions (350 thousand horses, and 3 .5 million donkeys) pull carts and transport goods supporting millions of households in urban and peri-urban areas of Ethiopia. Serve as assets for wealth accumulation and poverty alleviation, especially for women and marginalized groups. Provide jobs in breeding, transport services, veterinary care, and equipment production

History, Cultural and Traditional Practices: Equine breeding in Ethiopia is closely linked to cultural and traditional practices, with horses, mules, and donkeys playing significant roles in, trade, festive, weddings, ceremonies and during war. They symbolize wealth, social status, and resilience in many communities. Donkeys represent resilience in daily life. Traditional selective breeding based on desirable traits has been passed down through generations, with natural mating practices and culturally specific training methods. Elders teach younger generations in equine care and training. Despite challenges from modernization, there is growing recognition of the need to conserve indigenous breeds and sustainable practices while promoting the preservation of cultural knowledge through equine-related events. For instance, Adwa Victory, Celebration across diverse cultures, Horse fare (Enjibara) (Alemu Alene, 2020; Yirga, 2020) are all prominent historical examples.

Sports and entertainment: Equines in Ethiopia are bred for sports like polo, racing, and traditional games, with horseback riding being an integral part of rural life, particularly in

the highlands. However, urban Ethiopians are increasingly detached from these traditions. In Addis Ababa and Sullulta, horse-riding spaces are often dominated by foreigners. Horse sport events, primarily show jumping and occasionally polo, are organized by Equestrian clubs in the capital. The Ethiopian Horse Sport Association hosts at least three events annually at Jan Meda, while clubs like Il Cavallino, Palace Administration, and Beka Ferda also organize events at their respective Venues.

Eco-Tourism: Horses are often used in eco-tourism industry in Ethiopia, attracting tourists to rural areas. Ethiopia, with its rich cultural heritage, diverse landscapes, and unique wildlife, holds immense potential for eco-tourism. Tourists arrive by plane from abroad, travel to the site in motorized vehicles, and complete local journeys on horseback or muleback, confirming that equines enhance the value of eco-tourism. Equines are indispensable to mountain communities, providing essential transport, supporting livelihoods, and contributing to eco-tourism. Tourists also rely on mules and donkeys to transport their belongings. At many eco-tourism sites in Ethiopia, it is common to find local horse owners' groups playing a key role in promoting the use of equines in eco-tourism. Equines provide an environmentally friendly, low-carbon transport solution that aligns with SDG goals for reducing the carbon footprint of torusim. However, the contribution of equines to the eco-torusim industry has not developed. The package to enhance the sector includes, among other things, producing equines with the required pedigree and establishing standard operating procedures, including addressing welfare challenges. By doing so, we promote eco-friendly tourism, improve the welfare of equines and protect the country's image (Alemu Alene, 2020).

- Biodiversity and Conservation (Preserving Indigenous Breeds): Breeding programs often aim to protect native equine breeds that are well-adapted to local environments and resistant to specific diseases. Maintaining genetic diversity is crucial for developing stronger and more resilient equine populations in Ethiopia.
- Adaptation to Climate Change: Equines are a sustainable option in areas where

fuel-based machinery is not feasible or affordable. Equines support agricultural resilience by assisting with the cultivation of drought-resistant crops and the transportation of materials for irrigation systems. Equines are vital in disaster response, especially in areas impacted by floods, landslides, or droughts. Their ability to navigate tough terrain and transport supplies ensures that even remote areas receive aid, helping communities access assistance, evacuate, or rebuild after climate-induced disasters. It is common to see donkeys in footage of internally displaced people or refugees following natural or human-induced disasters. As it stands today, in Ethiopia, neither relief organizations nor national relief programmes have recognized or included equines in disaster and relief packages. As climate change continues to affect ecosystems and communities, equines may be integrated into new climate adaptation strategies. There are donkey breeds adapted to drought conditions and horse breeds suited for extreme cold climates, helping communities thrive in challenging environments (Garce et al, 2022)

- Emergency and Disaster Response: Resilience in Remote Areas: In disaster-prone regions, equines are often the only means of transport for relief goods and medical aid in areas inaccessible by vehicles.

1.2. Vision

- To establish a sustainable, productive, and welfare-oriented equine breeding system that enhances the livelihood of communities and support Ethiopia's national economy by 2030.

1.3. Mission

- To make efficient utilization of equines genetic resource base of the country through selection and sound genetic improvement, breed conservation and sustainable utilization for the betterment of the livelihood of producers and increased contribution to the national economy

1.4. Goal

- To enhance equine production and productivity, positioning equines' essential roles in agriculture, transport, tourism and culture, thus contributing to poverty reduction and sustainable economic growth.

1.5. Objectives of the equine breeding strategy

- Over all objective: Enhance the contribution of equines to national and household economy in Ethiopia

Specific objectives:

- Improve equine breeds, breeding practices and reproductive efficiency
- To establish equine genetic improvement program for different production system and agro-ecologies
- To enhance the professional and institutional capacity for academic and research systems, development institutions and private sectors in different production systems
- To preserve indigenous equine breeds in Ethiopia
- To create social behavioural change for the general public and introduce extension service for equine producers

1.6. Scope of the Strategy

- The scope of the National Equine Breeding Strategy covers critical areas designed to enhance the quality, productivity, and conservation of the equine population. It encompasses breed identification and selection mechanisms, genetic improvement initiatives, breeding programs, performance testing, conservation which involves comprehensive data collection, education, awareness rasisng and training programs, policy advocacy as well as robust monitoring and evaluation frameworks, all aimed at ensuring the efficient integration of equines into the national economy.

1.7. Guiding principles

- The national equine breeding strategic intervention is guided by a set of basic governing principles. These are;
- The national equine genetic improvement shall be an integral part of the national research for development efforts, guided by the fundamental principles outlined in the national livestock master plan.
- All activities shall be based on the policies and priorities outlined in the roadmap for the national genetic improvement strategy for equines in the Livestock Master Plan, embracing the principles of cost-effectiveness, technical efficiency, and respon-

siveness to stakeholders in both the public and private sectors

- In the process of project formulation and implementation, genuine participation and engagement of the community shall be ensured. The national equine genetic improvement activities shall follow a participatory approach and ensure a sufficient degree of client orientation.

- Through its impact pathway, the national equine genetic improvement initiative shall ensure that its research for development outputs contribute to macro-level goals of economic and social transformation, environmental sustainability, and livelihood improvement.

- During project formulation and implementation, the required ethical, social and environmental impacts shall be ensured

- In the national equine genetic improvement engagement, special emphasis shall be placed on capacity building, institutionalization of an integrated approach, institutional pluralism, and effective engagement of partners and stakeholders based on comparative advantage.

- Due attention shall also be given to inclusiveness in terms of diversity and equal opportunity for all encompassing gender-sensitive approaches in its research for development engagement

- In all of its deliberations, the national equine genetic improvement initiative shall ensure commitment to excellence, knowledge sharing, and access to information.

- In the national equine genetic improvement engagements, monitoring mechanisms and evaluation criteria shall be established from the inception of its projects and activities.

2. Situational Analysis for Equine Breeding in Ethiopia

2.1. General overview

a. Overview of Equine Population

Ethiopia has the largest equine population in Africa, primarily concentrated in densely populated Central Highlands. This demographic highlights the potential for leveraging equines for agricultural and economic development. Developing strategic breeding programs to enhance health and productivity, while considering socio-economic contexts, can

support agricultural growth and improve rural livelihoods through sustainable management and genetic diversity.

Donkey population is on the rise, while the population of Horse and Mule never showed increment, and horse and mule ownership decreased overtime.

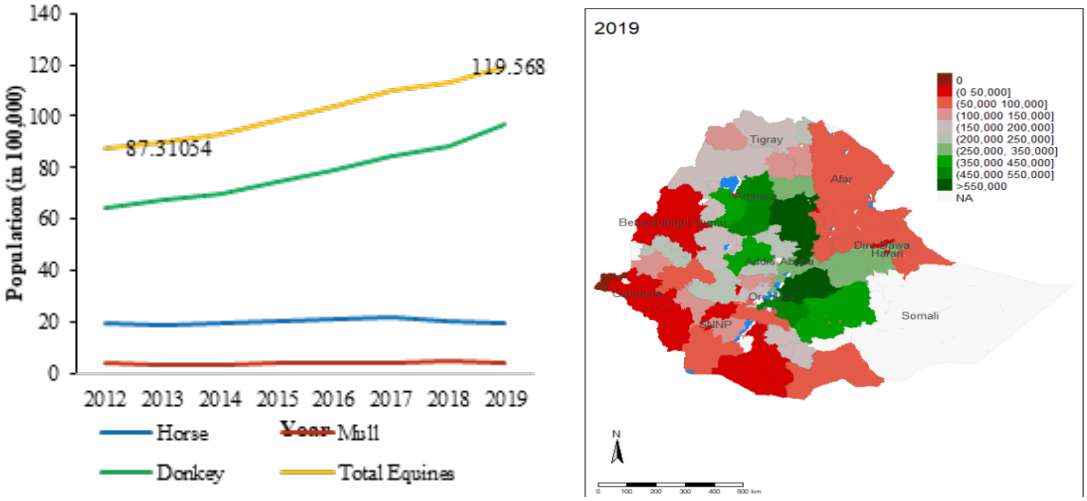

Figure 1: Donkey population trend

ESS, 2019 showed that more than 93% of equine owners used equines for transportation and draft purpose.

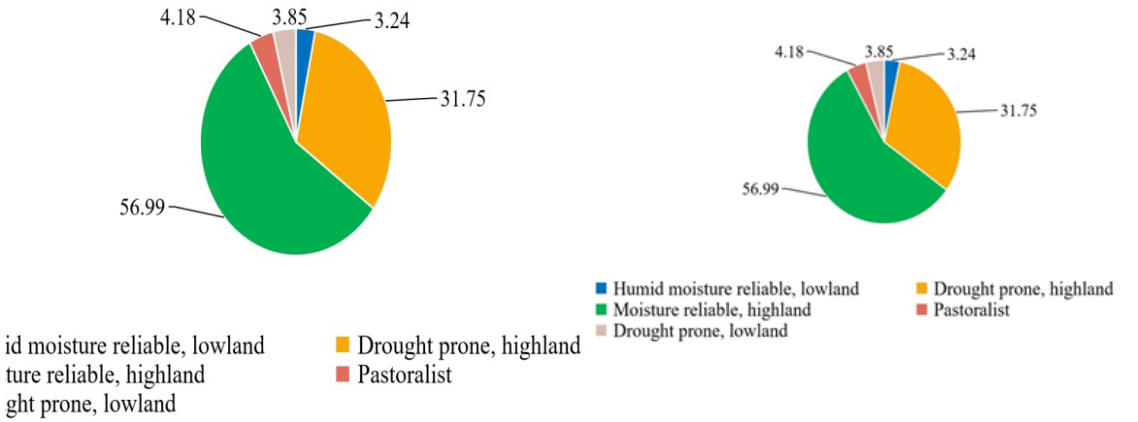

Figure 2: Distribution of donkeys in the different agro-ecological zones

b. Historical Context and Current Utilization

Historically, donkeys and mules have been essential draft animals, while horses were seen as prestigious assets (Astatke and Mohamed Saleem, 1996; Svendsen, 1997). They are vital for farming systems with less than 1% reliance on mechanical power (Ellis-Jones and O'Neill, 2000), especially in semi-arid regions. Donkeys alleviate labour burdens but often

face nutritional stress and overwork (Alemayehu, 2004). Primarily dual-purpose, equines are crucial for smallholder farmers due to underdeveloped transport infrastructure.

c. Breeds and Genetic Diversity

Ethiopia hosts numerous unidentified donkey breeds, with the Abyssinian donkey being the most common (Mason, 1996). These donkeys are categorized into six major types based on size and coat color: Abyssinian, Afar, Hararghe, Ogaden, Omo, and Sinnar, the latter being notable for its size and mule production. Horse classification in Ethiopia is complex due to extensive crossbreeding, with some identifying them as Abyssinian horses or pony/light horse crosses. A comprehensive study (Kefena et al., 2012) identifies seven distinct horse populations: Abyssinian, Bale, Boran, Horro, Ogaden, Kafa, Selale, and one feral population (Kundido). Both donkeys and horses exhibit significant variability in color, size, and conformation, reflecting the rich equine diversity in the country.

d. Importance of Equines in Farming Systems

Equines are integral to various farming systems in Ethiopia, primarily serving as a source of animal power (Astatke and Mohamed Saleem, 1996). In semi-arid regions, where agriculture engages up to 85% of the population, donkeys alleviate the burden of labour-intensive tasks, enhancing the efficiency of subsistence farming (Blench, 1997). However, many donkeys experience significant nutritional stress and overwork during peak seasons (Alemayehu, 2004; Gebreegziabher et al 2017).

Equine breed improvement in its strict sense doesn't exist in Ethiopia. At best, in a more traditional way, equine breeders do keep large donkeys (Sennar breeds) to produce mules. Selective breeding for specific traits or characters, the application of modern reproductive technologies is only minor (relative to the equine population) and very recently introduced (Deresa and Lemma, 2009; Tsega and Lemma, 2015; Alemayehu et al, 2015, Lemma, 2017; Ararsa et al, 2019; Ararsa and Alemayehu, 2020). However, there is a huge potential for breed improvement and recent initiatives employing biotechnology both in donkeys and horses breeding are evident (Saragusty et al, 2017, Ararsa et al, 2019; Ararsa and Alemayehu, 2020). One of the major setbacks in equine breeding is the lack of Institutional and policy framework, hence failure to include equines in national livestock research and development policy in the past.

e. Challenges in Equine Breeding

Equine breeding in Ethiopia presents both challenges and opportunities that must be navigated thoughtfully to enhance productivity and improve livelihoods. By addressing health, nutrition, market access, and breeding practices through targeted interventions, Ethiopia can harness its rich equine resources to foster economic growth and resilience among rural communities.

1. Health and Nutrition: many equines suffer from inadequate nutrition and health care, leading to decreased productivity and increased vulnerability to diseases. Limited access to veterinary services exacerbates these issues.

    1) Breeding Practices: traditional breeding methods dominate, often resulting in low genetic diversity and suboptimal breeding outcomes. Lack of structured breeding programs limits improvements in traits such as size, strength, and disease resistance.

    2) Market Access: smallholder farmers often face challenges accessing markets for their equines, leading to underutilization of these animals' potential economic value. Price fluctuations and limited demand can discourage investment in better breeding practices.

    3) Environmental Factors: climate change impacts, such as droughts and changing rainfall patterns, affect the availability of forage and water resources for equines. Overgrazing and land degradation further threaten the sustainability of equine breeding.

    f. Opportunities for Improvement

    1) Genetic Improvement: establishing structured breeding programs can enhance genetic diversity and improve desirable traits in equines. Collaboration with research institutions can facilitate access to improved breeding techniques and technologies.

    2) Capacity Building: training programs for equine owners on proper care, nutrition, and breeding practices can lead to better management of equine resources. Awareness campaigns can educate communities about the economic benefits of

investing in equine health and breeding.

3) Market Development: enhancing market access through cooperatives or associations can empower smallholder farmers to sell their equines at fair prices. Development of value chains for equine products (e.g., manure for fertilizer or sport accessories) can create additional income streams.

4) Policy Support: government policies that support veterinary services, infrastructure development, and research funding can bolster the equine sector. Encouraging public-private partnerships can mobilize resources for equine health and breeding initiatives.

5) Strategic Recommendations

1. Establish institutional and policy support
2. Establish Breeding Programs: Develop structured breeding programs focused on
3. improving genetic quality among local breeds.
4. Enhance Veterinary Services: Increase accessibility to veterinary care and nutritional support for equines.
5. Promote Sustainable Practices: Implement sustainable grazing practices to mitigate environmental impact and ensure long-term viability.
6. Foster Community Engagement: Involve local communities in decision-making processes related to equine management to ensure culturally relevant solutions.
7. Leverage Technology: Utilize modern technologies (e.g., mobile apps) for tracking health records, breeding information, and market prices.

2.2. SWOT Analysis

Table 1. SWOT Analysis for Equine Breeding Strategy

Category	Details
Strengths	Genetic Diversity: Indigenous breeds (e.g., Abyssinian horse, Ethiopian mule, donkeys) are well-adapted to local conditions
	Cultural Importance: symbol of wealth and social status,
	Large Equine Population: Ethiopia has one of the largest equine populations in Africa, providing a strong base for breeding
	Disease Resistance: Indigenous breeds have natural resistance to local diseases compared to exotic breeds.
	Economic Value: Increasing reliance on equines for work in both rural and peri-urban areas, role in transportation, agriculture, and rural livelihoods.
	Basic research data on characterization of equine breeds/ecotype, reproductive physiology, and application of reproductive biotechnology
Weaknesses	Lack of objective evidence: Limited or insufficient studies on genetics, productivity, and reproduction of local breeds.
	Low Productivity: Indigenous equines often have poor reproductive and physical performance. Precarious and less attractive for business
	Veterinary Limitations: Poor access to veterinary services, especially in remote areas.
	Traditional poor breeding Practices: Uncontrolled, mating practices dominate rural areas.
	Poor Infrastructure: Lack of facilities for breeding centers, supplies and inputs, training, and research. Absence of equine breeding programs/extension packages
	Nutritional Challenges: Poor-quality feed and insufficient grazing areas affect equine health and productivity.

Opportunities	**Government Support**: The presence of national live stock breeding policy
	Export Potential: Opportunity to develop export markets for equines and equine products
	Modern Technologies: Use of artificial insemination, embryo transfer, and genetic selection can enhance breeding programs.
	Collaborations: Partnerships with research institutions, NGOs, and international organizations to improve nutrition, health and breeding practices. Presence development partners such as The Donkey Sanctuary, SPANA, The Brooke
	Climate Resilience: Indigenous breeds' adaptation to drought and heat can support sustainable agriculture.
	Rural Development: Equines can contribute to poverty alleviation through transport and agricultural labor. Research: increasing interest in by research and academic institutions to work on equine breed and breeding
Threats	**Climate Change**: Increasing droughts and environmental degradation threaten pasture and water availability
	Disease Outbreaks: Risks of diseases like African horse sickness (AHS) Equine Herpes Virus 1, Dourine (equine trypanosomosis)
	Competition: Mechanization in agriculture and transportation may reduce demand for equine production; Increased urbanization and industrialization
	Population Pressure: Overgrazing and land degradation limit grazing lands and resources.
	Genetic Erosion: Loss of genetic diversity due to unregulated trade and breeding.
	Lack of Awareness: Limited awareness among farmers about the economic value of selective breeding. Cultural taboos Increasing donkey trade for skin that drastically affect donkey population

2.3. Strategic Issues

Table 2: Strategic issue and Interventions

Strategic issue	Strategic Intervention
Lack of accountable institution and fragmented institutional responsibilities to transform the equine sector, in general. Ministry of Agriculture and Ministry of Transport seems to have no obvious common bridging goals between production and services provided; Absence of specific equine breeding policy	Institutional Intervention Institutionalization of Equine breeding: enhancing coordination & linkage between institutions Advocate for equine breeding policy
Lack of baseline data: Limited research and documentation on indigenous breeds and their unique traits.	Indigenous genetic resource enhancement interventions a) Identification and characterization of indigenous equine breed/s and mapping their geographical distribution; b) Select, multiply and utilize identified equine breeds with outstanding genetic potential;
Traditional breeding that might have led to inbreeding and genetic erosion limiting the health and productivity of equines	Genetic improvement interventions through crossbreeding a) Improve the performances of indigenous equine breeds by applying community based equine breeding program through both natural mating and artificial insemination; b) Import suitable exotic equine germplasm in the form of live animal, embryo and semen for sustainable utilization; c) Implement production system and agro-climatic zone-based crossbreeding program; d) Develop synthetic equine breed/s through crossbreeding of selected indigenous breeds with other indigenous or with exotic equine breeds at research center.

Drivers of equine population decline: Habitat loss, urbanization, and mechanization (replacement by mechanized alternatives reduce the demand and populations of equine breeds).	Establishing equine genetic improvement and multiplication center for improved breeds a) Identify breed improvement and multiplication centers in different agro-climatic zones of the country; b) Establish breed improvement and multiplication centers for indigenous as well as exotic equine breed/s by traditional breeders, c) private investor, equestrian clubs and by the government; d) Distribute improved equine breed/s to improve community herd
	Breed conservation **a)** In situ conservation: This can be carried out at any level, in any region, with the skills and resources already available. **b)** Cryobanking: Store genetic materials (semen and embryos) in a cryobank. **c)** Economic incentives: Provide economic incentives for conservation and related livelihoods

Cross cutting issue Resource Constraints: Limited funding and resources for large-scale breed characterization and mapping studies and economic Barriers to implement breeding programs, coupled with limited financial support for breeders. Limited incentives for private investors and equestrian clubs to engage in equine breeding programs. High initial costs for setting up infrastructure and acquiring advanced breeding technologies Limited experts on equine production and breeding, and absence of specialized centers Community ingrained negative attitude and taboos attached to equine keeping, production and trade	Public awareness and policy advocacy a) Awareness and policy advocacy for policy makers b) Formulate Social behavior change and Extension service for equine producers and the general public c) Institutional and professional Capacity building (research and extension centers, higher institution curriculum, child education) d) Establishing equine knowledge base (data, models, breed/gene bank, business etc)

Lack of organized and recognized modern equestrian industry initiatives in Ethiopia Gender issue: Lack of understanding of the role of working equines in women empowerment programs Disaster and IDP: Lack of recognition of the role of equines in disaster and relief (climate, conflict) at IDP Poverty Reduction: lack of recognition of the role of equines in employment, income generation	Promoting equine production as industry a) Incentivize and creating enabling environment for traditional breeders b) Promoting private equestrian efforts c) Establishing a regulatory framework for live equine and genetic material for breeding purpose d) Establish Integrated IDP-equine management zones (IEMZs) e) Livestock-exclusion and diversion infrastructure at distribution sites f) Mobile IDP-linked Animal Health Surveillance and Vaccination Units g) Temporary animal identification and movement recording system h) Rapid phenotypic and genetic surveillance of equines in IDP zones

2.4. Bench-marking

• For Ethiopia, countries with similar ecological, socio-economic, and cultural conditions can provide valuable benchmarks for equine breeding programs. Here are a few countries that could be considered for benchmarking, along with the rationale put forward:

• South Africa has a variety of climates, from dry arid areas to temperate regions, and equines are used for transport, agriculture, and tourism. South Africa has established breeding programs to improve equine health, productivity, and resistance to diseases, which can be useful for Ethiopia's diverse equine populations.

• Saudi Arabia (Al-Khaldi, K. (2019) can serve as a benchmark for Ethiopia in horse breeding due to its advanced practices, significant investments in equine health, and thriving horse racing industry. By studying Saudi Arabia's breeding programs, genetic improvement initiatives, and horse management strategies, Ethiopia can develop a

roadmap to enhance its equine sector.

- Ethiopia can adopt the European Union's advanced breeding technologies, stringent animal welfare standards, and comprehensive veterinary practices as a model for enhancing breed quality, improving health management, and advancing industry development..

- Brazil's focus on sustainable livestock breeding and animal welfare could provide a model for Ethiopia, especially in ensuring that equine breeding programs are integrated into broader conservation and environmental sustainability efforts.

- Egypt has successfully bred equines that are well-adapted to arid desert climates, which could offer insight into breeding equines for Ethiopia's dry and semi-arid regions.

- India's focus on community-driven equine breeding, where local knowledge is integrated with modern breeding practices, aligns well with Ethiopia's needs for community-based programs.

3. Strategic interventions

3.1. Institutional intervention

Figure 3. Schematic presentation of institutional setup

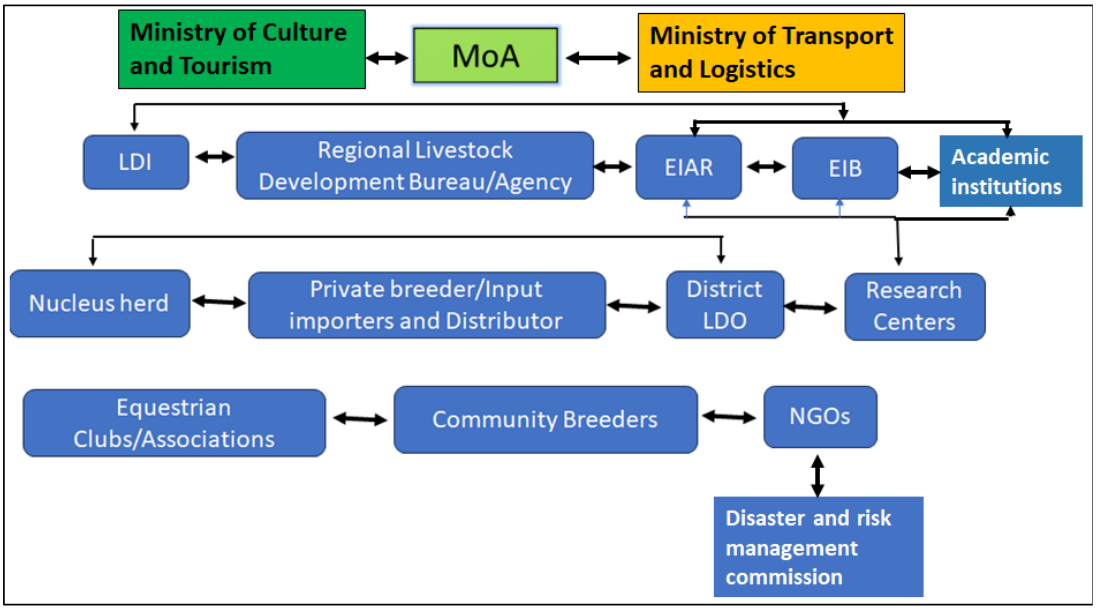

Table 3: Enhancing Coordination and Linkage Between Institutions

Strategic Intervention	Intervention strategies
Identify key coordination and linkage value chains	1. Identify key actors in the equine business, breed development, adoption, technology multiplication and dissemination 2. Create database of the identified actors; Establish contact with the actors in the equine value chain
Ensure a nationally coordinated research and development efforts	1. Develop modality for national coordination of research and development activities 2. Strengthening and maintaining the coordination of research and development activities using the national coordination modality
Establish strong linkage among research and development institutions working on equine breeding activities	1. Creating platforms for establishing linkages among different institutions 2. Continue strengthening and maintaining established linkage and eventually scale up the effort
Develop coordinated equine extension system in Ethiopia	1. Create a forum for discussion on strengthening the extension system; Identify key strategies to strengthen the system 2. Make protocol for implementation of selected strategies 3. Conduct monitoring and evaluation

3.2. Indigenous genetic resource enhancement interventions

This strategic intervention comprises the following: Identification and characterization of indigenous equine breed/s and mapping their geographical distribution; and Selection, multiplication and utilization of identified equine breeds with outstanding genetic potential;

Table 4. Strategic intervention through characterization, selection and breeding

Strategic interventions	Intervention Strategies
Generating detailed information on systematic characterization of indigenous equine breeds/ecotypes	1. Production system dynamics and equine genetic resources distribution will be assessed and described; Preparation of equine distribution and production environment maps 2. Genetic characterization on selected genetic resources will be done; Identification of equine breeds/types performing best under different agro-ecologies 3. Recommending & selecting equine genetic resources for genetic evaluation and maintaining the breed characterization activities
Establishing equine knowledge base (data, models, breed/gene bank, business etc)	1. Collect and maintain data on equine populations across different regions, including breed characteristics, health status, productivity, and genetic diversity. 2. Establish a gene bank to store genetic material (semen, embryos) from high-quality equine breeds and develop a registry to track genetic lineage and performance. 3. Create databases for health, performance metrics, and genetic traits, including disease resistance and fertility. 4. Collect economic data on the equine industry's contributions, such as production costs, market demand, export opportunities, and growth potential. 5. Develop a centralized online platform (website or app) to aggregate equine data, research, genetic models, breeding protocols, and industry best practices. 6. Continuously update the knowledge base with new data, scientific advancements, and industry trends to meet the evolving needs of the equine sector.

Developing comprehensive national equine breeding programs for the various production systems and breeds in the country	1. Equine breeding strategy will be approved; Priority breeds will be identified; Implementation modality will be developed and equine breeding programs for priority breeds will be drafted 2. Breeding programs will be implemented and maintained for priority breeds
Molecular and genetic characterization of indigenous equine breeds genetic resources and develop elite herds for traits of economic and social importance.	1. Classify the genetic potential of indigenous equines for performance and reproductive traits through conventional methods 2. Development of population structure trees for indigenous equine breed/s genetic resources by using polymorphic microsatellite markers 3. Develop breed descriptors and geographic mapping for major indigenous equine breeds; Continue breed improvement through selection for maintaining produced elite herds for traits of economic and social importance
Establish systematic record keeping and data utilization for equine genetic improvement and breeding	1. Identify sound record keeping methods and tools at nucleus flock level 2. Start record keeping, data management and utilization

3.3. Genetic improvement interventions through crossbreeding

Table 5. Genetic improvement strategic interventions

Strategic interventions	Intervention Strategies
Enhance community based equine breeding	1. Improve the performances of indigenous equine breeds by applying community based equine breeding program through both natural mating and artificial insemination 2. Implement production system and agro-climatic zone-based crossbreeding program 3. Strengthen the equestrian community knowledge and skills on community-based breeding programs by linking the on-station stud farms with community herds in terms of sharing superior breeding stallions and jacks
Enhance the application of biotechnology tools in the genetic improvement of equines	1. Import suitable exotic equine germplasm in the form of live animal, embryo or semen for sporting (Racing, dressage, polo) and draft performance, disease tolerance, and nutritional adaptation through application of biotechnologies 2. Undertake structured and continued within-breed selection and improvement for best performing genetic resources with genes for draft, racing, dressage, and polo and link them to community herds
Develop improved equine genotypes and synthetic breeds for traits of economic and socio-cultural importance by crossing it with exotic breeds	1. Designing crossbreeding scheme for developing synthetic breeds; Appropriate breed importation and evaluation 2. Start the crossbreeding and evaluation of genetic merits of subsequent crossbred generation for traits of economic and socio-cultural importance 3. Develop and avail complete production package for produced improved synthetic equine breeds
Enhance maintenance of exotic pure blood line	Encourage establishemnt of selected exotic pure blood line by exuestrian clubs or private horse breeders

3.4. Establishing equine genetic improvement and multiplication centers

- a) Identify breed improvement and multiplication centers in different agro-climatic zones of the country.

- Mapping existing facilities to address local needs while aligning with agro-climatic and socioeconomic conditions seems like an ideal first step. However, none of the existing livestock breed improvement centers across Ethiopia's agroecological zones specialize in any equine species. Equines are naturally bred, and if any breeding practices exist, they are fragmented and based on traditional methods within communities.

- There is a need to set up specialized equine breeding centers in key agro-climatic zones to develop and multiply improved breeds adapted to local conditions. In the long term, breed improvement and multiplication centres can be in the four agro-ecological zones of Ethiopia. (1) The Afro-alpine region (Wurch and Kur) for breeding mountain horses that are adapted to the cold climate and rugged terrain. Horses for the the puposes of eco-tourism can be bred and multiplied here. (2) Highland (Dega) region for breeding horses often used for transport, farming, and cultural purposes due to their endurance and strength. (3) Mid –highland (Woina-Dega) region for breeding horses. Donkeys, hinnies and mules. (4) Lowland (Kolla) region for breeding donkeys and mules.

- However, in the short term, for practical reasons, it is recommended to start the equine breeding prorgams in three key agro-ecological zones:

Agroecological Zones	Breed focus	Programmes priorities
1. Highland regions	Horse breeding	Sports, eco-tourism, transport, livelihoods
2. Mid-highland regions	Horse, donkyes, hinnies, and mule breeding	Agriculture, transport, livelihoods
3. Lowland regions	Donkey, mule,	Agriculture, transport, livelihoods, drought resilient breeds

- The adaptation of various equine species to different agro-ecological zones

enhances productivity by ensuring that each species is bred in an environment suited to its physiological and ecological requirements.

- b) Establish breed improvement and multiplication centers for indigenous as well as exotic equine breed/s by traditional breeders, private investor, equestrian clubs, and by the government.

Table 6. Potential equine breeding programmes integrated with existing Agricultural Research Centers, particularly those with a primary focus on livestock research

Agroecological Zones	Agricultural research centres	Primary research focus
1. Highland regions	1. LDI	Livestock
	2. Holeta Agri Research Centre	Livestock
	3. Bishoftu Agri Research Centre	Cereals and livestock
	4. Andassa Agri Research Centre	Livestock
	5. Fitche Agri Research Centre	Highland crops, Livestock
2. Mid-highland regions	1. LDI	Livestock
	2. Bako Agri Research Centre	Crops and Livestock
	3. Sinana Research Centre	Highland crops
	4. Areka Agri Research Centre	Root crops, Livestock
3. Lowland regions	1. LDI	Livestock
	2. Werer Agri Research Centre	Lowland crops, irrigation
	3. Admi Tulu Agri Research Centre	Dryland livestock, forage
	4. Melkassa Agricultural Research Center	Dry land agriculture (what about breeding donkeys?)
	5. Pawe Agri Research Centre	Lowland crops, irrigation
	6. Mekelle Agri Research Centre	Dryland Agri, livestock

Enhance equine breed multiplication and dissemination centers through establishing public private partnership, private investors, equestrian clubs and communities as indicated in the following table.

Type	Breeding Programmes	Who
Natural	Indigenous horse, mule, donkey breeds	Traditional breeders Equestrian clubs
	Exotic horse breeds, donkey breeds and sennar mules	Public Private Partnerships Private investors Producers Association
AI	Establish equine AI centers	Government Equestrian clubs

c) Distribute improved equine breed/s to improve community herd

- Establish extension system to distribute improved breeds of stallion and jack to communities, cooperatives or equestrian clubs
- Establish Artificial Insemination (AI) programmes for Stallion and Jack. It involves infrastructure development for semen collection, processing, storage and insemination. It also requires trained experts.
- Establishing Equine Embryo transfer biotechnology. This may require high level expertise and investment. However, disseminating improved equine breeds through embryo transfer biotechnology is an effective way to spread superior genetics without the limitations of natural reproduction. Embryo transfer allows for the production of multiple offspring from high-quality stallions and mares, accelerating genetic improvement and increasing the reach of superior breeding stock.
- Foster collaboration and incentives: Financial, technical, and social incentives ensure that breeders are motivated to adopt improved breeding practices, leading to enhanced genetic quality, better herd productivity, and sustainable equine industries.
- The government should incentivize equine breeding programmes by offering tax exemptions for the importation of high-quality genetics and subsidizing equine AI programmes.
- Providing breeders with access to free or subsidized training programs on reproductive technologies (e.g., AI, embryo transfer) and genetic selection helps to ensure that they are

equipped with the skills needed to implement breed improvement techniques.

- Providing social recognition and prestige for breeders who excel in adopting and disseminating improved equine breeds can be a powerful motivator.

3.5. Public awareness and policy advocacy

- **3.5.1. Public awarness, social behaviour change and policy advocacy**

Advocate for policies supporting equine breeding, including tax incentives for importing high-quality genetics, subsidies for AI programs, and funding for equine research.

- Organize workshops and seminars to educate breeders, farmers, and the public on the benefits of improved equine breeding, focusing on high-quality genetics, AI, embryo transfer, and economic development.
- Partner with local organizations, extension services, and cooperatives to engage grassroots farmers and breeders.
- Establish demonstration farms to showcase new breeding technologies and improved equine genetics, highlighting their impact on productivity and health.
- Establish mass media programs to highlight equine breeding's importance, featuring success stories, expert interviews, and discussions on its benefits.
- Utilize social media to share educational content, info-graphics, videos, and success stories, increasing public interest in improved equine breeding.
- Participate in agricultural fairs and exhibitions to showcase equine breeding techniques, improved breeds, and their benefits to a wide audience.

3.5.2. Institutional and professional capacity building (research and extension centers, higher institution curriculum, child education)

- Integrate equine breeding education into agricultural and veterinary curricula,
- Collect data on the economic benefits of equine breeding, such as its impact on rural economies, job creation, and agricultural growth.
- Commission studies to assess the economic impact of equine breeding, highlighting export potential, local market growth, and improved animal health.

- 3.6. Promoting equine production as industry
- 3.6.1. Incentivize and creating enabling environment for traditional breeders
- Provide financial incentives, technical support, and access to improved extension and veterinary services to encourage traditional equine breeders.
- Recognize and integrate traditional breeding knowledge into modern practices to preserve genetic diversity.
- 3.6.2.Promoting private equestrian efforts
- Support private initiatives by providing subsidies, grants, and infrastructure to boost equestrian sports and recreational activities.
- Encourage partnerships between private equestrian clubs, agriculture, sports or tourism sectors to create sustainable business models.
- 3.6.3. Establishing a regulatory framework for live equine and genetic material importation
- Develop policies and standards for the trade and management of live equines and genetic material, ensuring quality, traceability, and adherence to international standards.
- Facilitate the import and export of equine genetic resources while protecting Ethiopia's indigenous breeds.

3.6. Strategies for Equine Breed Conservation

- Ethiopia is home to diverse equine breeds (horses, donkeys, and mules) that are well-adapted to the country's unique environments. However, these breeds face numerous challenges that threaten their sustainability. Conservation efforts are crucial to maintain the genetic diversity, ecological balance, and socioeconomic benefits of these breeds

3.6.1. In-Situ Conservation (Conservation in natural environments)

- Educate local communities about the importance of conserving indigenous equine breeds.
- Provide economic incentives or subsidies to farmers who breed and care for indigenous

equines

- Involve communities in decision-making about breeding and grazing practices to ensure sustainability
- Promote selective breeding practices that enhance desirable traits (e.g., endurance, disease resistance) without losing genetic diversity.
- Establish village-level breeding stations with high-quality local stallions to improve breed quality while preventing crossbreeding with exotic breeds.
- Encourage the use of equines in agricultural and transport activities to make their conservation economically viable
- Provide technical and financial support to farmers for sustainable equine breeding.

3.6.2. Cryobanking for Equine Breed Conservation in Ethiopia

- This ex-situ conservation method ensures the preservation of genetic material for long-term use in breeding and research programs, even if the live population faces extinction.
- Create regional cryobanks in areas with significant indigenous equine populations.
- Train veterinarians, technicians, and researchers in cryopreservation techniques
- Partner with international organizations for knowledge transfer and technical support.
- Develop national policies promoting cryobanking as part of equine conservation strategies
- Secure funding from the government, NGOs, and international organizations.
- Work with local farmers to identify genetically valuable equines for conservation.
- Provide incentives to encourage farmer participation
- Conduct studies to improve cryopreservation techniques for indigenous equine breeds

3.6.3. Economic Incentives for Equine Breed Conservation in Ethiopia

- Economic incentives are crucial for encouraging farmers, communities, and other stakeholders to participate in the conservation and sustainable use of indigenous equine breeds.

- Allocate resources for conservation incentives in national livestock development programs.
- Engage private sector actors (e.g., agribusinesses and tourism companies) in funding and supporting conservation efforts
- Educate farmers and communities about the long-term economic benefits of conserving indigenous equines
- Regularly assess the effectiveness of incentive programs and make necessary adjustments.

4. Strategy for Designing and Implementing Equine Breeding Program

- The world of equine breeding is a complex and dynamic field that requires careful planning, strategic thinking, and a deep understanding of genetics, animal husbandry, and market demands. As the equestrian industry continues to evolve, breeders face new challenges and opportunities that necessitate a well-structured approach to breeding programs. A successful equine breeding program not only aims to produce high-quality animals but also seeks to enhance the genetic diversity, health, and performance capabilities of the breed. This strategy document serves as a comprehensive guide for equine breeders looking to design and implement an effective breeding program. It outlines the essential components of a breeding strategy, including goal setting, genetic selection, health management, and performance evaluation. By establishing clear objectives and leveraging best practices in breeding science, breeders can ensure the sustainability and success of their programs. Breeding programs are the main activities to translate the strategy into action.

4.1. Designing options for selection program

4.1.1. Prioritization of equine breeds or ecotypes

- Prioritization of breeds is required since resources are limited and breeding programs cannot be developed for all breeds. The prioritization could be at national or regional level.

Breed prioritization in equine breeding programs is a multifaceted process that requires careful consideration of various factors. Prioritization involves several mechanisms that help breeders determine which breeds to focus on based on various factors. These mechanisms can be influenced by market demands, genetic considerations, performance goals, and conservation needs. Ultimately, a strategic approach to breed prioritization can lead to successful breeding outcomes and contribute positively to the equestrian industry as a whole. Prioritization will be based on different aspects:

- Market demand analysis considering community preferences in keeping the breeds for specific traits such as draft power, breed characteristics, such as temperament, athletic ability, and conformation or discipline-specific needs such as jumping, racing, or dressage in horses, the production environment, and the economic and sociocultural significance of the breeds at national level; conservation and heritage considerations particularly recognizing the historical and cultural importance of certain equine breeds and prioritizing their preservation. Proposed criteria for prioritization are listed below. Consultation on the breed literature and stakeholders' workshops are required for the prioritization. Time frame for the implementation of breeding programs shall be prepared.
- Population size (15%)
- Genetic uniqueness and breed/ecotype characteristics (35%)
- Contribution to livelihood of the producers (15%)
- Contribution to national economy and export trade (25%)
- Conservation status (10%)

4.1.2.Designing Breeding Programs

- Designing a breeding program is a complex process that involves setting goals, selecting individuals, and evaluating the results. A breeding program needs to be integrated and its success is largely determined by the scope of farmer participation. Steps in designing

a breeding program include setting specific goals such as such as improving a trait or increasing performance, select individuals to breed based on their desired characteristics, evaluating the individuals for the desired characteristics, determining the breeding value of each individual, breeding or mating the selected individuals, multiplying and assessing the results of the breeding program.

Defining of Breeding Goals

- A breeding goal is a set of desired traits for a population of equines, along with the direction of change for those traits over time. The goal should be to improve the suitability of the breed for its intended purpose. Hence, breeding programs need to be designed to address both the objectives of the breeder and the national strategy. The breeding goal is often designed to increase the profit of the equine industry or community/society that invests in the breeding program. The steps for defining breeding goals include defining the national development objective, characterizing the production system in which equines will be raised, identifying traits to improve and their economic value, establishing a recording system for equines with the highest breeding value for the desired traits and use the selected animals to spread their genes throughout the population. Economic values can be estimated through participatory consultation of equine breeders and consumer markets. This approach is suitable for community-based programs where selection programs on scientific index selection based on breeding values may not be feasible. For central nucleus programs, bio-economic models (in combination with participatory approach could be adopted to define breeding goals.

Designing of Breeding Schemes

- Like few domestic animals, there is no sufficient research output on design of equine breeding scheme. However, the breeding structure need to be defined based on sound breeding principles. The design needs to address a significant proportion of the breed population. The scheme to be designed need to address the population of equines

targeted. Similar breeding scheme recommended for camel could be adopted.

- Community-based breeding scheme: Community-based breeding increases the productivity and profitability of indigenous breeds without undermining their resilience and genetic integrity. This could be a one-tier scheme where villagers organize and implement selective breeding to improve their own herds. However, when designing breeding programs based on clan at scale addressing a large proportion of the breed population, a two-tier village breeding programs need to be designed. This involves establishing cooperative breeding villages strategically placed across the breeding tract. These will be where genetic gain is generated, that will be disseminated to the rest of the herds. The strategy for opting a breeding scheme/structure would depend on the need for accelerating genetic progress and the need for conserving the equine genetic resources.
- The Central Nucleus Breeding Scheme (CNBS) can be a recommended approach for equines if the goals include improving specific traits while maintaining genetic diversity because the scheme is a breeding strategy that focuses on maintaining a central population of genetically superior animals while allowing for the strategic use of other populations or lines to enhance genetic diversity and improve specific traits. This approach can be beneficial in the context of equine breeding, particularly for certain objectives. The central nucleus scheme has not been tested yet and research initiatives on this matter are limited and needs to be improved and perfected.
- Advantages of Central Nucleus Breeding Scheme for Equines includes genetic improvement through the systematic selection of high-quality breeding stock, leading to genetic improvements over generations. By concentrating superior genetics in a central nucleus, breeders can enhance desirable traits more effectively. It also enhances controlled breeding since the central population can be managed more easily, allowing for better control over breeding practices, health monitoring, and performance evaluation. While focusing on a central nucleus, breeders can also introduce new genetic material from other populations or lines, helping to prevent inbreeding and maintain genetic

diversity. Central Nucleus Breeding Scheme improves resource efficiency by centralizing breeding efforts that can lead to more efficient use of resources, including veterinary care, nutrition, and training, as well as better management practices. The scheme will also facilitate the collection of data on performance, health, and genetics, which can be analyzed to inform future breeding decisions.

- There are, however, many considerations and challenges to choosing CNBS: 1) Establishing a CNBS requires significant planning and resources to create a central population and develop protocols for managing it; 2) If not managed carefully, a central nucleus could lead to genetic bottlenecks if too much emphasis is placed on a small number of individuals; 3) It is essential to strike a balance between selecting for specific traits and maintaining genetic diversity. Introducing new lines or populations should be done thoughtfully to ensure compatibility and desired outcomes; 4) If breeders are geographically dispersed, implementing a CNBS may require collaboration across regions, which can complicate logistics; and 5) A successful CNBS requires a long-term commitment from breeders to maintain the structure and goals of the breeding program. CNBS could complement to accelerate progress of village /clan programs and could be linked to village-based scheme to jumpstart and accelerate genetic progress.

4.1.3. Organizational considerations

- The geography of the breeding program needs to be delineated. The geographic
- description includes the districts, kebeles, the equine population
- Community sensitization and mobilization of stakeholders is required
- Throughout the program, a fully participatory approach should be maintained, emphasizing consultative meetings with communities and stakeholders.
- Training of communities and experts on equine breeding principles and methods.
- Identify appropriate administrative structures and organizational setup of cooperative breeding groups is required for community-based breeding programs.

4.1.4. Designing options for breeding program

- Cross-breeding serves as an effective strategy for introducing genetic diversity within equine populations. This approach can take various forms, such as ongoing cross-breeding among indigenous breeds, creating a new synthetic breed, or implementing breed substitution through repeated crossings. In the latter two scenarios, the cross-breeding initiative may transition into a straight breeding program. Establishing a cross-breeding program can be intricate, requiring careful organization and potentially the segmentation of the equine population into multi-tiered breeding structures. Guidance is provided on defining breeding objectives, evaluating existing breeding practices, and formulating a comprehensive plan that lays the groundwork for securing funding, executing the program, and facilitating its future development. When sustained crossing is planned, particular attention is given to ensuring that the distribution of improved germplasm is practical, considering the existing technology and infrastructure.

Table 7. Proposed equine breeding program strategic option

Proposed Breeding Program Design	Equine Breeds/Populations	Traits to be selected	Agro-ecology the breed type found	Breeding Activities	Existing Production System	Proposed production system	Tasks required	Stakeholders involved
Straight breeding (selection)	Somali Pony horses/ Ogaden	riding, pulling heavy loads, and working	Somali lowland pastoral areas of eastern Ethiopia (Jigjiga area)	Selection Nucleus herd formation Elite-breed development Multiplication Conservation Dissemination	Agro-p/pastoral	Agro-p/pastoral	Site identification and securing (nucleus/stud) Identify foundation stock from respective genetic resources Develop herd recording system Develop herd breeding plan for breed improvement through selection Breeding value estimation Selection and culling according to their breeding value Undertaking mating according to breeding plan Multiplication Breeding society/pastoralist selection, organization, capacity building Dissemination Monitoring and evaluation	MOA, LDI, EIAR, EBTI, , Universities etc
	Abyssinian horse	Draft	Northern Ethiopia (Gondar)		Mixed			
	Bale horse	Pack, Riding	Southern Ethiopia (Bale zone)		Mixed highland			
	Borana horse	Riding	Borana lowland		Pastoral			
	Kafa horse	Transport, Race, Draft	Sheka and Kafa zone	Mixed Mixed highland pastoral	Mixed Highland			
	Selale horse	Transport, Riding	Selale, Shewa	Mixed Highland	Mixed			
	Kundido horse	Transport, Draft and Breeding	Kundido plateau, East Hararghe	Mixed Mixed highland	Mixed highland			
	Abyssinian donkey	Pack/Transport	All over Ethiopia		All production system			
	Ogaden donkey	Pack, Draft	Somali region		Pastoral	Agropastoral		
	Jimma donkey	Pack/Draft	Jimma		Mixed	Mixed		
	Sennar donkey	Transport/ Pack/Breeding	North Shewa, central Ethiopia and N & NW Ethiopia, Metema, Benishangul		Mixed lowland	Mixed lowland		

Community based breeding	Selale horse	Transport, Riding, Sport	Selale, Shewa	Selection of indigenous breeds for riding, transport, pack, draft and sport types Transfer elite animals at nucleus stud farm in the community Train and build capacity of the community Utilization of on-station developed elite-breed for improvement of community development Multiplication Conservation	Mixed	Mixed	Set selection criteria of stud Participate the community Select the preferred traits with the community Develop the Stallions and Jacks on-station based on the preferred trait Estimating breeding value of the stud Identify destinations of the equine population Train communities on equine breeding techniques Disseminate the developed Stallions and Jacks Monitoring and evaluation of the line breeding task at community level If successful, scale-up to other equine breeding sites.	MOA, LDI, EIAR, EBTI, , Universities etc
	Bale horse	Pack, Riding	Southern Ethiopia (Bale zone)		Mixed highland	Mixed highland		
	Kaffa horse	Transport, Race, Draft	Sheka and Kafa zone		Mixed highland	Mixed highland		
	Kundido feral horse	Transport, Draft and Breeding	Kundido plateau, East Hararghe		Mixed highland	Mixed highland		

Crossbreeding	Exotic stallion draft Type (Endurance) X Indigenous draft type	Draft/Riding	As per the requirement	Establish breeding communities/equestrian clubs Import exotic sire for different sport types and endurance types Development of crossbred (Exotic X Indigenous Superior) stallions on-station Disseminate (50% blood level) to community, 75% blood level to specialized producers, 75% blood level to modern producers	Mixed	Mixed	Identify, license and establish breeding communities/equestrian clubs Identify pre-requisite for importation of exotic Stallions or jacks/semen and import Research on application of reproductive biotechnologies (AI, Embryo technology, sexed semen) in equines Select and cross superior dams (Sport/draft) with imported exotic stallions and jacks of each type and production of subsequent progeny Multiplication of 50% and 75% exotic blood levels for sport/draft Build the capacity of equine producers/ breeding communities and equestrian clubs on improved equine breeding and husbandry techniques Disseminate (50% blood level) to community, 75% blood level to specialized producers, 75% blood level to modern producers	MOA, LDI, EIAR, EBTI, , Universities etc
	Exotic stallion Jumping or Dressage Type X Indigenous Jumping or Dressage type	Jumping / Dressage	Urban/Periurban		Urban/ Periurban	Urban/Periurban		
	Exotic racing or Polo Type X Indigenous Racing type	Racing/Polo	Urban/Periurban		Urban/ Periurban	Urban/Periurban		
	Exotic Pack/Draft Type Jacks or Sennar X Indigenous Pack/Draft Type	Pack/Draft/ Riding	Mixed system		Mixed system	Mixed system		

4.2. Roles and responsibilities of institutions

Table 8. Roles and responsibilities of institutions

Stakeholders	Roles and responsibilities
MoA	Develop a system that ensures integration and coordination of Stakeholders engaged on breed improvement activities Build human and infrastructural capacity required for genetic improvement Build capacity for supplying, distributing and marketing of inputs and out puts to ensure success of genetic improvement and follow up the implementation of the strategy Promote better technologies and training services Establish a system that ensures quality standard for product supply Establish a system that ensures access to quality veterinary services to improve the prevention and timely control of animal disease that could influence the success of genetic improvement Conduct quarantine on import and export of equine and their products; prevent communicable diseases and the outbreak of migratory parasites

LDI	Prepare and implement national breeding programs and follow up implementation of strategies and program Establish, organize and lead animal breeding centers required for genetic improvement Build human and infrastructural capacity required for genetic improvement Establish national animal breed recording system, set up database, collect breed improvement data, develop Webpage and follow up its implementation Run breeding program analyses the data and genetic gain, the measure productivity and provide feedback to users; Ensure sufficient availability of liquid nitrogen and other necessary breeding inputs for semen preservation in semen banks, for field operation purposes and follow up its execution; promote breed improvement activities on public media by developing WebPages, fliers, posters and through other knowledge sharing means and follow up its outcome; Establish synergy between the Institute and regional operation system and provide technical support; Provide technical trainings for beneficiaries on improved breed; organize workshops, symposia and seminars concerning animal breed improvement, facilitate experience sharing programs among stakeholders involved in animal breed improvement; Lead animal resources registration, movement, exchange and uses in consonance with international conventions

Ministry of Transport and logistics	Enhance equine powered transport as intermediate transport system Build capacity for supplying, distributing and marketing equine breed tailroed inputs Promote better technologies and training services Establish a system that ensures quality standard for transport product supply
Equestrian clubs	Involve on implementation of breeding program and multiplication of improved genotypes Work hand in hand with sector authorities to promote the equine industry Participate in service delivery (AI and delivery or other biotechnologies)
Ethiopian Agricultural Research Institute	Generate, develop, and equine breeding technologies, Coordinate equine genetic improvement research activities conducted at research centers, higher learning institutions, and others Participate on development of breeding program and analysis of the success of breeding program Establish an effective system for coordination between the federal research centers and other stakeholder involved on breed improvement Collect, organize and disseminate information on equine genetic improvement research
Institute of Biodiversity Conservation	Initiate policy and legal proposals on the conservation and sustainable utilization of the equine genetics Survey and explore the diversity and distribution of the country's equine genetic resources, identify and characterize the status of breeds for conservation and sustainable use status Develop means of conservation by utilization
National Animal Health and Diagnostic center	Evaluate and certify stallions, jacks, mares and jennets used for equine genetic improvement Involve in importation of stallions and breeding jacks Undertake and monitor herd health programs
National veterinary institute	Produce vaccines to prevent disease that can influence breed improvement
Ethiopian biotechnology Institute	✓ Support in introduction, optimization and application of equine biotechnology

Higher learning institutions (Universities)	✓ Undertake research of equine genetic improvement ✓ Produce competent human power and involve in human capacity building ✓ Participate on implementation and analysis of breeding program ✓ Research and training ✓ Technical support on equine genetic improvement
Regional bureaus/ Agencies of Livestock and fisheries	✓ Own and implement equine breeding strategies and programs. ✓ Facilitate Land and finance for stud farms strengthening and establishment ✓ Engage on breed improvement, multiplication and conservation ✓ Build human and infrastructural capacity required for genetic improvement
Agricultural Investment Agency	✓ Formulate policy strategies, rules and regulation that can accelerate the equine investment, ✓ Identify agricultural investment potential lands ✓ Transfer investment lands to investors ✓ Bridging role between private investors and out growers, ✓ Provide necessary information and advisory services to agricultural investors, ✓ Create conducive environment to scale up applied technologies and best practices among investors and out growers
Agricultural transformation Agency(ATA)	✓ Provide technical support on equine genetic improvement ✓ Build human and infrastructural capacity required for genetic improvement ✓ Promote technologies and innovations required for genetic improvement
Development partners	✓ Technical support on equine genetic improvement ✓ Financial support
Ministry of culture and tourism	✓ Establish a standard equine services in the eco-tourims value chain ✓ Promote use of equines in the eco-tourism industry ✓ Promote better equine harnessing technologies and training services ✓ Establish a system that ensures quality standard for product supply

5. Expected Outputs

- Enhanced public and institutional capacity to sustain equine-focused initiatives and policy support for equine breeding. This involves developing skills, infrastructure, and knowledge systems necessary to support the growth and sustainability of the equine sector

- Establishment of well-defined national equine breeding strategy targeting productivity and genetic diversity.
- Established sound equine breeding stock and Identified equine breeds for specialized production traits contributing to household and national economy
- Availiablity of improve equine breeds from multiplicaiton centres for equine breeders and equisterian society
- Postive social behavioural change of equine breeding community and the general public
- Improved market systems and incentives for breeders, including export opportunities.
- Conservation of indigenous equine breeds and their genetic resources.

6. Target Groups and Beneficiaries

Equine breeding strategy aims to create a ripple effect that enhances the livelihoods of various stakeholders involved in equine husbandry, production, and sport business in Ethiopia. The direct beneficiaries of the equine breeding strategy include:

- Equine Breeders: local community breeders will benefit from improved genetics and breeding practices, leading to healthier and more productive animals.
- Farmers, Livestock Owners and Rural Communities: Those who rely on equines for transportation, agricultural work, and other purposes will see enhanced performance and productivity from better-bred animals. Communities that depend on equines for their livelihoods will experience economic growth through improved animal performance and productivity
- Research Institutions: Organizations involved in animal genetics and breeding research will gain access to improved data and collaborative opportunities.
- Private Sector Enterprises: equestrian clubs, businesses that provide veterinary services, feed, artificial breeding and other supplies related to equine care and recreation will benefit from increased demand as breeding programs expand.
- Government Agencies (MOA, Ministries of Transport and logisitics, Culture and toruism):

National and local governments may see improved agricultural productivity and economic development through better livestock management practices.

- Conservationists: Those focused on preserving indigenous equine breeds will benefit from efforts to conserve genetic diversity and promote sustainable breeding practices.

7. Crosscutting Issues

7.1. Gender and Youth

Equines, such as donkeys, mules, and horses, play significant roles in gender and youth dynamics, particularly in rural communities. Equines serve as vital assets that contribute to the empowerment of both women and youth in rural communities. By enhancing economic opportunities, promoting skill development, and facilitating social interactions, equines play a crucial role in advancing gender equality and youth engagement.

- Economic Empowerment: Equines are often used for transportation and agricultural work. Women who have access to equines can enhance their economic activities, such as farming or selling goods, leading to greater financial independence.
- Labor Division: In many cultures, the responsibility for caring for equines often falls on women and children. This can empower women by providing them with skills and responsibilities that enhance their status within the household and community.
- Social Status: Ownership of equines can elevate a woman's social status within her community. It can provide her with a means to participate in social events and community activities, fostering connections and support networks.
- Access to Resources: Women who manage equines may have better access to resources such as veterinary care, feed, and training, which can improve the health and productivity of their animals.
- Mobility: Equines can enhance mobility for women, allowing them to travel further for markets, healthcare, or education, which can improve their overall quality of life.
- Skill Development: Caring for and working with equines provides youth with valuable skills in animal husbandry, responsibility, and management that can be beneficial for future employment opportunities.

- Education: In some regions, youth who manage equines may have increased access to education through improved mobility and the ability to transport goods or attend school.

- Community Engagement: Youth involved with equines often participate in community activities related to livestock management, fostering a sense of belonging and responsibility within their communities.

- Entrepreneurship: Young people can engage in small businesses related to equines, such as transportation services or selling animal products, promoting entrepreneurship and economic development.

- Cultural Identity: In many cultures, equines are integral to traditional practices and lifestyles. Youth engagement with these animals helps preserve cultural heritage and identity.

7.2. Climate Change

In Ethiopia, climate change and variability is already having impact in the livelihood of different communities particularly pastoral and agro-pastoral society. Horses, donkeys, and mules, play a multifaceted role in relation to climate change. Their impact can be both positive and negative, depending on how they are managed and utilized. Promoting sustainable management practices can enhance their role in mitigating climate change while supporting local communities and ecosystems. Some of their positive roles in climate change mitigation include

- Sustainable Transportation: Equines provide an eco-friendly mode of transport, particularly in rural areas where mechanized transport may not be feasible. Using horses or donkeys reduces reliance on fossil fuels, thereby lowering greenhouse gas emissions.

- Agricultural Practices: In many agricultural systems, equines are used for plowing and other farm work. This traditional practice can help maintain soil health and reduce the need for heavy machinery, which contributes to carbon emissions.

- Manure as Fertilizer: The manure produced by equines can be an excellent organic fertilizer, enriching soil fertility without the need for synthetic fertilizers that can contribute to greenhouse gas emissions.

- Biodiversity Conservation: In some regions, equines help maintain landscapes that support biodiversity. By grazing in certain areas, they can prevent overgrowth and promote the health of ecosystems.

- Cultural Practices and Knowledge: In many cultures, equines are integral to traditional practices that promote sustainable land management. These practices often include rotational grazing and other methods that enhance ecosystem resilience.

- While equines produce significantly less methane compared to ruminants like cows and sheep, they still contribute to greenhouse gas emissions through enteric fermentation and manure management. Unnecessary expansion of equine populations can also lead to increased land use for grazing, potentially resulting in deforestation or conversion of natural habitats into pastureland, which can release stored carbon into the atmosphere. In some regions, the demand for feed for equines can compete with food production for humans, leading to unsustainable agricultural practices that can contribute to climate change.

7.3. Interventions at interface of internally displaced people (IDP)

- Animal management at the IDP interface

Intervention: Establish Integrated IDP–Livestock Management Zones (ILMZs). Create designated livestock holding and service zones adjacent to IDP sites, equipped with basic water points, temporary shelters, veterinary outreach, and controlled movement corridors. These zones reduce uncontrolled animal–human interaction, improve welfare, and enable coordinated animal health and management services without disrupting humanitarian operations.

Animals congregating at resource distribution points

Intervention: Livestock-exclusion and diversion infrastructure at distribution sites Introduce simple physical barriers, animal-proof fencing, and alternative livestock watering/feeding points away from food and aid distribution centers. Community animal attendants can be assigned to guide animals, minimizing contamination, injuries, and conflict while improving hygiene and efficiency of aid delivery.

Control of new and transboundary diseases

Intervention: Mobile IDP-linked Animal Health Surveillance and Vaccination Units Deploy mobile veterinary teams integrated with IDP health responses to conduct rapid

disease surveillance, targeted vaccination, and syndromic reporting. These units should prioritize high-risk transboundary diseases and mixed-origin animals, linking field data to national and regional animal disease surveillance systems

Genetic mixing of unknown breeds across borders

Intervention: Temporary animal identification and movement recording system Introduce low-cost, temporary identification (ear tags, paint marks, or digital photo IDs) combined with basic origin and movement records at IDP sites. This allows tracking of cross-border and inter-regional animal movement, supports disease control, and provides baseline data on genetic admixture without restricting livelihoods.

Assessment of equine breeds in IDP areas

Intervention: Rapid phenotypic and genetic surveillance of equines in IDP zones Implement a rapid equine breed assessment combining phenotypic characterization (size, conformation, coat type, performance traits) with strategic genetic sampling in selected sites. Data should feed into a national equine genetic monitoring framework to understand gene flow, protect local breeds, and inform future breeding strategies.

8. Monitoring and Evaluation

The success of this breeding strategy highly depends on the designing and implementation of sound monitoring and evaluation plans. Sound monitoring and evaluation requires participatory approach, which involves a number of stakeholders from the preparation of the document to the implementation of the strategy/programs. Various institutions mentioned as responsible are expected to be involved in various missions. The following table summarizes the tentative monitoring and evaluation matrix for equine breeding strategy.

Table 9. Monitoring and Evaluation Framework

Activity	Indicator(s)	Means of verification	Responsibility of
Equine breeding strategy document prepared	Document validated and endorsed	Validation workshop held	LDI, MoA, EAA
Equine breeding programs designed	Endorsed programs	Consultative workshops held	LDI, MoA, EAA
Central coordination of breeding initiatives	Breeding initiatives identified and institutionalized	reports	LDI
Construction/maintenance of breeding house	Newly constructed/ maintained houses	Reports, field observation	LDI
Importation and evaluation of exotic breeds	Bids for importation & payments made	Reports, Imported breeds	LDI, EIAR & universities
Development of synthetic breeds	Prepared synthetic breed development document	Reports, workshop, review	LDI, EIAR & Universities
Implementing breeding program-selection for equine breed development	Initiated breeding activity	Reports, filed monitoring	LDI, EIAR & Universities
Application of genomic and reproductive biotechnology tools in breeding programs	Initiated Biotechnology activities	Reports, filed monitoring	LDI, EIAR, BTin and Universities
Equine breed developed	Initiated breeding program	Reports, filed monitoring	LDI, EIAR, BTin and Universities
Approval and registration of developed breeds	Endorsed approval and registration document	Reports, review,	MoA, LDI, Equestrian Clubs, EAA, EBI
Equine breed multipliers established	Contractual agreement	Official letter of group establishment, reports	LDI, Equestrian Clubs, EIAR & Universities
Equine breed multiplication	Initiated multiplication initiative	Reports, filed monitoring	LDI, Equestrian Clubs, EIAR & Universities
Dissemination of improved equine breed to the farmers	Disseminated technologies	Reports, filed monitoring	MoA, LDI, Equestrian Clubs, EIAR & Universities

Establishment of farmers groups and Equestrian clubs	Registered groups	Reports, letter of registration	LDI, Equestrian Clubs, EIAR & Universities
Training for stakeholders	Training materials	Lists of participants, reports	LDI, EIAR & Universities
Impact assessment	Collected Survey data	Survey study, reports, filed monitoring	MoA, LDI, EIAR & Universities
Promoting equine technology generation and multiplication as a business	Newly established businesses	Reports, filed observation	LDI, Equestrian Clubs, EIAR & Universities
Establishing public – private partnership for equine breed development & dissemination	Linkage established	reports, letters, signed documents	MoA, LDI, Universities & EIAR
Commercialization of equine breeding and breed technologies	Number of commercial units imitated	Reports, filed monitoring	MoA, LDI, Equestrian Clubs & Universities
Breed conservation	conservations strategy initiatives	Reports, filed monitoring	EBI, LDI, BETin

9. Time Frame

Table 10. Time Frame for implementation of equine breeding strategy

Breeding strategy interventions	Terms to be implemented		
	Short term (up to 5 years)	Medium (5 – 10 years)	Long term (>10 years)
Institutional interventions	✓[1]	✓	
Structuring and developing equine genetic improvement initiatives	✓		
Rationalizing equine genetic improvement interventions	✓	✓	✓
Strategy for accelerating genetic improvement	✓	✓	✓
Developing new breeding programs and new breeds	✓	✓	
PPP model for Commercialization of genetic improvement	✓	✓	
Standardization of genetic resources nomenclature and documentation	✓	✓	

1

Genetic improvement programs as opportunity for small businesses	✓	✓	✓
Database system	✓	✓	
- Advance reproductive technologies such as Embryo technology, Oocyte collection and in vitro maturation, In vitro fertilization, AI, and cloning - Extensive use of AI and MOET	✓		
Introduction of genomic tools in breeding programs		✓	✓

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11. Annex

Indigenous donkey breeds

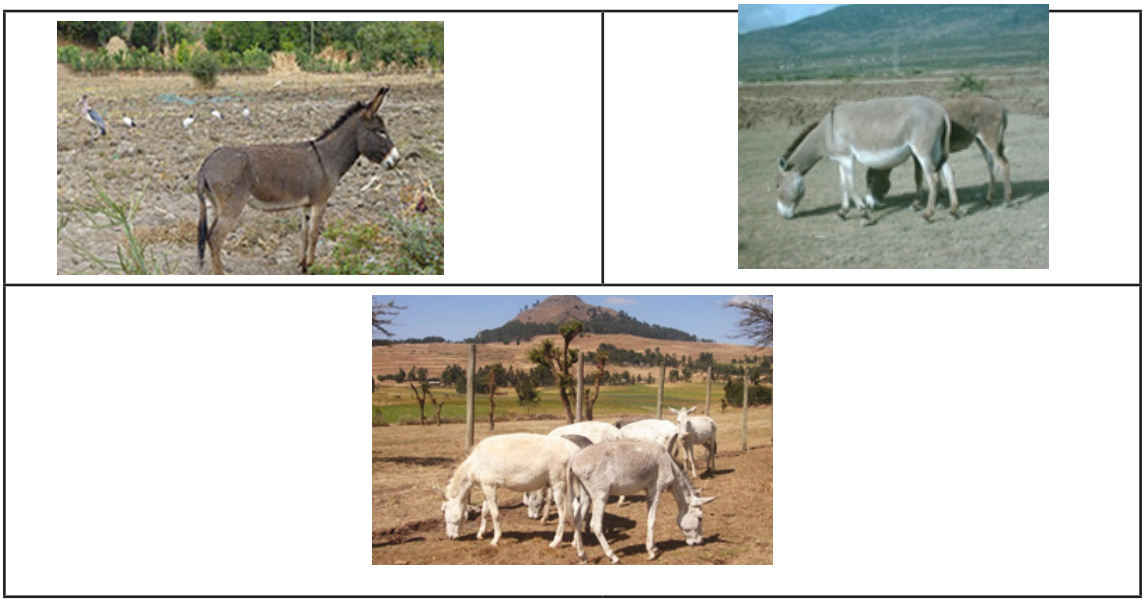

Figure 3: Breeds of donkeys in Ethiopia (Abyssinian donkey; Ogaden donkey; Sennar donkey)

Table 1: Body Dimensions of local donkey breeds

Breed/strain	f(%)	MBW(Kg)	HAW(cm)	CHG(cm)	LS(%)	(%)S
Abyssinian 99		108.3±7.1	96.2±2.0	102.6±3.2	80	100
Mousy gray	65	94.6±3.1	95.6±3.1	103.5±4.3	96	100
Gray brown	20	119.4±9.3	98.6±7.9	105.6±3.2	87	100
Black	11	120.2±9.0	94.2±2.4	99.7±0.9	1	100
Pied	2	94.6±2.9	95.5±0.3	102.5±5.1	1	100
Pink	1	126.6±0.5	102.3±4.1	106.2±0.5	0	100
White	0.005	95	93	101	0	0
Sinnar	1	170.7±11.4	115.3±3.7	113.0±2.0	0	0
Gray	0.3	160	111	114	0	0
White	0.3	182	120	115	0	0
Black	**0.3**	**170**	**115**	**110**	**0**	**0**
Somali: Only about 200 animals remained in the Awash Sanctuary						

Figure 4: Different breeds of horses found in Ethiopia. A) Somali Pony; B) Kaffa horse; C) Selale horse D) Bale horse; E) Borana horse, F) Abyssinian horse, G) kundido feral horse