

Derleme makalesi/Review article



## Economic development opportunities and general structure of livestock production in Somalia

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#### Abstract:

Somalia is a country in the horn of Africa. Most of Somalia's geography comprises arid and semi-arid rangeland, making pastoralism the most appropriate form of land use. In addition to being the primary source of income for pastoralists, livestock also makes up the most significant portion of the country's gross domestic product (GDP). The primary livestock of Somalia comprises cattle, camel, sheep, and goats. This livestock has multipurpose utilizes and is ideally suited to the local environmental conditions in the region. Prolonged droughts are not a problem for indigenous breeds, and they can feed inadequate forage. In Somalia, all primary livestock data are still in the hands of pastoralists and agro-pastoralists, as only they practice livestock farming. Although Somalia has experienced conflict and instability for the past 20 years, which caused livestock infrastructure to fail and be destroyed, livestock production is still the nation's primary source of income. At present, there are few livestock enterprises in the whole country. Also, there are a lack of public animal health care services and a lack of feed industries. Somali livestock experts spent much time in the sector, lacking modern technology and research centers. This makes it challenging to obtain accurate data on the livestock sector. Because of a lack of resources, international recognition, and insufficient development program support, the Somali government can not establish animal farms. All animals depend on rangeland resources because of the free grazing system. Like most rangelands, this area has been affected by environmental change and degradation, primarily due to increasing population pressure, overstocking, lack of rangeland management plans (overgrazing), vegetation clearing for fuelwood (overgrazing) deforestation), and lack of clear jurisdiction over rangelands. In this study, the current situation and problems of animal production activities in Somalia are determined, and suggestions on the related solutions are presented.

**Keywords:** Somali, Rangeland, Livestock, Pastoralism

### Somali'de hayvancılık sektörünün üretim yapısı ve ekonomik gelişimdeki önemi

#### Özet:

Somali, Afrika boynuzunda yer alan coğrafyası kurak ve yarı kurak meralardan oluşan bir ülkedir. Bu durum arazilerin hayvancılık faaliyetlerinde kullanımına imkan tanımaktadır. Hayvancılık, göçerler (pastorelistler) için birincil gelir kaynağı olmasının yanı sıra, ülkenin gayri safi yurtiçi hasılasının (GSYİH) en önemli bölümünü oluşturmaktadır. Somali'nin ağırlıklı olarak hayvan varlığı sığır, deve, koyun ve keçilerden oluşmaktadır. Hayvancılık faaliyetleri birden fazla amaç için yapılmakta olup, bölgedeki çevre koşullarına uygun sınırlı faaliyetlerden biridir. Yaşanan uzun süreli kuraklıklar yerli ırklar için bir sorun teşkil etmemekte sınırlı miktarda yem kaynağı ile yetinebilmektedirler. Somali'de, hayvansal üretim ağırlıklı olarak pastoralistlerin ve tarımsal-pastoralistlerin elindedir. Somali, son 20 yıldır, hayvancılık altyapısının yetersizliği, yetersiz olan altyapının çatışmalardan dolayı tahrip olmasına ve istikrarsızlık yaşanmasına rağmen, hayvancılık üretimi hala Somali'de birincil gelir kaynağı konumundadır. Şu anda, tüm Somali'de sınırlı sayıda hayvancılık işletmesi vardır. Ayrıca, kamu hayvan sağlığı hizmetleri ve yem sanayisinde temel konularda eksiklikler bulunmaktadır. Somali'deki hayvancılık uzmanları, modern teknoloji ve araştırma merkezlerinden yoksun olarak sektörde uzun yıllar geçirmiştir. Bu durum, hayvancılık sektörü hakkında doğru veriler elde etmeyi zorlaştırmaktadır. Kaynak eksikliği, uluslararası tanınırlığın düşük oluşu ve yetersiz kalkınma programları desteği nedeniyle, Somali hükümeti hayvancılık sektörüne gerekli desteği verememektedir. Serbest otlatma sistemi nedeniyle tüm hayvanlar mera kaynaklarına bağımlıdır. Çoğu merada olduğu gibi, artan nüfus baskısı, mera yönetim planlarının eksikliği (aşırı otlatma), yakacak odun için bitki örtüsünün temizlenmesi, ormanların tahribi ve meralar üzerinde net bir otorite yetkisinin olmaması nedeniyle çevresel değişim ve bozulmadan etkilenmiştir. Bu çalışma ile Somali'de hayvansal üretim ve faaliyetlerin mevcut durum ve sorunları tespit edilmeye çalışılmış olup sorunlara somut çözüm önerileri ortaya konulmuştur.

**Anahtar kelimeler:** Somali, Mera, Hayvancılık Sektörü, Göçer Hayvancılık

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## Introduction

The Republic of Somalia is a country in the east of Africa that shares borders with Djibouti, Ethiopia, and Kenya. Somalia has a landmass of about 638,000 km<sup>2</sup> and a coastline that is about 3333 km long. With rising altitude, precipitation increases, and a part of the western region receives up to 20 inches (9 kg) of precipitation per year (Elmi, 2021). In East Africa, there are two distinct seasons within the rainy season. Long rains usually account for more than 60% of the annual precipitation during the rainy season from April to June. Short rains occur between September and November (Desta, 2016). The average monthly temperature variance in the north of Somalia is between 15–25°C, whereas it ranges from 25–35°C in the south.

Nomadic livestock is the most suitable livestock activity in Somali lands; it is based primarily on semi-arid and arid pastures. In Somalia, pastures make up 55% of the country's land assets, residential land makes up 19%, forests make up 14%, and cropland makes up 12%. In 1990 according to estimations, 8.2 million hectares were cultivated (Cecchi et al., 2010). Rangelands are about 45 million hectares. Forest areas are about 9.6 million hectares. The agricultural areas of Somalia are used for grazing animals. Raised animals' sheep, cattle and goats and camels are commonly fed with barley, wheat, sorghum, oats, and other grain straws. In the south, there are two permanent rivers (Cecchi et al., 2010). This study aims to investigate the nomadic production structure in Somali agriculture and animal husbandry.

### Livestock system

Both settled, and nomadic livestock models are used in Somalia's livestock production system. The main animal species within livestock enterprises are cattle, sheep, goats, and camels. It is estimated that there are 7.2 million camels, 4.9 million cattle, 11.5 million sheep, and 11.6 million goats in Somalia (Muigai et al., 2016).

**Table 1.** Number of animals in Somalia (million heads) FAOSTAT (2014–2018)

Year	Camel	Index	Cattle	Index	Goat	Index	Sheep	Index
2014	7 150 000	100	4 900 000	100	11 600 000	100	12 325 000	100
2015	7 212 732	100.9	4 890 346	99.8	11 648 453	100.4	11 974 491	97.2
2016	7 229 221	101.1	4 850 000	99.0	11 582 464	99.8	11 561 176	93.8
2017	7 225 419	101.1	4 800 000	98.0	11 576 726	99.8	11 000 000	89.2
2018	7 243 771	101.3	4 749 973	96.9	11 536 738	99.5	10 649 679	86.4

Table 1 shows that the quantity of camels, cows, and goats has not increased significantly during the past five years. According to sheep, there has been a significant decline (13.6%) because of overconsumption, slaughter, and export.

European Commission (EC) reports reported that in 1999

livestock production contributed to the incomes of 60% of the Somali population. EC concludes that no country in Africa has greater importance as livestock than Somalia (Fereja, 2016).

There were some livestock farms (two significant cattle farms in the south of the country, one sheep and one cattle enterprise in the north, and three significant poultry farms), and livestock production was widespread before the civil war that began in Somalia in 1991. Even crossbreeding studies were carried out at the artificial insemination center in the city of Afgoye, but since the civil war, it has been left inoperative today (Abdullahi, 1990). Somalia's livestock production practices vary based on the local climate, labor availability, animal species, and herd size. Seasonal migration occurs as people seek pasture and water-rich areas for their livestock to graze (White et al., 2001).

In Somalia, there are certain locations where cattle, sheep, and goats can be found. This was probably due to the following. It is proven that particular animal breeds are linked to specific regional tribes. Therefore, not all participants hold more than one type of cattle and could not give their breed preferences. It was possible to determine more than one type of cattle and breed preferences in several counties where the respondents kept. However, there is a preference for the Surqo breed over the Dauara breed among livestock breeders in the Dinsmoor district. However, the Dauara breed is a preferred breed over the Somali Boran in the Afmadow region; the Gasara breed was preferred in the Beldweyne region, which also had Dauara and Gasara people. This was also revealed by Dauara (Mekasha et al., 2014).

While the breed of choice in the relatively promising agropastoral areas in the central Shebelle region, the Somali Boran was preferred in the drier areas of the Juba region in the middle Shebelle region, goat breeders mostly breed either the Somali long-eared or Somali short-eared variety. A total of 40 respondents who own both varieties indicated they prefer the long-eared breed because it produces more milk and meat, with 93% of these individuals responding similarly. According to Farm-Africa (1996), long-eared goats can weigh up to 42 kg as adults, whereas short-eared goats can only weigh up to 32 kg. There is some genetic variability, such as compelling growth rates. These features reveal the genetic advancement opportunities of the herds.

Exports of livestock and their products constitute 60% of the total exports in the country over the years. However, exports were interrupted by drought and international bans as Saudi Arabia implemented in 2000 (FAO 2018). There has been a great loss of livestock due to the drought in Somalia in recent years.



Nomadic livestock breeders have been severely affected by these adverse events and the country's food security has also been endangered (FAO 2018). The livestock sector in Somalia is a sector that is directly or indirectly affected by climate change. The livelihoods of millions of people will be at risk if appropriate measures are not taken to ensure the sustainability of livestock farming (Cecchi et al., 2010).

### **Nomadic livestock system**

Nomadic livestock breeders migrate with their herds to graze their animals in the pasture. Although it varies depending on the location, pastoralists derive all their income from the animals and consume the products themselves (Kiliç, 2014). As stated in the review study, the nomadic lifestyle depends on mobility, and communal grounds are crucial as a source of pasture and natural fodder; even when it comes to the use of pastures and water resources, their animals survive possible shocks and recover faster because nomads manage their herds well (Desta, 2016).

Mobility allows nomads to have many opportunities. For example, mobility enables animals to migrate from drier regions to greener regions or locations that most animals will not soon reach. It removes diseases from areas known to occur at certain times of the year (Bishop et al., 2008). While it is less frequent during the rainy season, factors including the probability that the location has a source of water and feed and the animals' endurance as they migrate from pasture to pasture tend to occur during extended dry periods and times of drought. While goats and camels are more prevalent in Somalia's wetter central and northern regions, drought cow breeding is frequent in southern regions (Kassahun, 2006).

Somali nomads are planning a larger family to raise more animals and scale up. Males are the most engaged in animal husbandry. While it is responsible for finding feed and water for animals, adults and children stay in villages. Animals are

kept close to settlements, villages, and buildings and are looked after by men and women (Unruh, 1991).

Although there are plenty of arable lands, they do not grow forage, and storage techniques (silage, hay) are not used, so they face a shortage of roughage in dry seasons, which is restrictive throughout the country. In nomadic livestock, all animals depend on grazing resources and use the free grazing system. Livestock yields are quite low due to the insufficient use of high-quality feeding techniques (Shire, 2015).

### **Settled (Extensive) livestock system**

It is a settled family's livestock-related occupation in rural locations. There are numerous varieties; it is obvious that it can be carried out by several animals, a small herd, or a single animal. This production method was previously only employed in the south and northwest of Somalia, but it is now present throughout the country. The problem is widespread because natural pastures are deteriorating and becoming useless for animals, even in arid and barren areas (De Waal, 2007).

There is a division of labor in the settled livestock system among family members. While most of the herd is fed outside the property, some are kept inside to provide milk. Family members on the farm also work in agriculture (grain cultivation). Generally, animals are allowed to graze because there is so much grass in the rainy season. If they are in the dry season, roughage (wheat, barley, sorghum, straw, and corn products) is also produced (Birhan and Manaye, 2015).

### **Livestock breeds of Somalia**

Camels (*Camelus dromedarius*), cattle (Somali Boran, Surqo breed, Gasara, Dauara), sheep (Somali sheep blackhead) and goats (Somali goats) are the most common animal breeds in Somalia. The nomadic livestock system is widespread in Somalia, where animals graze over a large geographic area (in Somalia, Djibouti, Ethiopia, and Kenya).

**Table 2.** Number and species of animals by region (million heads).(F SAU 2017 data)

Region	Northwest	North	Middle	South	South east	Total
Camel (Head)	1 684 702	1 224 142	1 179 782	1 393 912	1 293 902	6 776 440
Camel Percentage Distribution	24.86	18.06	17.41	20.57	19.09	100
Cattle (Head)	408 960	135 890	461 860	1 340 870	2 061 850	4 409 430
Cattle Percentage Distribution	9.27	3.08	10.47	30.41	46.76	100
Sheep (Head)	5 837 320	3 448 720	109 868	707 020	741 860	10 844 788
Sheep Percentage Distribution	53.83	31.80	1.01	6.52	6.84	100
Goat (Head)	6 790 000	3 096 180	370 580	1 860 110	2 047 800	14 164 670
Goat Percentage Distribution	47.94	21.86	2.62	13.13	14.46	100
Total number of animals (Head)	14 720 982	7 904 932	2 122 090	5 301 912	6 145 412	36 195 328



The economic importance of chicken farming is low compared to other livestock sectors (Muigai et al., 2016).

### **Livestock composition in Somalia**

Camels, goats, sheep, and a few cattle are primarily raised in the nation's northwest, northeast, and center. Due to the significant rainfall, many cattle are on the Hiran side. Camels, goats, and sheep are also present. Cattle herds managed by the settled livestock systems of the middle Shabelle and lower Shabelle are frequent (Mugunieri et al., 2012). Although camels and goats are also raised in Juba, cattle are the main livestock species.

Table 2 shows that the animal species and numbers reared by region in Somalia are mostly goats, and camels in small numbers, and cattle and sheep can be found in the middle, north, and northwest. Due to the significant amount of rain in the middle, there are many camels. In addition, there are cattle, goats, and sheep. In the South and Southeast, the primary places for growing cattle and goats as well as camels and sheep, the established livestock system is frequently used to rear herds of cattle in the Central Shabelle and Lower Shabelle districts.

### **Camels**

Camels are sacred to Somali shepherds. Camels are owned and inherited animals; ownership begins with the child's birth. Camels are first marked with the sign, then unique shepherds for individuals or families use proverbs and songs to show their love for camels. They are used in social rituals to strengthen social solidarity among nomads (Farah, et al., 2004).

Across Somalia, dromedary camel breeding (*Camelus dromedarius*) is common and this species is known for its resilience to harsh desert conditions (Ameha Kassahun et al., 2008). Although the body weight of dromedary camels is estimated to be around 350-400 kg, the live weight of mature males and females can reach 500 kg. Since camels can be used for different purposes and are a source of labor and transportation, especially milk and meat output, breeders are of great importance (Elmi, 1991).

For nomadic livestock breeders to make a living, it is essential to secure their milk production throughout the year. The great importance of camels comes from their ability to produce milk throughout the year, regardless of the season. Traditionally, camels are milked twice a day. The average milk yield for one lactation per day is 7 lt/day. Camel milk is traditionally thought to have potential health benefits and medicinal properties,

which may also help treat certain diseases. It has a high concentration of nutrients and bioactive components and is close identical to human breast milk (Elmi, 1991).

### **Cattle breeds**

The zebu cattle breed is the most common breed of cattle in Somalia. While Boran, Gasara, Dauara, and Surqo are subspecies of Somali cattle breeds (Rege and Tawah, 1999). Somalia Boran breed; Zebu are believed to have been one of the first animals to enter Africa from Western Asia after Ethiopian cattle migrated there, (Rege and Tawah, 1999). This breed is distributed in Gedo, Lower Jubba, Central Jubba, North-West Somalia, and Eastern Somali Regions. The heights of adult males and females are 117-147 cm and 114-127 cm, respectively, and their live weights are 500-850kg and 380-450kg (Muigai et al., 2016). Boran, one of the breeds, is preferred as a meat breed. It has black spots on its skin and is generally white. Small horns may be present, humps present, and well developed. The neck is short, humped groin-fat, and in the thoracic position, the upper line rises posteriorly, broad and Suited-muscled, the upper right may be thick and rounded, with the long tail (Muigai et al., 2016). Surqo breed: It is a hybrid of Somali Boran or Ethiopian that is not known origin breed (Rege and Tawah, 1999). Gasara: Breed of little East African Zebu cattle subgroup, while Somalia's central and northern regions are home to several Somali short-horned zebu. It is a small animal, with a weight range of 250–300 kg at its heaviest. The horns are short and slender, but the hump is extremely noticeable, and the dewlap and skin are less developed. The skin is lead gray, dark gray, or dark red, with a white face, tawny, or light brown (Muigai et al., 2016). Dauara (Dawara): The Garre or Ghera tribe those are living in the middle and upper Shabelle river region of southern Somalia cultivates the Dauara breed. The animals weigh between 280 and 320 kg, and they are a small breed. The horns are short and slender, and the skin is usually red with black patches. When compared to pinchers, whose slopes are severely raised, it rises more (Muigai et al., 2016). Characteristic of four breeds of Somali cattle Dauara, Gasara, Surqo, and Somali Boran are described in Table 3.

In Table 3, the characteristics of the cattle, their breed and live weight (kg), the regions where they were raised, and their physical characteristics are indicated. As you can see, it has been in Boran since its highest body weight. The Somali Boran is believed to be a descendant of the Zebu's first entry into Africa from Western Asia and is thought to have developed as livestock from Ethiopia moved to Somalia and Jubaland near the Somali-Ethiopian border. The Surqo breed is a genus of zenga. After Zebu cattle arrived in Africa from Asia, zebu-sanga crosses gave rise to the zenga breeds.



**Table 3.** Characteristics of Cattle

Breed	Weight (kg)	Growing regions	Physical characteristics
Boran	380-450	North-western, Eastern, Gedo, Lower, and Middle Jubba	The Humpback, a carnivore breed, is present and well developed. The neck is short, humps in the back, is broad, and is well-muscled.
Dawara	280-320	Middle Shabelle, Awdal, Hargeisa and Benadir	It is a small breed, its coat color is red, sometimes with black spots, its horns are short and thin.
Gasara	250-300	Lower Jubba, Middle Jubba, North-western, North-Eastern, Hiran, and Bakool Gedo	Bark color is lead gray, dark gray, or dark red, horns short and slender, but with very prominent hump, less developed dewlap and skin.
Surqa	>350	Middle and Lower Shabelle, Bay and Lower Jubba	

The Surqo breed is a cross between the Somali or Ethiopian Boran and an unidentified sanga population.

#### **Sheep breeds**

The most common breed of sheep in Somalia is the Somali Karabash. It should be noted that this type of breed is the origin of the Karabash Iranian breed (Otte and Chilonda 2002; Wilson 1991). It is a fat-tailed breed found throughout Somalia, distinguished by a black head and a white body, also its hooves rarely black. It has a powerful head that seems convex and has a hollow nasal structure. Usually without horns, though a few do have them, and they have medium-sized ears. Males typically weigh 35 to 45 kg when they reach maturity (Muigai and Hanotte, 2013).

#### **Goat breeds**

The long-eared Somali goat, the short-eared Somali goat, and to a lesser extent the Somali Arabian goat are the three main breeds of goats found in Somalia. The Somali long-eared goat is believed to be a descendant of the Somali Arabian goat introduced from Arabia (Farm-Africa, 1996). The Somali Arabian goat, as its name implies, was introduced to Africa by Arab traders. Somalia Long-eared goat (Great White Somali): It can be found all over Southern Somalia's dry and semi-arid regions and Northern Kenya and Ethiopia. Adult mature males' bodies measure between 70 and 75 cm and weigh 42 kg living weight. The hair is short and thin, the complexion is white, and the ears can be horizontal or slightly drooping (Farm-Africa, 1996).

In arid and semi-arid climates, Somali Short-Eared Goat is primarily found in the northern towns and eastern regions of Jijiga, Degeh-bur, and Werder. It is a small goat, weighing between 28 and 33 kg in mature males. The ears are horizontal or semi-drooping, the skin is mostly white, and the plumage is short. The facial features are flat in two dimensions and are reported to be 19% male and 8% female (Fereja, 2016).

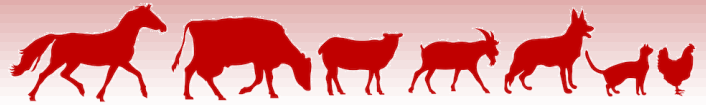
Somali Arabian goat (Benadir): It is grown in the northern and southern regions of Somalia. In several towns and villages, long-eared dairy goats are bred. The smallest goat in Somalia is this one. The typical length of a female appears to be 65 cm, while a mature male weighs about 26 kg. The dark or light brown hair, and long hair. It shows twin and triple calving in goats. (Farm-Africa, 1996)

#### **General status of the livestock sector in Somalia**

Livestock has for centuries been the backbone of the Somali economy. Income from livestock is an important source of food security, as is the domestic use of meat and other animal products. However, cyclical droughts happen every three to five years, while catastrophic droughts last 20 to 25 years in Somalia. Important animals used for a living are said to have died during the rainy season due to severe flooding and poor water resource management (Abdullah and Arisoy, 2020). Inadequate veterinary care and a lack of disease surveillance, weakened commerce and exports, overgrazing and soil erosion in some places, and a lack of sufficient water resources are the key issues facing the cattle industry. Because the transition to a modern agricultural system would boost productivity and create more job opportunities, formal education and training are required to increase the capacity of nomadic systems. Feed industries must be built to reduce cattle pasture and prevent overgrazing (Maystadt and Ecker, 2014).

#### **Livestock export in Somalia**

Most of the commerce in livestock is among the Middle East countries. This is supported by linkages to the past, present, and culture (Mugunieri, 2015). Sales of cattle typically increase during Ramadan and Hajj. For instance, this rise is exclusively seen in sheep and goats; it is not seen in those other animal species. Cattle and camels have mostly stayed the same. As the country with the largest market share, Somalia exports live animals to Saudi Arabia, Kuwait, Qatar, the United Arab Emirates, Oman, and Bahrain, where typically 70% of the country's livestock is sold. Yemen, Egypt, Iraq, Jordan, Libya,



and Malaysia are the nations that come after it (Wilson, 2016).

Compared to other nations in the region, Somalia exports a very high of livestock, with 5 million head of livestock exported annually between 2012-2016 (Elmi, 2021). Due to its predominant dry and semi-arid climate pattern, grazing is the most appropriate use of the land in Somalia (Musa, 2020). The Somali economy has long relied heavily on livestock. It is the main export product of the nation and the main source of food and money for the largely rural populace.

Before the war, 46% of Somalis made a living as livestock and nomadic breeders. It accounted for 80% of total export income and 40% of GDP (Mugunieri et al., 2012). A record 5 million animals were transported from Somalia to markets in the Arabian Gulf in 2014, mostly as a result of substantial expenditures in the control of animal diseases, which were backed by the European Union and the United Kingdom. The amount of cattle shipped from Somalia in the past 20 years has never been higher.

According to export statistics gathered by the Food Safety and Nutrition Analysis Unit (FSNAU), under the Food and Agriculture Organizations (FAO) supervision, Somalia exported 4.6 million goats and sheep, 340 000 cattle, and 77 000 camels in 2014 for a total estimated export value of \$360 million. The FAO, Galkayo-Bossaso livestock certification program will aid in ensuring high-quality livestock for domestic and international consumption (FAO). Due to the relative mobility of cattle, which allowed them to relocate from conflict zones to more stable surroundings with ease, it was also one of the

rural and urban areas, particularly for women. Milk is a crucial food source for producers, who often increase household consumption during dry seasons. Additionally, it significantly improves the nutrition of the general populace (Zampieri et al., 2019).

### **Milk production**

Since the early 1990s, Somalia's production of fresh raw milk has significantly increased. The most significant is camel milk. According to FAOSTAT, Somalia generated over 1.1 million tons of camel milk in 2014, with a gross market value of \$1.65 billion. With total milk production, an estimated 2.7 billion dollars in revenue is generated (Farah, 2007). Camel milk is popular in Somalia, and Somalia tops the list of African nations that produce the most camel milk.

Compared to other animal species, camels may produce an average of 2.5–3.5 liters of milk per day on low-quality feed. In the rainy season, when production is at its highest, milk prices are lowest; in the dry seasons, when output is at its lowest (Hagaa), prices are highest. Since most cattle are kept outdoors, the seasonal accessibility and availability of milk in towns are a significant concern. Milk is less accessible and more expensive during dry seasons when cattle wander in search of pasture and water (Umphlett et al., 2019)

### **Meat production**

Because of rising urbanization rates and rising demand brought on by a growing population, Somalia is producing more meat. The most common animal meat is beef. The majority of the meat trade is for the regional market, where fresh (chilled or not frozen) meat is desired. Sometimes local governments own and operate slaughterhouses that supply meat. The meat industry generates job and income opportunities for women, who predominate in the meat marketing industry, in all urban markets. (Yhannes Mehari et al., 2007). The most significant barriers to domestic meat marketing are related to the unsanitary infrastructure of slaughterhouses and meat markets. According to Castiello, 2011 research conducted in Somalia, many slaughterhouses lacked drainage systems, roofing, running water, and lighting, making them unsanitary. It has been stated that a lack of meat inspectors and a lack of a legislative framework for veterinary departments to enforce rules frequently result in inadequate production supervision. Most of the meat markets are reported to have poor cleanliness standards, making the meat susceptible to contamination (Rembold, 2013).

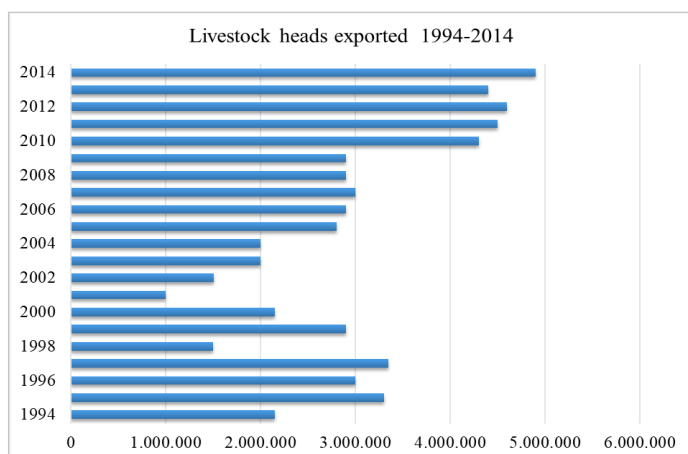


Figure 1. Livestock heads exported 1994-2014

### **Livestock production**

Breeders in Somalia primarily cultivate different animal species alongside one another to produce milk and meat. Production of meat and milk throughout the nation's various ecological regions generates employment and revenue in



### ***Animal feeding applications***

Nomadic livestock is the foundation of Somali livestock. Consequently, animals feed on meadows naturally. Therefore, the application does not suit the Somali cattle feeding system. However, under some uncommon circumstances, feeding animals indoors with hay, straw, and grains is possible. However, it only happens sometimes. Many animals are exported from Somalia to Arab nations. These animals are fed dried grass from various meadow species at the quarantine sites where they are shipped (Unruh, 1991).

### ***Pastureland***

In Africa, pasture lands are the main sources of fodder for ruminant animals, approximately 41% of the total land area, and 59% of all the agricultural land (Zerga, 2018). Rangelands make up about 55% of the total land resources in Somalia. The entire life of the nomadic herds depends on the pastures. Somalia has different types of arid and semi-arid pasture plants, such as open savannas (shrub meadows), closed savannas, and grasslands (shrublands). Although these pastures have abundant biological resources, they are currently subject to unfavorable human and ecological effects (Bedunah & Angerer, 2012). Deterioration in agricultural areas reduces the fodder and its quality and makes it necessary for animals to move longer distances to meet their needs. Hence, the destruction of pastures may reduce the production of milk and meat, which are staple foods for nomads, as well as endanger the food security and long-term livelihoods of rural farmers (Ameha Kassahun et al., 2008).

As stated in Zerga's studies, the lands covered by the rangelands are currently starting to become desert due to overgrazing, lack of precipitation, prolonged drought, improper management of the rangelands, and the region's biodiversity in the region is decreasing day by day. The scarcity of vegetation, soil fertility and quality also reduce negatively affecting the livelihoods of growers and creating one of the main environmental problems in the country (Zerga et al., 2018). The main problems in the development of rangelands are the illegal occupation of pastures as private property, lack of basic knowledge of rangeland management, lack of relationship between stocking rate and carrying capacity, lack of support services, poor research and expansion, improvement, and inadequate supply (Pande, 2009).

In Somalia, animals do not find enough water due to nomadic livestock herds, especially during the dry seasons (summer and winter) when it hardly rains. They must therefore use water

carefully at these times. Cattle are irrigated every two days, sheep, and goats every four days, while camels are watered once every ten days during drought spells. In challenging conditions, camels only drink once a month (Unruh, 1995).

### ***Forage production and feeding problem***

Although the annual precipitation average of Somalia is 100-200 mm, this amount can be 500-600 mm in high-altitude regions. Since the majority of Somalia has an arid, semi-arid climate, nomadic livestock breeding is appropriate (Muchiri, 2007). Due to this, nomadic animal husbandry is carried out to provide suitable grazing areas, and animal mobility is experienced depending on the year or season. Additionally, due to these resources limited mobility and availability, fights may arise between the growers for pasture resources. In recent years, forage crops have been grown on 30 ha in modern livestock enterprises, and primarily traditional farmers were trained on planting forage crops, while forage crop seeds were provided. The feed can be found most of the year as a scarce resource in many parts of Somalia. Although the amount of feed may be sufficient in some parts of the country, it is insufficient in quality due to low energy and protein, and high cellulose, and lignin content, which limits livestock breeding and growth (Opio et al., 2020).

The quality and quantity of dried roughage in rural areas are insufficient to feed a large number of animals. Dry riverbeds and waterways (rainwater) is used for natural pastures along mixed farm areas, forage production, and subsistence grains. Grain scraps and by-products are important for animal rations in this mixed production system. However, they are generally of low quality and have low nutritional values, and there is a lack of information regarding processing and preservation methods. The roughage is usually harvested with a scythe, piles are formed and kept until it is fed to the animals. The both methods cause losses (Elmi, 1989). However, roughage production from traditional and newly introduced seeds is around 18,000 tons, which needs to be increased. In addition, these forage crops grown are mostly meadow grass and cereal scraps, corn, sorghum, and wheat straw with low protein and energy content, and high lignin and cellulose content (Conway, 2005).

While most roughage is sold, bales are sold tied large enough to be carried by hand. Therefore, the prices of the bales vary according to the supply and demand balance. In some cities (Bosaso), where there is no livestock, hay prices can be very low. However, a truck of roughage is between US\$150 and US\$450. Grass quality and transportation also affect prices (Castiello et al., 2011).



### Agricultural trade sector

The majority of Somalia's exports were agricultural goods. Before the war in early 2010, agricultural exports made up about 93% of all exports. In the past thirty years, there have been significant changes in export figures.

Somalia continues to be highly dependent on a select few export goods (Table 4) and foreign markets. The main export in the early 2010s was livestock, which brings in about \$208.9 million annually. Livestock is primarily sent for slaughter but also for reproduction, in the late 1980s, it was nearly seven times as much (Abdullahi et al., 2022). As a result, In the early 2010s, the livestock subsector accounted for 74 percent of all export revenues, up from 93 percent in 2015.

As we can see, there is a large difference between the export and import of the country resulting in a negative foreign trade balance (Figure 2). Somalia ranks 175th among export countries in the world. With exports of \$198 million and imports of \$2.23 billion, Somalia had a negative trade balance of \$2.04 billion in 2017. Most exports to Italy were fruits, particularly bananas (Somalia also exported grapefruit and papaya). In recent years, fruits have been exported only occasionally to gulf countries.

### Conclusion

The Nomadic and settled livestock is a big part of Somalia's livestock production system. Somalia, one country that exports a lot of animals, depends on livestock for around 60% of its income. However, it has serious issues with animal nutrition, particularly with the provision of feeds. This predicament is summed up by the absence of feed factories in Somalia. The most significant benefits for Somalia are believed to be the number of pastures and the continued herding of nomadic animals. For animal husbandry to continue producing, scientific research must be expanded. Establishing and improving animal marketing, veterinary care, and drought mitigation methods, including water conservation, is necessary. Cattle are typically maintained on farms, and farmers provide food and water to the animals. This is known as the zero-grazing system. Zero grazing can lessen unneeded stress on plants and give damaged rangelands a chance to recover because of the smaller shared grazing area.

In addition, suggested solutions for Somalia would be listed as:

- ◆ Alternating grazing should be done on the pastures by dividing the animals into groups and regions. During pasture use, contact with different herds with each other should be kept to a minimum.

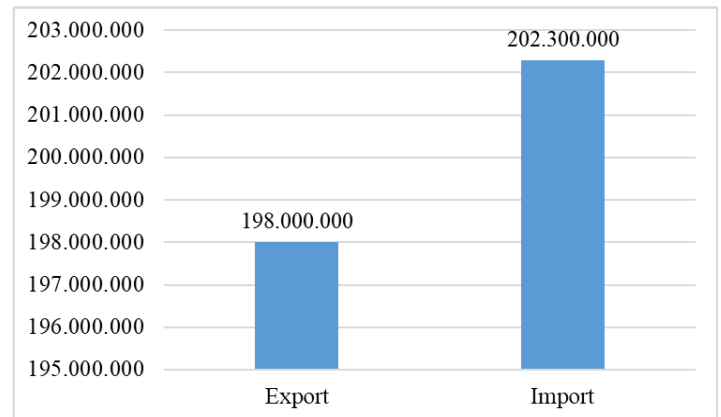


Figure 2. the comparison between exports and imports in 2017

Table 4. the comparison between exports and imports of the country (Million USD) (FAOSTAT 2016)

Years	Total Agricultural Exports	Total Exports	Index	Total Agricultural Imports	Total Imports	Index
1981-1985	115	119.6	100	118.1	297.9	100
1986-1990	109	114.3	95.6	82	279.1	93.7
1991-1995	93.7	102.5	85.7	84.7	144.2	48.4
1996-2000	112.3	119.9	100.3	122	167.1	56.1
2001-2005	141.1	169.5	141.7	201.9	288.1	96.7
2006-2010	208.9	282.5	236.2	525.9	719.7	241.6
2011-2014	518.1	559.1	4675	1 217.90	1 674.7	562.2
2015	643	688.5	575.7	1 496.80	2 358	791.5

- ◆ Water wells can be drilled in every pasture to reduce animal movements caused by lack of water and prevent animal disease spread.
- ◆ The government should set up agricultural extension organizations that motivate farmers to embrace cutting-edge farming practices for lower imports.
- ◆ Farmers should participate in all production-related training and courses.
- ◆ The government should continue to work to improve and support the production process of animal breeders. In addition, it is essential to make the necessary infrastructure improvements, especially in the agriculture and livestock sectors.

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## Competing interests

The authors declare that they have no competing interests.

## Author Contribution

Abdinasir Hassan MOHAMUD and Burak MAT took part in the compilation of the articles, the writing of the research, and the making and interpretation of the tables. Mustafa Bahadır ÇEVRİMLİ assisted in the coordination and arrangement of the study. All authors have read and approved the manuscript.

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