A Landscaping Analysis of Working Equid Population Numbers in LMICs, with Policy Recommendations

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Abbreviations and acronyms

AADRI	African Agricultural Data Rescue Initiative
AAEPF	American Association of Equine Practitioners Foundation
AHC	American Horse Council
AHS	African horse sickness
AEZ	agroecological zone
AGRIS	Agricultural Integrated Survey
ANSD	National Agency of Statistics and Demography
APM	Agricultural Productivity Module
APQ	annual production questionnaire
AU-IBAR	African Union Inter-African Bureau for Animal Resources
AVMA	American Veterinary Medical Association
CAPI	computer-assisted personal interviewing
CASI	computer-assisted self-interviewing
CATI	computer-assisted telephone interviewing
CED	Central Equine Database
CGAP	Consultative Group to Assist the Poor
CGIAR	Consultative Group for International Agricultural Research
CLAP	Community Livestock and Agriculture Project
CNSB	China National Statistical Bureau
CSA	Central Statistical Agency
DAERA	Department of Agriculture, Environment and Rural Affairs
DCA	Dutch Committee for Afghanistan
DEFRA	Department for Environment, Food & Rural Affairs
EAC-I	Enquête Agricole de Conjoncture Intégrée aux Conditions de Vie des Ménages
EQUHS	Equinos de Honduras
ERSS	Ethiopia Rural Socioeconomic Survey
EU	European Union
FAIR	findable, accessible, interoperable and reusable
FAO	Food and Agriculture Organization of the United Nations
FCDO	Foreign Commonwealth Development Office
FDA	Food and Drug Administration
FEG	Food and Economy Group
GPD	gross domestic product
GHS	General Household Survey
GPS	Global Positioning System
GSARS	Global Strategy to improve agricultural and rural statistics
IBGE	Brazilian Institute of Geography and Cartography
ICPALD	IGAD Centre for Pastoral Areas and Livestock Development
ICT	information communication technology
IGAD	Intergovernmental Authority on Development
IHS	Integrated Household Survey
ILRI	International Livestock Research Institute
INS	Institut National de la Statistique

INSD	Institut National de la Statistique et de la démographie
InSTePP	International Science & Technology Practice & Policy
IUCN	International Union for Conservation of Nature
LIP	Livestock Information Programme
LITS	livestock identification and traceability systems
LMICs	low- and middle-income countries
LSMS-ISA	Living Standards Measurement Study – Integrated Surveys on Agriculture
MAIL	Ministry of Agriculture, Irrigation and Livestock
MARF	Ministry of Animal Resources and Fisheries
NASS	National Agriculture Statistic Service
NED	National Equine Database
NGO	non-governmental organisation
NSO	national statistics office
OECD	Organization for Economic Cooperation and Development
OIE	World Organization for Animal Health
ONS	Office for National Statistics
PAPI	paper-and-pen interviewing
PDA	personal digital assistant
PDF	portable document format
PHC	Population and Housing Census
PICES	Poverty, Income, Consumption and Expenditure Survey
R(D)SVS	Royal (Dick) School of Veterinary Studies
ROR	Research Output Repository
RS	Remote Sensing
SDG	Sustainable Development Goal
SEBI	Supporting Evidence-Based Interventions
SIAP	Servicio de Información Agroalimentaria y Pesquera
SPANA	Society for the Protection of Animals Abroad
sSA	sub-Saharan Africa
TZNPS	Tanzania National Panel Survey
UK	United Kingdom
UN	United Nations
UNICEF	United Nations Children's Fund
UNFPA	United Nations Population Fund
UNPS	Uganda National Panel Survey
USAID	United States Agency for International Development
USA	United States of America
USDA	United States Department of Agriculture
ZARDI	Zonal Agricultural Research and Development Institute

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Executive Summary

Livestock contribute to livelihoods globally, and particularly so in low- and middle-income countries (LMICs), where they help alleviate poverty for hundreds of millions of smallholders. Production animals are sources of nutrition, income and security, and whilst less well acknowledged, working animals also provide incomes from agriculture, transportation as well as tourism. Now formally recognised as livestock, working equids are part of these animals contributing to livelihoods, often the most valuable asset owned by families and communities, and yet they are frequently ignored by governments and policy-makers. In order to inform future policy development, good data are essential, yet it is acknowledged that there are gaps in this data, and particularly so for 'invisible' working equid populations.

The global equid population is estimated to be around 116 million, but data for donkey, horse and mule populations are highly variable and often lacking. As well as a lack of data on equid numbers and related information, there is a lack of knowledge and clarity around who collects the data, how, and who is ultimately responsible for this in an oversight capacity at the global level. This pilot study was established to carry out a landscaping analysis of the equid population data available, with a focus on donkeys, and making links to livestock more generally. The study objectives were to i) establish population numbers that are available and what methods are used to generate these data, ii) investigate what the problems and challenges are in data collection, and the methods used where data is collected effectively, and iii) establish a rating system to show the range from poor to best practice.

Scoping review methodology was used to examine the literature and data available, looking at donkeys, horses and mules, as well as traditional production livestock species, to provide context and comparison for how different species' data are represented. Case studies were created, to establish data collection processes in individual countries. A total of 34 LMICs were explored, with the addition of the UK and USA for high-income country comparisons. The review identified that many countries are including equid data in their agricultural and livestock censuses, but with varying levels of detail and frequency. Enumeration methodologies were explored and described. The majority of countries report population data to the FAO, which is presented in a user-friendly, publicly available database, and where data are not reported, FAO provides estimated or imputed figures. Whilst it is not perfect, the FAO database provides the most comprehensive and comparable overview of global livestock populations.

As well as issues with reporting between countries and the FAO, the review highlighted numerous other problems in the process of data collection; equid populations are currently marginalised, without the collection of detailed and timely data, in particular, data on their use. Without knowing their purpose, the number of those working cannot reliably be established. Other problems included weak statistical capacity, inadequate census frequency, access to official data, negative attitudes to censuses, inadequate survey scope and coverage, ministry procedures, lack of export data, and numerous logistical problems. Additionally, the review identified negative attitudes towards animal power, lack of inclusion of equids in education, negative perceptions towards donkeys, and poor social status of working equids – all of which are likely adding to their exclusion from the livestock platform. Some best practices were highlighted and household surveys and poverty reduction schemes were identified that appear to be improving data collection. Ethiopia and India, whilst imperfect, both stood out as collecting equid data effectively. A rating system was established, based on defined criteria, and all case study countries were scored and assigned a rating, in order to provide an overall impression of how individual countries are doing with regards to equid data; seven countries were rated 'poor', six were rated 'average', 10 rated 'good' and 13 rated 'very good'.

Recommendations were made to address some of the problems. Full recognition and classification of working equids as livestock is required, if their data is to be included as standard amongst other livestock species. International standards need to be in place to ensure the reporting of consistent and reliable data to FAO, in a timely manner. The purpose of equids must be captured in order to count the populations working. There is the requirement to show quantitatively the economic contributions working animals make to livelihoods, and to demonstrate unequivocally the links to the most urgent Sustainable Development Goals, including poverty reduction, gender equity, food security and education, in order to attract the attention of those making changes. Improvements to censuses, public-private approaches, involvement in household surveys and integrated schemes, livestock identification and traceability systems, participatory research and collaboration were recommended. These approaches should assist in identifying and addressing the gaps in data, make linkages between livestock, economics and poverty reduction, and inform livestock policies and investment.

By highlighting problems in data collection, including problematic attitudes that are likely contributing to the exclusion of equids from the livestock data environment, it is hoped that the profile of these essential populations can be elevated and integrated into the mainstream livestock agenda. Only once fully featured can they receive due attention, allocation of policy development, and funding, which ultimately should benefit not only the welfare and productivity of working equids, but also that of their owners and communities.

Introduction

Globally, there is estimated to be approximately 116 million equids, with around 36 million located in the 38 least developed countries [1], where their lives are predominantly spent working [2] and subsequently contributing to livelihoods in resource-poor areas [3].

Despite the vital roles that working equids play in household livelihoods, accurate equid population data are lacking for many countries, with census data for livestock species often excluding working equids, in spite of most of the global population of equids being working animals [4] - the working equid population is estimated to be between around 100 to 112 million [5–9], representing between 86 and 96% of the total global equid population.

The global donkey population can be generally categorised as 1) working donkeys (rural and urban) of LMICs, 2) companion donkeys in affluent countries, 3) feral donkeys in the western hemisphere, east Africa and Australia, and 4) intensively farmed donkeys in China (and elsewhere) [10]. The donkey population is almost entirely (99%[1]) in LMICs [1]. To this day, there are huge numbers of donkeys working in some of the poorest regions of the world [10]. Draught power is a vital output from working animals and yet it is often excluded from the outputs and production of working equids [11]. Working donkeys are commonly regarded to have less value than ruminant livestock species [12] and this, combined with a paucity of evidence on their economic inputs compared to other livestock [13], is resulting in the exclusion of these populations from government initiatives and policies [14,15].

Reliable data are essential for disease surveillance, planning and epidemiological research [16], as well as in situations where populations are susceptible to other types of threat. There is currently enormous pressure on the world's donkey populations, with the collapse of some national populations [17]. A gelatin called '*ejiao*' is produced from donkey skins, and is used in traditional Chinese medicine [18]. The growing demand for this product, used in luxury cosmetics, is causing a rapid decline in donkey populations in some African and Asian countries, as donkeys are slaughtered for their skins [19]. The demand for *ejiao* is high in China; the supply of donkey skins within China has been drastically reduced whilst trying to meet the current requirements of around 4.8 million donkey skins each year [20]; the donkey population of China has plummeted, from 11 million in 1992, to around 2.6 million as donkeys are being culled for their skins [17]. To meet demand, it is thought that China imported 3.5 million donkey hides in 2016 [21].

There is little information on the actual demand for *ejiao* but it is anticipated to increase [22] and due to the highly sensitive and political nature of the donkey skin trade, there is an urgency in gathering accurate data on the global donkey population. Several African countries are thought to be targets for donkeys in the hide trade, namely Burkina Faso, Ethiopia, Niger, Nigeria, South Africa, Tanzania and Uganda [23] and Kenya is considered notably affected [24]. Of these countries targeted, increasing donkey populations have been reported over the past 20 years, with the exception of South Africa, which has a declining donkey population, and there is uncertainty with regards to the pattern in Kenya [1].

It has been acknowledged that government and development organisations often do not consider working equids as livestock, resulting in their exclusion from attention at the wider livestock agenda and from policies and interventions, and thus there is a pressing need for elevation of their status [25].

[1] Data from FAOSTAT, calculation by author

It is often not possible to determine the livestock activities in livelihood strategies from agricultural or household survey data, and thus the roles and relevance that specific livestock species have [26]. There is inadequate priority given to working animals, and particularly so to working equids, with minimal funding extended for research which is much-needed in order to inform data-driven and evidence-based advocacy [4].

This review aims to explore the equid data environment and to identify the barriers resulting in the exclusion of equids, and attempts to make recommendations that should aid the elevation of working equid data to the wider livestock agenda.

Objectives

The main objectives of the review were to:

1) Establish population numbers that are available, with a specific focus on donkeys, and the methods used to generate these data. Provide an overview of the global donkey population numbers, and more broadly working equids and livestock population data.
2) Investigate the problems in collecting data, as well as best practice methods used.
3) Establish a rating system.

The review aims to provide an evidence base to inform policy recommendations, highlighting any need for better data and elevation of the problem to the mainstream livestock agenda.

The scope of the project is global, but with focus on countries where working equid populations are significant, and where particular pressures, such as the donkey skin trade, exist.

Methodology

In order to enable policy makers in decision-making, there is a requirement for sound and comprehensive understanding of the relevant evidence (data). Livestock data, however, can be disparate and of highly variable quality, making evidence synthesis challenging. In situations where the breadth and or quality of data is prohibitive for using well developed systematic review methodologies, a scoping review is a suitable approach to describe the volume and type of literature, and can then inform the feasibility of a systematic review, either to address a specific research topic or to identify gaps in the literature [27,28].

In brief, the methodology involves identification of the question, identification of the studies, selection of relevant studies from the search, charting the data identified, collating and reporting the findings, and consultation with stakeholders [27].

There is a lack of data on working equid numbers and related information to inform future policy development, plus a lack of knowledge and clarity around who collects this data, how is it collected, and who is ultimately responsible for this in an oversight capacity at the global level. The primary research question for the basis of the review, therefore, was:

- What is the available evidence/data on donkey population numbers globally?

For the purpose of the literature searches, in addition to donkey population numbers, working equids and livestock population data were also included, to establish global patterns. Within the global

picture, case studies are described, to help understand a range of tendencies and dynamics in different locales.

In addition to illustrating current donkey population data, several research questions were formulated to further understand the livestock data environment and to address any knowledge and data gaps:

- What methods are used to generate these population data?
- What are the problems and blockages in collecting population data?
- What are the best practice methods used where data is collected effectively?

Studies that report on population or census data of donkeys, working equids (horses, donkeys, mules), or more general livestock population data, were considered for inclusion. In general, only literature written in English was considered for inclusion (with the exception of a few questionnaires and reports in French), due to constraints on time and resources and the reliability of translation applications. Due to the limited volume of data available and the requirement to identify patterns over time, no date exclusion was set, allowing all evidence to be assessed.

A variety of databases were used to search the literature, including PubMed, Google Scholar and the University of Edinburgh's DiscoverEd library database. This literature search identified study designs and data collection methods and used search terms and search strings. The scoping review was carried out solely by the author, due to the nature of the study. Searches on grey literature (non-peer-reviewed) included Google Scholar [29] as well as the Research Output Repositories (ROR) of specialist livestock institutions, including the Consultative Group for International Agricultural Research (CGIAR, https://www.cgiar.org/), the Food and Agriculture Organization of the United Nations (FAO, http://www.fao.org/), the International Fund for Agriculture Development (IFAD, https://ifad.org/), the International Livestock Research Institute (ILRI, https://www.ilri.org/), the United States Agency for International Development (USAID, https://www.usaid.gov/), and World Organization for Animal Health (OIE, http://www.oie.int/).

Search terms and strings included Donkey OR working equid OR mule OR ass OR burro OR horse AND population OR census OR enumeration AND data AND livestock AND challenges OR problems. All references identified in the literature search were managed with the online reference software Mendeley.

A four-level rating system (poor, average, good, very good) was established based on several criteria; i) when the most recent agricultural/livestock census was conducted; ii) whether equid population data were included and whether they were aggregated or disaggregated; iii) participation in Living Standards Measurement Study-Integrated Surveys on Agriculture (LSMS-ISA) or poverty reduction schemes. The type of data that a country's FAO population figures were based on i.e., official, estimated or imputed was considered for inclusion but as some countries may report to different international bodies, it was decided that this might not be fair and was not used as a rating criterion. Based on each criterion, a score was assigned and the total score resulted in the overall rating. The scoring was as follows;

i. Census conducted in past ten years (3 points), conducted in past 15 years (2 points), conducted in past 20 years (1 point), conducted more than 20 years or not done/presumed not done (0 points)

ii. Equid inclusion – disaggregated horses and donkeys (+/- mules as not all countries have mules) (2 points), horses only or donkeys only (1 point), aggregated (1 point), equids excluded (0 points)

iii. Involvement in LSMS-ISA/poverty reduction scheme i.e., showing to be working to improve their data – scheme involvement (1 point), no scheme involvement (0 points).

Scoring of 5-6 points assigned 'very good', 4 points assigned 'good', 3 points assigned 'average', 0-2 points assigned 'poor'. It is important to note that, due to the limited data and therefore limited criteria, as well as the single reviewer (author), this rating system is designed only to provide a basic overall impression of how countries are doing with regards to data collection, and care should be taken with its interpretation and dissemination.

The Equid Population

The overall global equid population has been relatively stable since data have been presented (1961-2019) by the FAO, increasing only 6% from an estimated 109 to 116 million. Over the past twenty years the population has increased by 3%, from 112,535,441 to 115,939,027. The equid population is currently comprised of 50.5 million donkeys, 57 million horses[2] and 7.9 million mules [1] (Figure 1) (Appendix, Table 7).

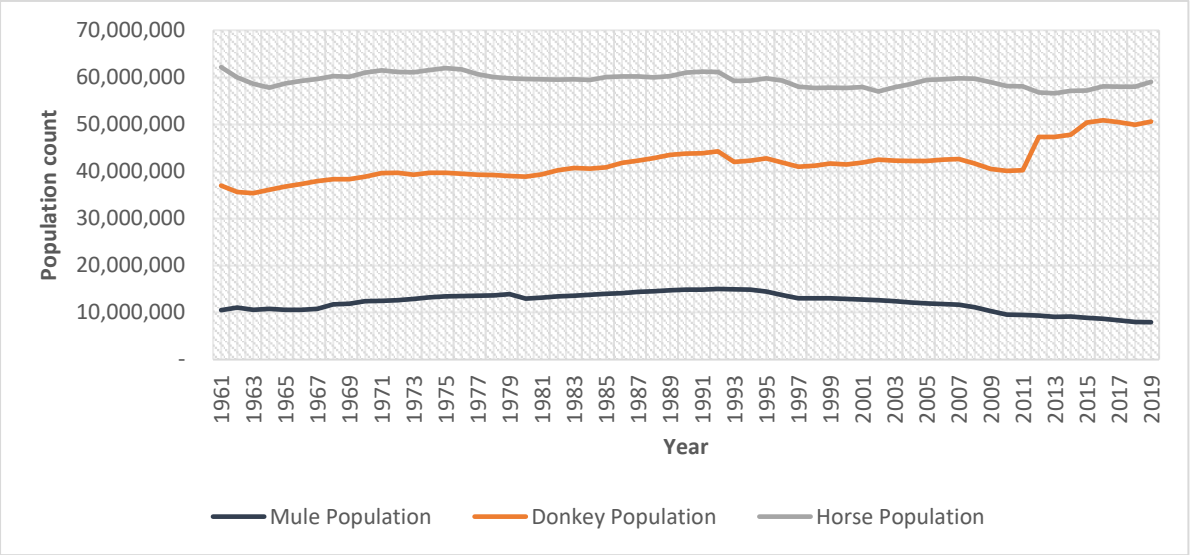

Figure 1. Global equid population counts (donkeys, horses and mules) between 1961 and 2019.Source: FAOSTAT. Aggregate data, may include official, semi-official, estimated or calculated data

Africa has the largest equid population, followed by Asia, South America, Central America and Caribbean, North America, Europe and Oceania (Table 1). The largest donkey population by far is in Africa, followed by Asia, Central America and Caribbean, and South America. Asia has the largest horse population, closely followed by South America and North America, Central American and Caribbean, Africa, and Europe. Mules are most prominent in Central America and Caribbean, South America, Asia and Africa (Table 1) (Figure 2).

Table 1. Equid populations by global region in 2019
Source FAOSTAT

Region	Equid population	Donkeys	Horses	Mules
Africa	38,884,998	30,640,119	7,397,922	846,957
Asia	28,414,784	13,234,286	13,925,579	1,254,919
Central America & Caribbean	16,615,869	3,746,598	9,118,134	3,751,137
Europe	4,818,518	121,247	4,696,333	938
North America	11,158,518	51,977	11,102,540	4,001
Oceania	354,353	8,924	345,429	-
South America	17,315,235	2,780,421	12,455,788	2,079,026

[2] FAOSTAT provides two figures, depending on database Region filters – 57,419,470 by 'World List' and 59,041,725 by 'World Total'

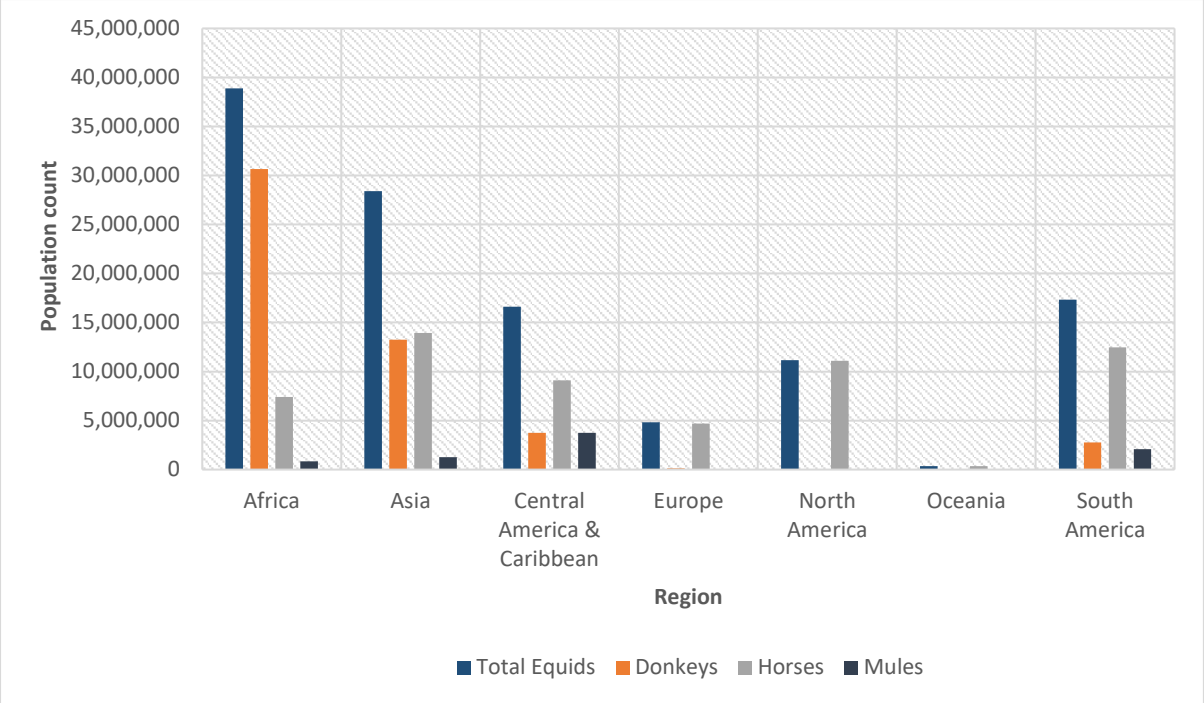

Figure 2. Equid populations by global region in 2019.
Source FAOSTAT

The largest national equid population is currently in Mexico (12.9 million), followed by Ethiopia (11.3 million), the United States of America (10.7 million), Sudan (8.4 million), Brazil (7.8 million), China (6.9 million), Pakistan (5.9 million) and Chad (4.9 million) (Appendix, Table 8).

Donkeys

The global donkey population appears to be increasing (Figure 1) (Appendix, Table 7), with the population increasing by 17.5% in the past twenty years, from 41,698,086 to 50,582,688. There was a notably large (15%) increase in 2012, from 40,273,830 to 47,351,567. Donkeys are most numerous in Ethiopia (8.7 million), Sudan (7.6 million), Pakistan (5.4 million), Chad (3.6 million), Mexico (3.2 million), China (2.6 million), Niger (1.9 million), Afghanistan (1.5 million), Iran (1.5 million) and Nigeria (1.3 million) (Figure 3) (Appendix, Table 9).

Horses

The horse population appears to be remaining stable globally (Figure 1) (Appendix, Table 7), with 0.6% reduction over the past twenty years, from 57,798,742 to 57,419,470. The United States of America contains the largest horse population (10.7 million), followed by Mexico (6.3 million), Brazil (5.8 million), Mongolia (4.2 million), China (3.6 million), Kazakhstan (2.8 million), Argentina (2.5 million), Ethiopia (2.3 million), Russia (1.2 million), and Chad (1.2 million) (Figure 3) (Appendix, Table 10).

Mules

The overall trend of the global mule population appears to be a steady decline (Figure 1) (Appendix, Table 7), reducing by 64% in twenty years, from 13,019,320 to 7,936,869. Mexico has the largest population of mules (3.3 million), followed by Brazil (1.2 million), China (0.71 million), Morocco (0.38 million), Peru (0.31 million), Ethiopia (0.30 million), Colombia (0.20 million), Pakistan (0.19 million), and Iran (0.17 million) (Figure 3) (Appendix, Table 11).

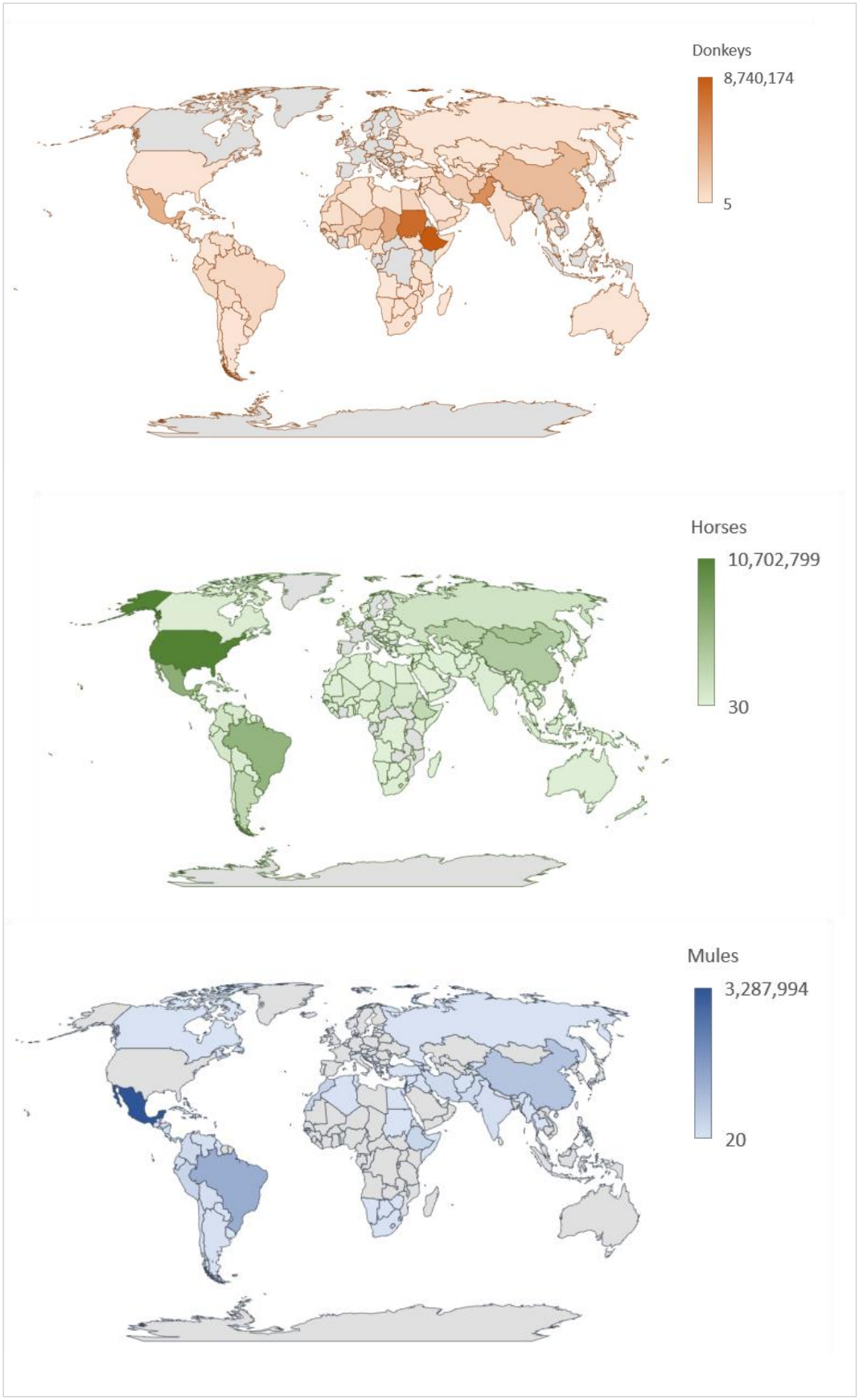

Figure 3. Global donkey, horse and mule population distribution in 2019, shown in orange, green and blue respectively. Countries highlighted in grey do not have population figures presented by FAO.Data source used to create maps: FAOSTAT

More than 95% of the global donkey and mule populations, and around 60% of horses are in developing countries [30]. There is, however, a lack of available or accurate data for equid populations, especially for LMICs [31].

Donkeys have historically contributed greatly to civilisation and development [32]. It is thought that more than 95% of the world's donkeys and mules are kept to be worked, most commonly for transportation and less so for farm tillage, threshing, milling or raising water [30,33,34].

Despite their overall population stability, however, there is significant variation between and within countries over time. For example, in 2004, approximately half of the global donkey population was in China, Ethiopia, Mexico and Pakistan [33]. China's donkey population has since plummeted and, while Ethiopia, Pakistan and Mexico remain some of the largest populations, Sudan and Chad's populations have reportedly surged[3] almost ten-fold [1]. The donkey skin trade is posing a serious threat to the global donkey population; between 1992 and 2017, the donkey population in China has reduced drastically, by 59%. Similarly, between 2011 and 2017, Kyrgyzstan's population has declined by 53%, with the population in Botswana falling by 37% in the same period of time. Brazil's donkey numbers dropped 28% between 2007 and 2017 [35] (Figure 4).

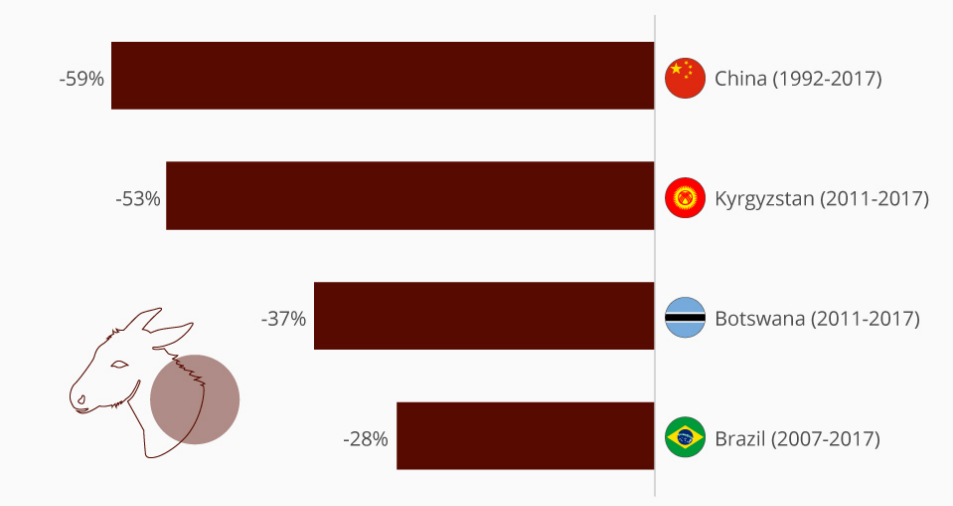

Figure 4. Change in donkey population in selected countries, due to the demand for Chinese medicine. [35]

These relatively rapid changes in population sizes demonstrate the need for accurate data so as to monitor trends and patterns, and allow timely interventions to be implemented.

Livestock Data

It has been stated by the World Bank that "agricultural data, especially in sub-Saharan Africa (sSA), suffers from inconsistent investment, institutional and sectoral isolation, and methodological weakness" [36]. It is also generally acknowledged that livestock data availability is lacking [37] and the lack of working equid data is part of this problem as a whole. It was stated by the Chief of the Agriculture Division of the US Bureau of the Census that "the nationwide collection of satisfactory livestock data ... is a difficult task and involves a number of problems. Even the job of obtaining a count of livestock is fraught with difficulties. Livestock numbers change every day of the year.

[3] This is most likely misrepresentative and due to changes in data sources

Marketing is a continuous process…" [38]. International development investment and poverty reduction strategies give inadequate attention to the enormous contributions that livestock provide in LMICs, and indeed equids are often excluded from national livestock ministry agendas in these countries [39].

Only as recently as 2016 were working equids (horses, donkeys and mules) recognised by the UN as working livestock [40,41] and considered as 'critical to the livelihoods and resilience of millions of families throughout the developing world' [42]. Yet despite this recognition, working equids are still very often overlooked as 'invisible livestock' within livestock policy definitions, databases and censuses [42].

When considering sustainable agricultural development, livestock provide vital and complex roles [43] and yet international research and development interest and investment in livestock has generally been weak. This is reflected in the relative paucity of high-quality livestock data, as well as analytical tools and capacity that can be used when evaluating options for improving smallholder livestock welfare and productivity [44].

In 2016, a brief was produced by The Brooke and the Food Economy Group (FEG), advocating for 'the systematic inclusion of working equids in livelihood baseline assessments' [45]. The proposal was developed to improve data collection tools, to include working equid numbers as well as evidence of equid importance in ascertaining household socio-economic status.

Yet even as far back as 1992, the FAO provided definitions for livestock:

> *All animals kept or reared mainly for agricultural purposes, including cattle, buffalo, sheep, goats, pigs, horses, mules and hinnies, asses, camels, poultry, bees, deer, rabbits, llamas, foxes and mink…Countries may wish to collect data separately on various types of livestock…to suit their needs* [46].

And livestock populations:

> *The present population of livestock refers to the number of animals present on the holding on the specific reference date, regardless of ownership. It includes animals temporarily away or in transit at the time of enumeration* [46].

At an AU-IBAR Conference of Ministers responsible for animal resources in Africa, 2010, the African Union Commissioner for Rural Economy and Agriculture (DREA), H.E. Rhoda Peace Tumusiime, spoke of the requirement for "complete, accurate and timely data and information to facilitate the formulation of appropriate policies and strategies, and the targeting of investments in animal resources" [44].

Therefore, incorporation of more data-driven decision making in programme management to actively measure impact is required, but poses a big challenge to the global livestock development community.

Who collects the data?

Livestock data are collected by several bodies, from the private sector, universities, non-governmental organisations (NGOs) and government agencies [47]. It is thought that where livestock data contribute to public well-being, that the public sector should be responsible for its collection and analysis. Livestock population data, and other indicator data such as location and price, are collected by governments and assist them in sector planning [47].

Private businesses collect livestock data that are relevant to themselves, such as consumption and prices, and NGOs collect data for designing and monitoring projects, and for advocacy. In LMICs it is thought, however, that there is minimal communication between the private and public sectors which means government agencies can be unaware of the private sector's data requirements [47]. Communication across the public sector is key, with horizontal coordination between country ministries and National Statistics Offices and, importantly, ensuring the collection of consistent and quality data from all involved [47,48].

Generally, FAO coordinate with governmental statistical agencies to obtain their estimates, and where statistics provided are insufficient, FAO makes provisional estimates [49]. FAO distribute and collect annual production questionnaires (APQ) from member countries as well as collecting data from national published yearbooks and pocketbooks, and from in-country websites, to provide official statistics. The data that countries provide are generated from administrative data, surveys and estimates and these sources are significant factors in how reliable, as well as comparable, the data are [50].

The FAO database is based on the cooperation of governments in completing annual questionnaires, and where countries do not report, or provide incomplete figures, data are estimated or imputed. Livestock population numbers are collected annually and uploaded by FAO twice yearly, regardless of when they are reported to FAO [51].

The African Agricultural Data Rescue Initiative (AADRI) was created in 2007 by International Science & Technology Practice & Policy (InSTePP), in collaboration with the University of Pretoria, and assisted by the Statistical Division of the FAO and agricultural statistical agencies in the region (and with financial support from the Bill and Melinda Gates Foundation, the University of Minnesota, the University of Pretoria, and Agricultural Research Council of South Africa) [52]. The initiative was created to address the often scarce production data for sub-Saharan Africa, with the aim of identifying and digitising historical agricultural censuses, and creating summary reports in order to carry out policy-related analyses [52].

Data collection methodology

Since 1945, the Food and Agriculture Organization (FAO) has provided support to its member countries, to facilitate the conduct of their national agricultural censuses, with provision of international standards and methodologies, and also technical assistance [53].

When considering the quality of data, FAO has stated that there is great variation between countries, based upon the collection methods being used in-country. FAO has recommended that samples surveys should be representative of a minimum of 95% of the area under a specific crop, and production and yield surveys should utilise statistically recognised methods with regard to reliability and quality. They have also called for more metadata and validation at national level [50].

Estimates of donkey populations have been provided in Annual Production Yearbooks published by FAO since 1949 [33], and data are available from 1961 on the FAO website [1]. Data collected by FAO is predominantly based on estimates from national agricultural ministries but it is important to note that all national ministries do not keep accurate donkey population estimates; this can be due to the difficult nature of estimating donkey populations as ownership is rarely registered and populations are often in remote areas inaccessible for carrying out surveys [33]. There is variation in data collection methods in different countries, and some countries vary from year to year. Subjective judgement can affect estimates from questionnaires, for example there may be shame in reporting large numbers of donkey [33]. In instances where local estimates are unavailable, FAO makes its own estimates, for example South Africa provided the same figure for many years, and Kenya stopped submitting figures. The result is that FAO data often differ to local figures, and there is a trend, in some African countries in particular, for FAO data to be underestimated. And with around a third of the global donkey population in just a few countries – China, Mexico, Ethiopia and Pakistan – global population numbers are reliant on these few countries providing accurate figures [33].

There are several main sources of livestock population and characteristics data and due to the nature of livestock data, most countries require more than a single source. Primary sources are i) agricultural census, ii) livestock census, iii) sample surveys, iv) research records, v) administrative records, and vi) household income-expenditure surveys [46](Table 2).

Table 2. Primary data collection methods for livestock numbers and characteristics. Source: FAO Collecting Data on Livestock (1992)

Data collection method	Considerations	Disadvantages
Agricultural census	- Used by most countries for livestock population data -Collecting at the national and administrative level -Data is often aggregated for the needs of the AEZ -Provides benchmark data for current statistics -Usually conducted every ten years	-Livestock numbers often under-estimated -Often incomplete coverage due to minimum holding size -Lack of data during intercensal period
Livestock census	-Can be annual, occasionally quinquennially -Conducted by veterinary extension officers (or those with similar capabilities) -Questionnaires used, on village basis, or interviews used on a holding basis -Information collected: numbers by species, sex, age and purpose -Holding livestock are recorded irrespective of ownership and include those temporarily away	-Often incomplete coverage due to minimum holding size
Sample surveys	-Periodic in nature – annual, semi-annual, quarterly or monthly -Can provide detailed data on numbers by species, age and purpose as well as milk and dry animals, broiler and layer poultry -Can be used to provide inter-censal estimates and during varying seasons	-Often confined to limited areas of a country
Research records	-Highly specialised and scientific nature -Used in breed improvement -Can provide rare species data	
Administrative records/returns	-Summarised versions of routine administrative government returns -Obligatory -Identify livestock movement, nomadic tribe locations, grazing/pasture/crop acreage, vaccines produced, livestock treated and outcome, disease surveillance testing, strength of veterinary staff by type of duty, number of livestock holders contacted and type of assistance, research stations and veterinary clinics, animals quarantined, and livestock taxes -Prescribed forms are completed according to detailed instruction and returned to the authorities by a set date	
Household income-expenditure survey	-Surveys of 'family budget' -Collect livestock data such as population numbers by species, sex, age and liveweight	

FAO acknowledges that a country should be able to conduct a census in the most appropriate way for its own unique conditions. As such, there are four main census approaches, namely classical, modular, integrated census and survey, and use of registers to provide data [54].

A classical approach involves a single one-off event, which would usually involve complete enumeration of all agricultural holdings. The approach often uses 'short-long questionnaires', whereby a short (basic) questionnaire is given to all holdings and a long (more detailed) questionnaire is given to a sample of holdings. Complete enumeration data is collected at the lowest administrative level and comprehensive data is produced for the whole population targeted, without sampling error. Data, including small administrative units and types of livestock, is presented in tables. There are, however, notable financial, administrative and logistical limitations and there is the potential to make the questionnaires cumbersome in attempting to collect detailed data [54].

A modular approach involves a core module for complete enumeration, as well as sample enumeration of additional/supplementary modules. Modules are types of data to be collected with regards to a target population, such as livestock holdings, agricultural practices or type of work. It is a requisite that the supplementary modules are based on a frame from the core module. This approach is useful in providing country-specific data where there is less importance on small area estimates, and can be a suitable approach for those countries with particular financial restrictions and lacking established survey systems, in a move towards an integrated census and survey system. It is necessary for the timing of the supplementary modules to be timely in relation to the core module, so as the frame is accurate. As with the classical approach, the core module can become cumbersome and there is the requirement for staff well trained in sampling. Cross-tabulation between core and supplementary variables can be challenging [54].

The integrated census and survey involve the integration of censuses and surveys over multiple years, for example the Agricultural Integrated Survey (AGRIS), a modular survey programme implemented with the agricultural census, and carried out annually in the intercensal period. This approach is relatively new and is based on a core census with complete enumeration, as well as rotating modules annually or periodically over ten years. As with the modular approach, a frame is provided for the rotating theme modules from the core census. Examples of thematic modules are production methods, economy, and crop and livestock production. The integrated method is considered a financially effective approach for annual enumeration of data that is of particular interest to countries. It collects a wide range of census data but requires focused training. There is, however, the potential to extend the core census which increases its cost and negates the integrated approach benefits. As with the modular method, cross-tabulation between thematic modules can be challenging and the reference period can have differences for the core and the modules; as such there is the requirement for strong planning and sampling capacity [54].

The use of registers utilises administrative sources and registers as census data sources, blended with field data. This method selects variables relevant to the census from the existing data and requires legal and public approval for use. There is reduced costs associated and is less taxing for respondents. Novel variables can be developed by the combination of administrative and field data, and can be published more often which can create positive public perception. Where data are based on whole populations, there should be negligible non-responses. This approach, however, is dependent on adequate legal and register owner compliance and administrative sources must have clear concepts and definitions if they are to be used effectively. It can be challenging to link data sources and if coverage changes over time, it can influence comparability over time which can be misleading [54].

Questionnaires can be implemented using paper and pen interviewing (PAPI), computer-assisted personal interviewing (CAPI), computer-assisted self-interviewing (CASI) and computer-assisted telephone interviewing (CATI). Additionally, questionnaires can be completed online or mailed back. Methods are often selected based on infrastructure and distances between households i.e., whether it is possible to conduct a face-to-face interview, and combinations are also used [53]. As well as handheld and mobile digital devices, the use of other technologies such as Global Positioning System (GPS) devices, and Remote Sensing (RS) and aerial photography are also used in census data collection [53,55].

There is the requirement for additional methods of livestock data collection for nomadic populations, which can be extremely challenging to enumerate due to their migratory nature. Sample surveys can be used but the distances and conditions involved can be prohibitive. Watering points can be used as sampling units, as can stock routes, and aerial surveys and satellite imagery are also utilised. As with all enumeration methods, there are limitations [46]. It has been recognised that there is scope to improve methods of enumerating nomadic livestock and that adequate sample size is essential in order to provide accurate estimates; GPS devices, improved Information Communication Technology (ICT), satellite imagery and drones should be considered for nomadic livestock enumeration [56]. It should be noted, however, with regards to enumeration of equids specifically, aerial counts can be challenging with regards to differentiation between horses, donkeys and mules, thus collecting aggregated data only, with the requirement for counts on the ground to establish disaggregated estimates [56].

Identification and Traceability Systems

With increasing awareness about the quality and safety of food, as well as animal welfare, there is growing interest globally in animal identification and recording, and traceability systems [57]. Unique identifiers and registration are used to identify animals [58] and the multi-purpose nature mean that these systems can help to protect human health, by tracing the movements of identifiable animals and allowing the recall of contaminated products throughout production and distribution [57]. They also protect against fraudulent marketing practices. FAO has supported national identification systems in Chile, Malawi, Lesotho, Uganda, Nepal and Ukraine and has implemented workshops on the development of identification and traceability systems in India, Poland, Slovenia, Switzerland, Tunisia and Finland [57]. Despite numerous identification and traceability systems being implemented, there is a paucity of literature on their economics [59].

Livestock identification and traceability systems (LITS) have been used in Botswana, South Africa and Namibia [60,61], but are generally not well developed in other African countries, where traditional identification practices cannot be used for traceability e.g. branding and ear notching [61]. However, LITS have been trialled in Kenya, Uganda, Tanzania and South Sudan, mostly in attempts to deter theft [62,63].

LITS generally have negative associations by farmers in the United States of America who are suspicious of the element of surveillance and consider them to be against their civil liberties; as such there is a requirement to incentivise their uptake [64]. And in Nigeria, where a LITS pilot study is being implemented by SEBI and Livestock247, there are negative associations with ear-tags, and again there is the need to incentivise these systems with provision of allied services to farmers involved (personal communication, Ciara Vance).

Household Surveys

Household surveys provide essential contributions to national statistical systems and the demand for household data is growing. Approximately a third of the Sustainable Development Goal (SDG) indicators are obtained from household survey data [65].

The Global Strategy to Improve Agricultural and Rural Statistics (GSARS) was established by FAO to improve data quality and credibility, often utilising integrated surveys. Associated with the desire to address gaps in agricultural data has been the use of alternative sources of data and big data, by using satellite and drone imagery, and machine learning [65]. In lower-income countries, however, there can be barriers to uptake of these sources, such as lack of analytical capacity, and the challenge of measuring smallholder agriculture. Additionally, and importantly, empirical household data is required in order to calibrate and validate alternative data sources [65].

In response to addressing often problematic agricultural data, a household survey project was created by the Living Standards Measurement Study (LSMS) team; 'Integrated Surveys on Agriculture' (ISA) is a collaboration between the LSMS team and the government national statistics offices of eight sub-Saharan African countries, whereby nationally representative household surveys are designed and implemented to explore the links between agriculture, non-farm incomes and socio-economic status [36]. The longitudinal and multi-topic character of LSMS-ISA is vital to its systematic goals, highlighting links between agriculture and welfare, and poverty-reduction from agriculture [65]. Several panel datasets are freely available and are discussed in case studies.

Community-level data

The collection of community-level data can support and compliment agricultural census data in rural development and policy-making, in particular data regarding services and infrastructure for holdings, and community food security analyses [66]. There is strong demand for this type of data, and FAO encourages its use as these data can highlight barriers to the uptake of improved agricultural practices and communities susceptible to sudden events. They can also identify produce markets within communities and demonstrate whether farmers' associations are effective in communities. In pastoral areas there can be community control that may not be captured at holding level and community-level data may be more representative of land use at national and subnational levels. The relatively low cost of adding community-level data collection to an agricultural census is conducive for its inclusion [66].

Country Case Studies

Despite the seemingly overall stability of equid populations globally, there is great variation between countries in population trends. A series of case studies (n = 36) have been created, detailing equid population data available, as well as other livestock species population figures, in an attempt to provide context for equids within each country. Due to the scope and time limitations, this report generally focuses on and discusses countries with large equid populations or those countries suspected of being involved in the donkey skin trade. FAO figures are presented for each country as well as the source of figures i.e., official, unofficial, estimated or imputed, as these data are the most comprehensive and allow temporal trends to be observed. Official (census) data are presented where available and can be compared to those presented by FAO.

An overview of census methodology is provided in Appendix Table 12; due to the detailed nature of census methodology, there is variation between countries and review of individual census reports is advised for further exploration of methodology.

Afghanistan

The total equid population was reported to be 1,699,463 in 2019, the majority (1,562,239) of which were donkeys (91.9%) [1](Figure 5). The most recent national livestock census was carried out in 2002-2003 and reported 1.59 million donkeys and 0.14 million horses. To put equids into context amongst other livestock species, Afghanistan had 12.2 million chickens, 8.8 million sheep, 7.3 million goats and 3.7 million cattle in. Livestock demographic data was collected by full enumeration for agroecological region, provincial and district level [67]. Afghanistan has suffered numerous droughts and ongoing conflict [68] and livestock numbers have changed substantially over the past 30 years [69].

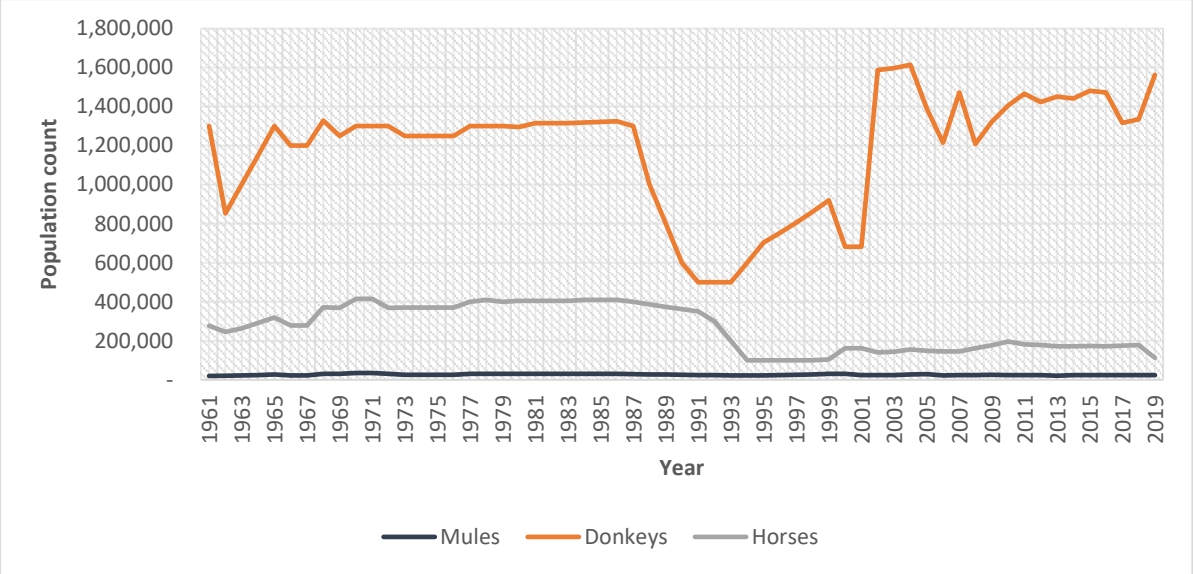

Figure 5. Population counts for donkeys, horses and mules in Afghanistan, between 1961 and 2019.Source: FAO data. ***Donkeys*** *– 1961-1963 official data; 1964 FAO estimate; 1965-1972 official data; 1973-1976 FAO estimate; 1977 official data; 1978-1982 unofficial figure; 1983-1985 FAO estimate; 1986 unofficial figure; 1987 official data; 1988-1994 FAO estimate; 1995-1998 unofficial figure; 1999-2017 official data; 2018-2019 FAO data based on imputation.* ***Horses*** *– 1961-1963 official data; 1964-1965 FAO estimate; 1966-1972 unofficial figure; 1973-1976 FAO estimate; 1977-1982 unofficial figure; 1983-1985 FAO estimate; 1986 unofficial figure; 1987-1990 FAO estimate; 1991 official data; 1992-1996 FAO estimate; 1997-2017 official data; 2018-2019 FAO data based on imputation.* ***Mules*** *– 1961 FAO estimate; 1962 official data; 1963-1965 FAO estimate; 1966-1972 unofficial figure; 1973-1976 FAO estimate; 1977-1982 unofficial figure; 1983-1985 FAO estimate; 1986 unofficial figure; 1987-2000 FAO estimate; 2001-2017 official data; 2018-2019 FAO data based on imputation.*

Three agricultural sub-sectors – horticulture, irrigated wheat and livestock – were identified as having economic viability by a 2014 World Bank Afghanistan Review, however, there is a lack of data to corroborate the potential of livestock described in literature, due to difficulties in collecting data [70].

In 2016-17, Afghanistan conducted a Living Conditions Survey, which included livestock enumeration. It was acknowledged that current statistics were lacking and suggested that cattle numbers had fallen since the livestock census in 2002-03, and small ruminant numbers had increased [71]. The survey estimated the donkey population to be 1,650,000 and the horse population to be 76,000. The number of donkeys sold was estimated to be 53,000 [71].

More than 70% of livestock holdings in Afghanistan are owned by the Kuchi nomadic pastoralists [72]. The Community Livestock and Agriculture Project (CLAP) is a partnership between DCA, the Ministry of Agriculture, Irrigation and Livestock (MAIL), and IFAD, established in 2014 to reduce poverty in rural Afghanistan, with livestock health service provision and business opportunities to the Kuchi pastoralists and agropastoralists [73]. Although oxen are favoured as draft animal, donkeys are most often used as they are more affordable to farmers [67]. Donkeys also provide transportation and are

worked in the brick industry [68]. The DCA-Brooke partnership in Afghanistan works to address the welfare of working equids with particular attention to improving livelihoods of owners and has demonstrated that 85% of welfare problems that reduce productivity and performance are owner-related and preventable [68].

It is thought that donkeys have been slaughtered in Afghanistan so that their skins can be used by the Taliban, as well as meat and fat being sent to China; the government has reportedly banned donkey skin smuggling [74].

Botswana

Between 1979 and 2013, the donkey population in Botswana was growing, from 127,000 to 310,000 and peaked at 493,000 in 2003. From 2013, however, the population has gradually been reducing and in 2017 was reported to be at an all-time low since 1984, at 140,000 [75]. The figure provided in the most recent national agricultural census (2015) for total donkey and mule population combined is 178,400, with other livestock populations reported as 1.7 million cattle, 1.2 million goats, 242,000 sheep and 32,000 horses [76]. The census collected data from traditional (subsistence) and commercial sectors, at national, administrative district and census district level. Cattle, goat and sheep data were focused on in the results report [76]. Agricultural holdings were the statistical unit (with no regard to title, legal form or size), and traditional Paper-and-Pen Interviewing (PAPI) methodology was used [77].

FAO reported an overall similar trend but with slight variation in annual figures, estimating the total equid population to be 165,947 in 2019, with 139,524 donkeys (84.1%) and 3,493 mules [1](Figure 6).

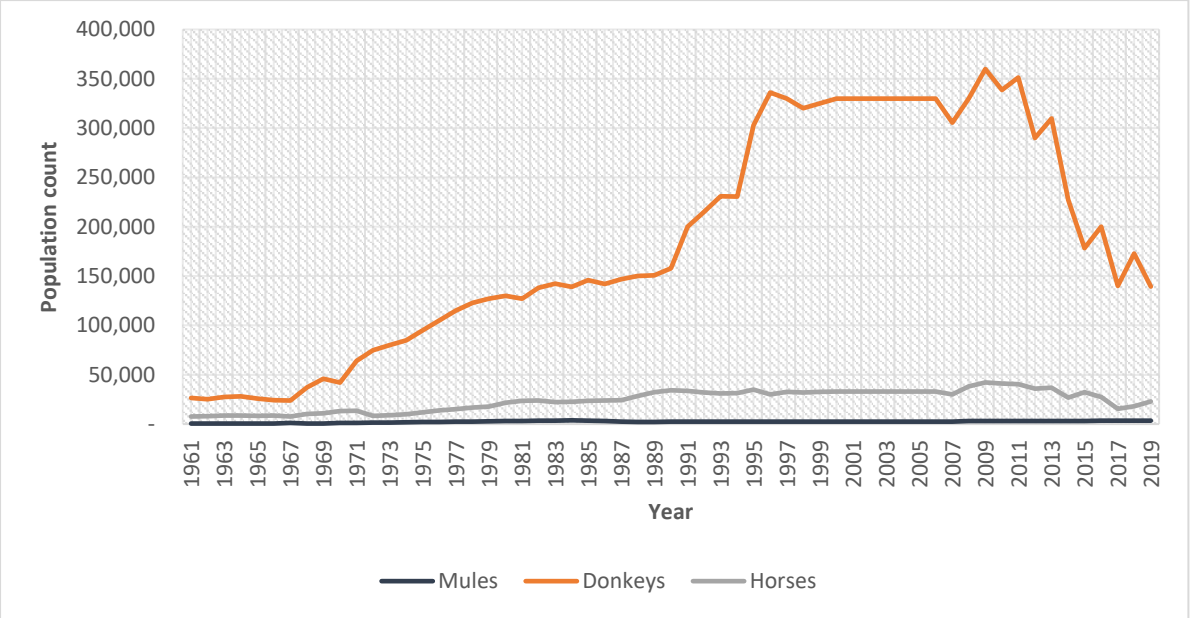

Figure 6. Population counts for donkeys, horses and mules in Botswana, between 1961 and 2019Source: FAO data. ***Donkeys*** *1961-1971 official data; 1972-1978 FAO estimate; 1979-1990 official data; 1991-1992 FAO estimate; 1993-1996 official data; 1997-2006 FAO estimate; 2007 official data; 2008 FAO estimate; 2009-2015 official data; 2016 FAO estimate; 2017 official data; 2018 FAO data based on imputation methods.* ***Horses*** *1961-1972 official data; 1973-1977 FAO estimate; 1978-1990 official data; 1991-1992 FAO estimate; 1993-1995 official data; 1996-2006 FAO estimate; 2007-2015 official data; 2016 FAO data based on imputation; 2017 official data; 2018 data based on imputation.* ***Mules*** *1961-1972 official data; 1973-1987 FAO estimate; 1988-1989 official data; 1990-2014 FAO estimate; 2015-2018 FAO based on imputation.*

The fall in the donkey population is thought to be due to several factors, including exportation of skins and local increase in consumption, as well as farm machinery replacing them for draught power and thus less requirement for them [75]. In 2017 the Botswana Government restricted the exportation of donkey skins [78] but smuggling and theft have continued [79]. The exportation ban was instated without a baseline survey on the country's donkey population and without assessing how the trade was affecting farmer livelihoods [80].

As their socio-economic value is fully recognised, the roles played by donkeys is changing, however there is a paucity of data on the roles of donkeys in Botswana [80]. Rural development has been affected in recent years, with job creation in slaughterhouses, but also increased prices for donkeys since the skin trade [81] has made them less affordable to those requiring donkeys for their livelihood [82]. As the illegal trade continues and donkeys continue to be stolen, the socio-economic status of farmers reduces, with the poor becoming poorer [80].

There is a lack of population data and accurate information on the donkey sector, as the government is not operating surveys and lacks regulation of the donkey skin trade, thus reliable economic analyses are constrained [80]. Botswana has successfully used livestock identification and traceability systems (LITS) in cattle for many years [61,83].

Brazil

The total equid population in 2019 was reported by FAO to be 7,891,952, the fifth largest in the world, with a donkey population of 788,595 (10%) and 1,253,203 (15.8%) mules [1](Figure 7).

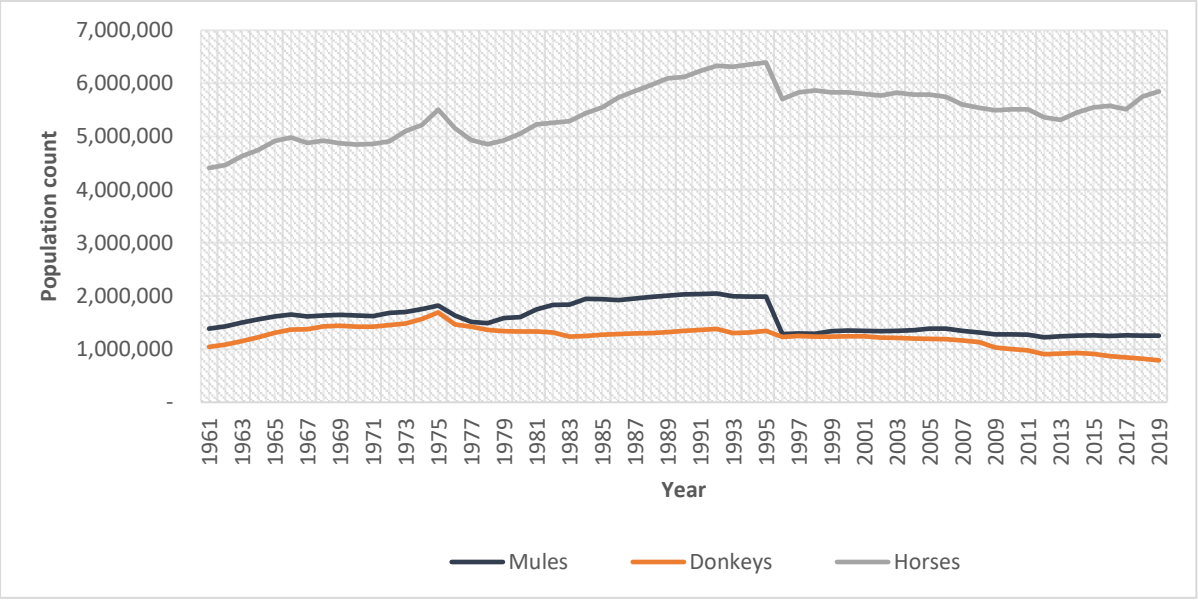

Figure 7. Population counts for donkeys, horses and mules in Brazil, between 1961 and 2019.Source: FAO data. ***Donkeys*** *– 1961-1970 FAO estimate; 1971 official data; 1972-1973 FAO estimate; 1974-2012 official data; 2013-2014 FAO estimate; 2015-2019 FAO data based on imputation.* ***Horses*** *- 1961-1970 FAO estimate; 1971 official data; 1972-1973 FAO estimate; 1974-2019 official data.* ***Mules*** *- 1961-1970 FAO estimate; 1971 official data; 1972 FAO estimate; 1973-2012 official data; 2013-2014 FAO estimate; 2015-2019 FAO data based on imputation.*

Mules and hinnies are often used to manage cattle in Brazilian beef ranches, with significant economic contribution [84]. However, once well regarded 'beasts of burden', the status of donkeys in Brazil has reduced, with them being considered pests by some; as the country has modernised, motorbikes are replacing donkeys [85] and as such, donkeys are considered outdated and have associations with poverty [86].

Between 1996 and today, there has been a declining population trend in South America; the three countries that still provide data to FAO - Brazil, Colombia and Ecuador - are all reducing, by 37.1%, 89.4% and 81.5% respectively [87]. The increased agricultural mechanisation, along with the value of leather and leather by-products are thought to be contributing factors [87].

With the relatively new threat of the donkey skin trade, the donkey population reportedly reduced by 28% between 2007 and 2019 [88]. Meat processing plants were reportedly intending to slaughter 200,000 donkeys annually [89]. Bahia State suspended the slaughter of donkeys in 2018, but the hide trade has grown with such speed that it is a huge challenge to enforce [17].

Brazil carried out its most recent agricultural census in 2017, reporting 172 million cattle, 39 million pigs, 13.8 million sheep, 8 million goats, 4,236,062 horses and 376,874 donkeys [90]. The census survey used novel technologies and collected data at national, regional and municipal levels [91]. The country's previous census was carried out in 2006, reporting 176 million cattle, 31 million pigs, 14 million sheep, 7 million goats, 5.9 million equines (of which, 4,541,833 horses, 750,529 mules and hinnies, and 654,714 donkeys) [92]. These figures indicate a reduction in the donkey population of 57.6% during the intercensal period.

Burkina Faso

The total equid population was reported to be 1,296,197, consisting of 1,253,587 donkeys and 42,610 horses in 2019 [1] (Figure 8).

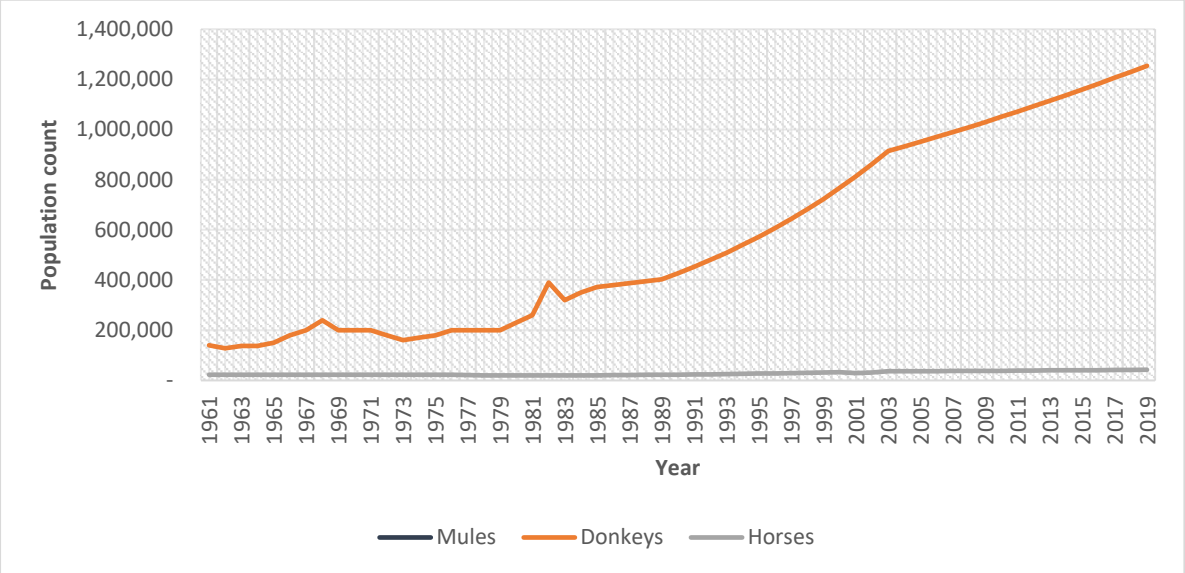

Figure 8. Population counts for donkeys and horses in Burkina Faso, between 1961 and 2019Source: FAO data. ***Donkeys*** *– 1961-1969 official data; 1970-1975 FAO estimate; 1976-1979 official data; 1980-1984 FAO estimate; 1985-1989 official data; 1990-2002 FAO estimate; 2003-2018 official data; 2019 FAO data based on imputation.* ***Horses*** *– 1961-1984 FAO estimate; 1985-1989 official data; 1990-2000 FAO estimate; 2001-2018 official data; 2019 FAO data based on imputation.*

There is low crop and livestock production in Burkina Faso, predominantly supporting subsistence farming [93]. An agriculture census was conducted in 2006-2010; poultry were the predominant livestock species at 32 million, followed by 9 million goats, 7.2 million sheep, 6.7 million cattle, 1,572,427 pigs, 1,157,449 donkeys, 25,237 camels and 23,915 horses [94]. A core module was intended for a Population and Housing Census (PHC) in 2019 but was postponed [95].

The LSMS-ISA project is working to build capacity in Burkina Faso to improve household agricultural data collection. Implemented by L'Institut national de la statistique et de la démographie (INSD) [96]. The questionnaire[4] did not collect data on livestock species [97] but the report described the economic importance of livestock, with 35% poverty in those with livestock, compared to 48% in subsistence agriculture [98]. 'Feed the Future' and 'Food for Peace' are initiatives by USAID, developed to support the agricultural sector by improving the livelihoods of vulnerable populations [93].

Donkeys are used in both rural and urban settings of Burkina Faso, for traction, transportation of people, crops and water, as well as transporting waste and construction materials [99]. In 2016 there were reports of the slaughter of 45,000 donkeys in a six month period, of an estimated total of 1.5 million, and export of 19 tonnes of donkey hides to Hong Kong in the space of three months [100]. In August 2016, however, the exportation of donkey skins (as well as camel and horse skins) was banned, with plans for more regulated donkey slaughter [101]. There are still high volumes of donkeys crossing Burkina Faso from Mali to Ghana [17] and theft of populations from Burkina Faso [102].

Chad

The total equid population was reported to be 4,889,900 in 2019, with 3,621,240 donkeys (74.1%) [1](Figure 9). OIE reported the equid population as 2,369,000 in 2018 (most recent available data) [103].

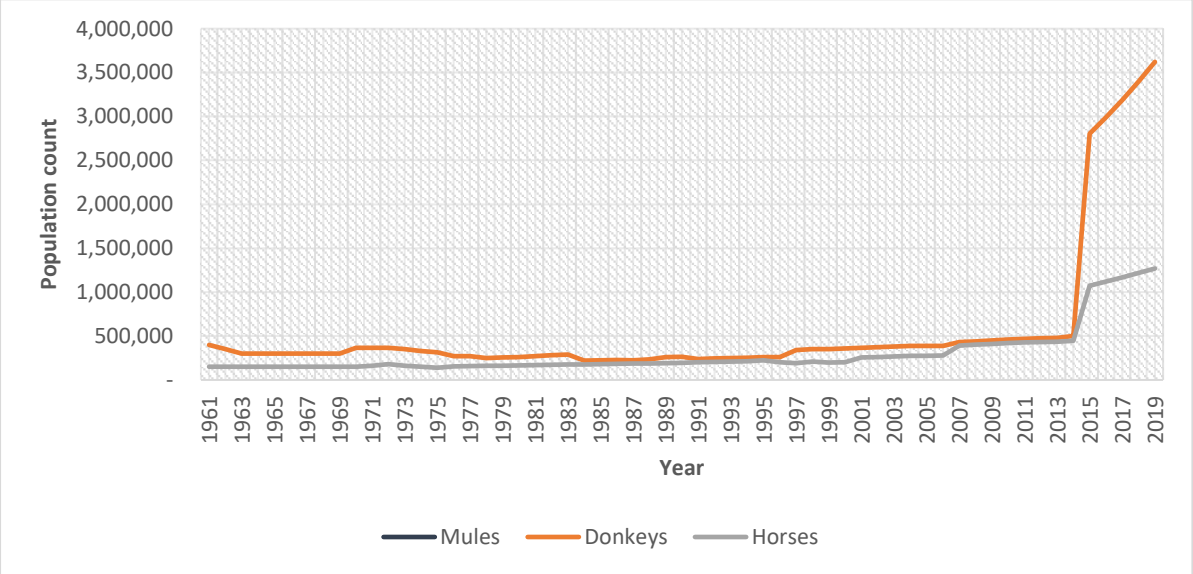

Figure 9. Population counts for donkeys and horses in Chad, between 1961 and 2019.Source: FAO data. ***Donkeys*** *– 1961 official data; 1962 FAO estimate; 1963-1964 unofficial figure; 1965-1973 official data; 1974 FAO estimate; 1975-1976 official data; 1977-1982 FAO estimate; 1983-2001 official data; 2002-2006 FAO estimate; 2007-2009 official data; 2010-2013 FAO estimate; 2014-2019 official data.* ***Horses*** *– 1961 official data; 1962 FAO estimate; 1963-1964 unofficial figure; 1965-1970 official data; 1971 FAO estimate; 1972-1973 official data; 1974 FAO estimate; 1975-1976 official data; 1977-1982 FAO estimate; 1983-2000 official data; 2001-2003 unofficial figure; 2004-2006 FAO estimate; 2007-2009 official data; 2010-2013 FAO estimate; 2014-2019 official data.*

These figures suggest an explosion in the donkey population, as in 2006 there were reportedly 715,300 horses and donkeys from a total 16.5 million livestock animals, also including 8.1 million sheep and goats, 6.3 million cattle and 1.2 million camels [104]. The type of data also changed at this time, from estimated between 2002 and 2006, to official from 2007 to 2009, so it may be that the population was greatly underestimated prior to 2007 (although there were official figures between 1983 until 2001).

[4] Questionnaire written in French

Determining livestock populations in Chad has been difficult, with drought and war in the major livestock region (the Sahel) causing reduced numbers in the 1970s and the 1980s [105].

Poverty is a huge problem in Chad and as around ninety percent of the poorest live in rural areas, there should be government focus on growing agriculture and livestock keeping [106]. It has been said that "official data in Chad are notoriously unreliable", with data being estimated and no recent surveys or census data [107]. No livestock census data has been identified; an agricultural census was intended for 2020 [53].

China

Working equid populations have been declining since around 1996, with mule numbers reducing from 5.3 million to less than one million in 2017; horse numbers have reduced from 10 million to 3.6 million; and the donkey population has fallen from 10.7 million to 2.6 million in 2019. The FAO reported a total of 6,988,595 equids in 2019, with 37.2% of those donkeys [1](Figure 10).

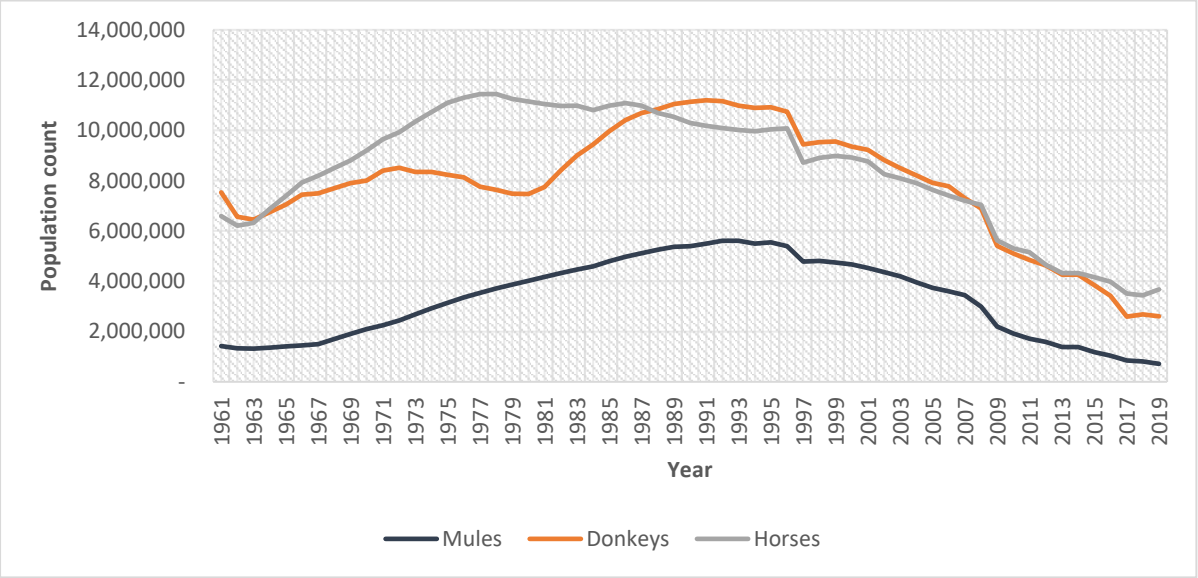

Figure 10. Population counts for donkeys, horses and mules in China, between 1961 and 2019.Source: FAOSTAT. All species 1961-2019 – Aggregate, may include official, semi-official, estimated or calculated data.

Interestingly, there was a small increase in the donkey population in China from 2016 to 2017 – the first increase since 1998 [22] - but the population has subsequently continued to decline [1,108] (Figure 11).

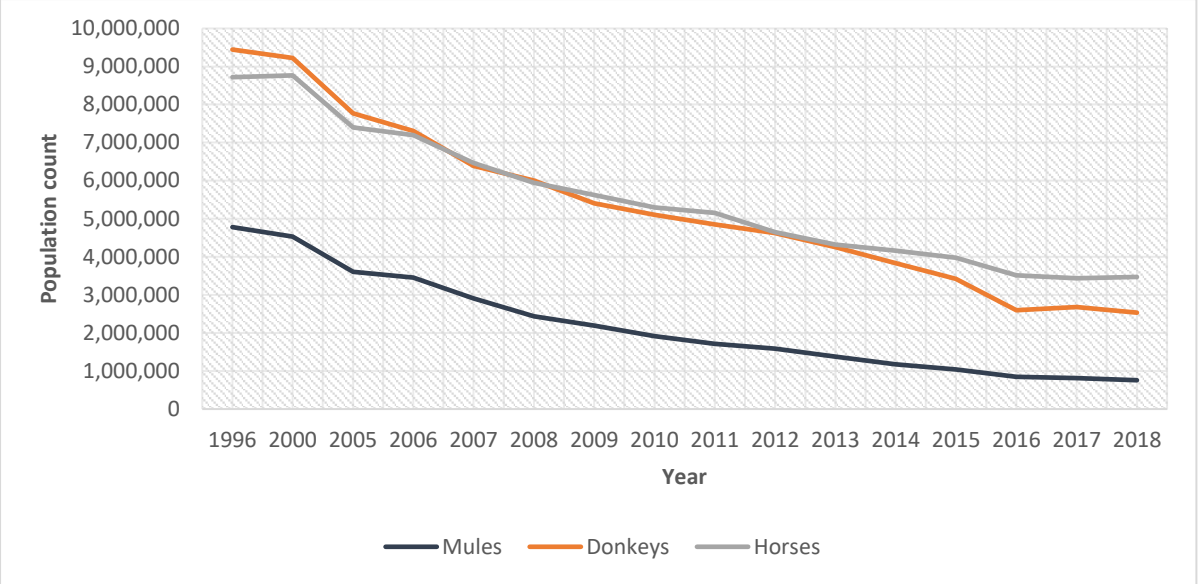

Figure 11. Population counts for donkeys, horses and mules in China, between 1996 and 2019.Source: National Bureau of Statistics of China (2019) data

In 1990 China had the largest donkey population in the world [17] but numbers have declined with urbanisation, industrialisation and economic development of China and, as the wealth of the Chinese middle-class has grown, so has the demand for and consumption of *ejiao* [80]. As China's economy has grown since 1990, the number of small tractors increased by more than double and medium/large tractors increased seven-fold, resulting in working equid populations plummeting [108].

China's reputation for accurate livestock production data is poor [109]. The National Statistical Bureau of China (CNSB) has acknowledged the inadequacies in its data series and measures were taken to revise them, however, the standards of research have been hampered by a lack of consistent data, potentially affecting policy recommendations [110].

An agricultural census was carried out in 2006, including urban and rural areas but excluding Taiwan Province, Hong Kong and Macao. It also had size limitations to those households included[5]. Livestock populations described in a metadata review were pigs (418 million), goats (147 million), sheep (131 million), cattle (104 million), and poultry (4.8 million), with no mention of equids [111]. A census was reported to be carried out in 2016 but it has not been possible to source a published report. It has been said that the 2016 agriculture census of China "confirms that the country's farming sector remains shrouded in a statistical fog where numbers reveal only grey indistinct shapes whose details cannot be discerned with any precision, and reveals nothing about what is produced" [112].

China does, however, present annual agricultural statistical yearbooks and reported livestock numbers for cattle and buffalo, horses, donkeys, mules, camels, hogs, sheep and goats. Equid populations for 2018 were reported to be 3.47 million horses, 2.53 million donkeys and 0.75 million mules [108], which are the same figures presented by FAO.

[5] As examples, a holding must keep at least one large or medium livestock, such as cattle, horse, pig and sheep, a holding must keep at least 20 head of small animals, and income from agricultural services must exceed RMB 500 (~£56 GBP)

Colombia

The total equid population was reported to be 1,437,929, with 90,978 donkeys, 1,144,651 horses and 202,300 mules in 2019 [1](Figure 12).

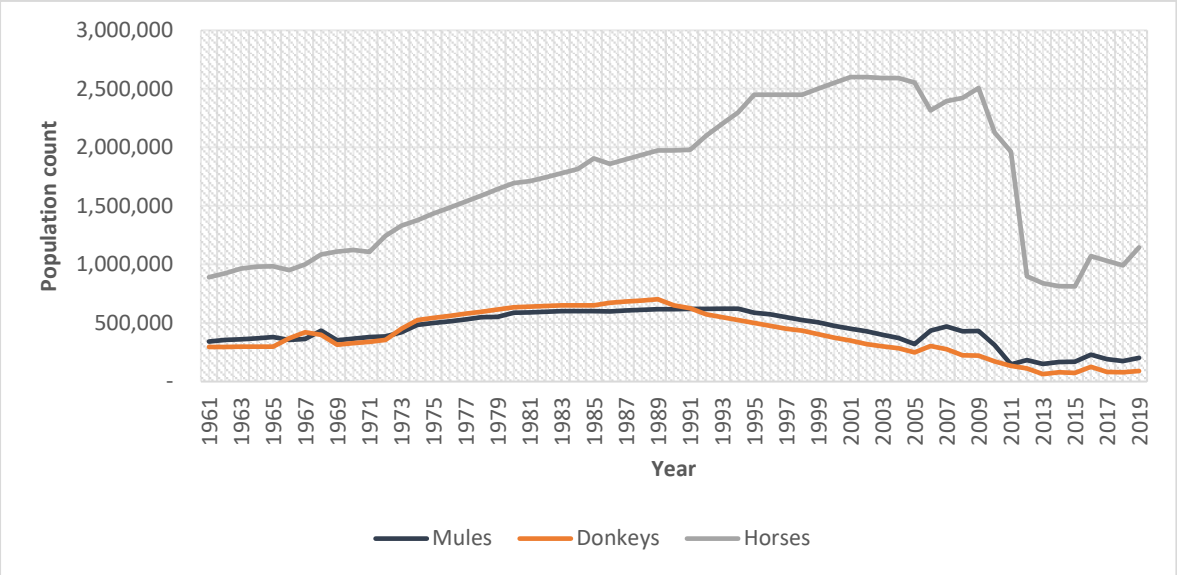

Figure 12. Population counts for donkeys, horses and mules in Colombia, between 1993 and 2019.Source: FAOSTAT. ***Donkeys*** *– 1961 unofficial figure; 1962-1964 FAO estimate; 1965-1972 official data; 1973 FAO estimate; 1974-1979 official data; 1980-1985 FAO estimate; 1986-1989 official data; 1990-2005 FAO estimate; 2006-2019 official data.* ***Horses*** *– 1961-1964 unofficial figure; 1965-1970 official data; 1971-1973 unofficial figure; 1974-1980 official data; 1981-1985 unofficial figure; 1986-1989 official data; 1990-1994 FAO estimate; 1995 official data; 1996-2002 FAO estimate; 2003-2010 official data; 2011 FAO estimate; 2012-2019 official data.* ***Mules*** *– 1961 unofficial figure; 1962-1964 FAO estimate; 1965-1972 official data; 1973 FAO estimate; 1974-1980 official data; 1981-1985 FAO estimate; 1986-1989 official data; 1990-1994 FAO estimate; 1995 official data; 1996-2005 FAO estimate; 2006-2019 official data.*

Around a quarter of Colombia's population resides in rural parts, with 60% of rural employment in agriculture (20% of national employment) [113]. The most recent agricultural census was carried out in 2014, having been conducted 45 years previously [114]. Population data were collected for horse, mules and donkeys separately[6] [115]. Due to census coverage being inadequate (less than 70% in some areas), a pilot project was implemented to provide additional information, by use of 'Big Data' remote sensing data [116]. Farm-level statistical data is considered inaccurate, resulting in insufficient information for policy makers [117].

In the 2001 Agricultural Census of Colombia, horses were the third largest livestock population, at 2.89 million, after chickens (33 million) and cattle (24 million) [118]. The horse population has since plummeted.

Horses are commonly used to pull loaded carts and referred to as 'animal traction vehicles'. These working horses are typically in poor condition, due to their extremely high workloads, but their owners are dependent on them for paltry incomes and have been chronically overlooked by the Colombian government [119].

[6] Census questionnaire written in Spanish

Egypt

The total equid population was reported as 958,190 in 2019, with 90.9% of those donkeys (871,447) [1](Figure 13).

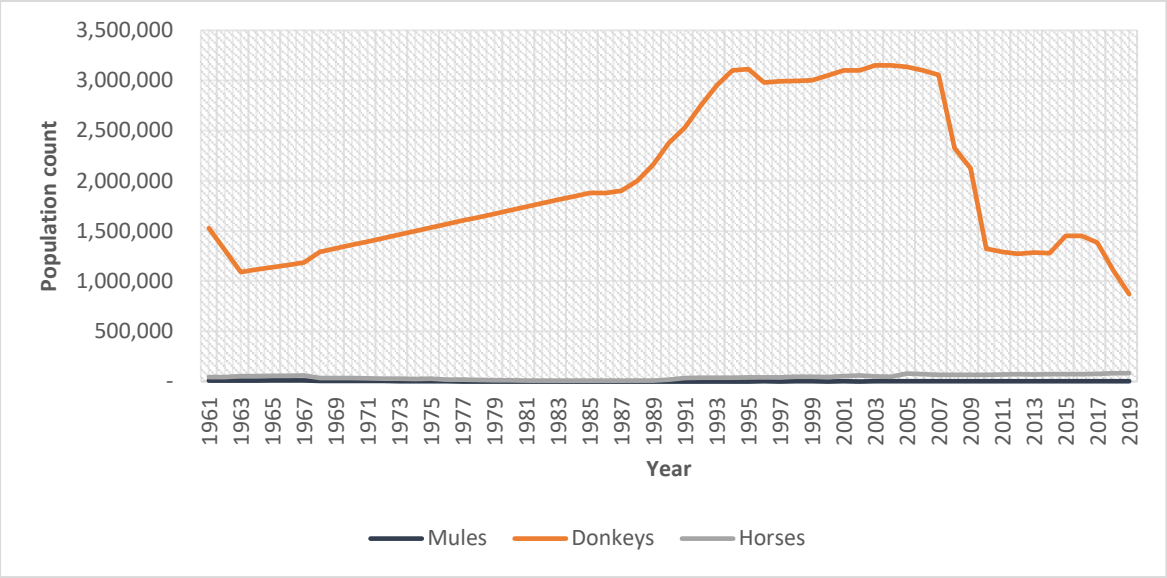

Figure 13. Population counts for donkeys, horses and mules in Egypt, between 1993 and 2019.Source: FAOSTAT. ***Donkeys*** *– 1961 official data; 1962 FAO estimate; 1963-1986 official data; 1987-2004 FAO estimate; 2005-2012 FAO data based on imputation; 2013-2018 official data; 2019 FAO data based on imputation.* ***Horses*** *– 1961 official data; 1962 FAO estimate; 1963-1979 official data; 1980 unofficial figure; 1981-1986 official data; 1987-1990 FAO estimate; 1991-1993 official data; 1994-1995 unofficial figure; 1996-2001 official data; 2002 unofficial figure; 2003-2018 official data; 2019 FAO data based on imputation.* ***Mules*** *– 1961 – official data; 1962 FAO estimate; 1963-1986 official data; 1987-1990 FAO estimate; 1991-2015 official data; 2016-2019 FAO data based on imputation.*

In 2009/2010 Egypt carried out an agricultural census, collecting data at national and district level. Poultry were the predominant livestock species (124,504,000), followed by rabbits (9,646,485), sheep (8,715,424), goats (6,651,915), cows (5,528,950), buffalo (4,335,817), donkeys (3,029,378), camels (153,801), horses (84,853) and mules and hinnies (28,096) [120]. More recent (2015) livestock statistics for Egypt have been provided by the Ministry of Agriculture and Land Reclamation, reporting chickens to be the predominant livestock species (776,424,139), followed by sheep (5,463,169), cattle (4,883,196), goats (4,046,238), buffalo (3,701,559), donkeys (1,452,262), dairy (402,070), camels (152,518) and horses (72,709) [121], indicating a general trend of declining livestock populations.

With regards to the donkey population, export of donkey skins is legal in Egypt, with reports of 10,000 skins exported annually, as well as illegal slaughter. And yet the loss of donkeys, so vital in the agriculture sector, would be highly damaging to local economies and ultimately increase farming costs [122]. All equid species are worked in Egypt, including transportation of produce as well as people [123].

In 2015, 27% of all households were reported to keep livestock, with 1,434,076 (7% of all households) keeping equids (26% of livestock-keeping households). Of those households, 98% were reported to keep less than two equids, and the remaining 2% kept between two and five [121]. Despite the lack of reliable statistics, horses are thought to contribute to the Egyptian economy, through breeding, education and employment in the equine industry [124].

Ethiopia

Ethiopia currently has the world's second largest total equid population after Mexico, and the largest donkey population at 8.7 million (76.9% of the 11,367,650 total equid population in Ethiopia in 2019)(Figure 14) [1] and with around eighty percent of the population living in rural Ethiopia and employed in agriculture [125][126], working donkeys provide vital draught power and transportation, in both rural and urban areas, contributing to Ethiopia's growing economy [127].

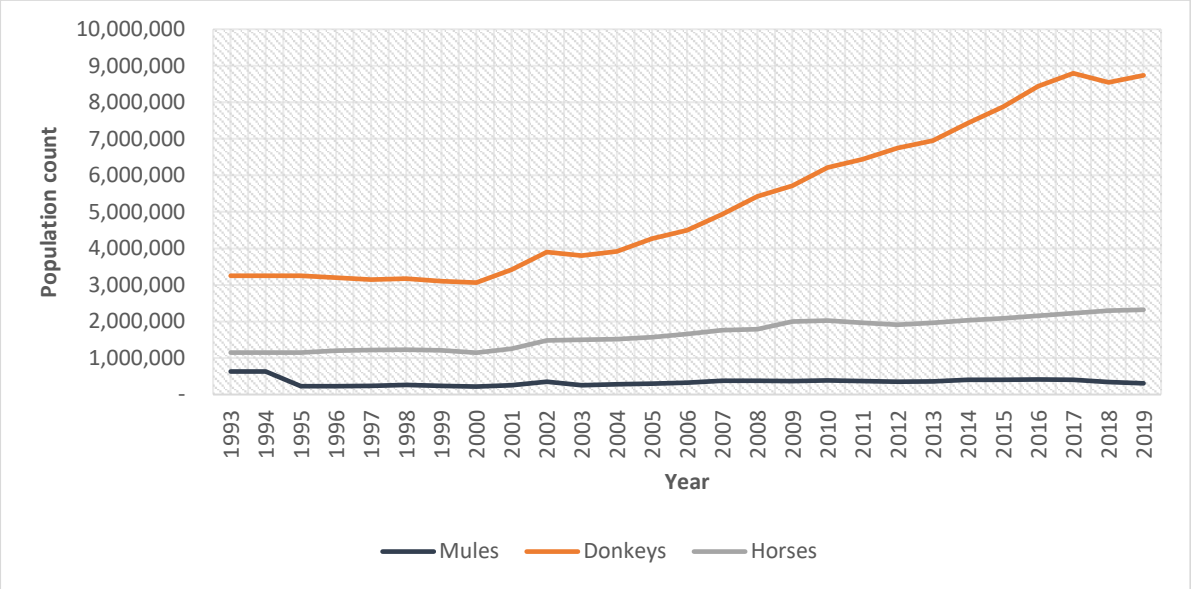

*Figure 14. Population counts for donkeys, horses and mules in Ethiopia, between 1993 and 2019.Source: FAOSTAT. For both **donkeys and horses**: 1993-1997 - FAO estimate; 1998-2002 – official data; 2003 – FAO estimate; 2004-2016 – official data; 2017-2019 – FAO data based on imputation methodology. **Mules**: 1993-1997 – FAO estimate; 1998-2002 – official data; 2003-2005 – FAO estimate; 2006-2007 – official data; 2008 – unofficial figure; 2009-2016 – official data; 2017-2019 – FAO data based on imputation methodology.*

Ethiopia held its first agricultural census in 2001/2002, reporting 3,962,969 donkeys, 1,504,208 horses and 354,120 mules. The predominant livestock species was poultry (42 million), followed by cattle (41 million), sheep (14 million) and goats (13 million) [128]. In 2010/11 a sample survey was carried out, estimating 6,209,665 donkeys, 2,028,233 horses and 385,374 mules. Approximately 3.8 million donkeys were reported to be used for transportation, 0.83 million for draught and 0.23 million used for other purposes. The survey also collected data on age and sex, purpose, diseases and treatments, births, purchases, sales, slaughters (no data for equids) and deaths, at national and regional level [129].

The Ethiopia Rural Socioeconomic Survey (ERSS) is part of the LSMIS-ISA project, addressing the requirement for household data (and comparable to other LSMS-ISA projects) [36]. The survey questionnaire collects data on livestock ownership, production and utilisation of livestock and livestock by products, including livestock population. Livestock types are categorised as 'large ruminants' (bulls, oxen, cow, steers, heifers, calves), 'small ruminants' (goats, sheep), 'camelids' (camels), 'poultry' (chickens), 'equines' (horses, mules, donkeys) and 'bees' [130]. Of the livestock-owning households in 2015/2016, 38% reported ownership of donkeys, 8.4% horses and 2.4% mules (85.9% cattle, 59.5% poultry, 39.3% sheep and 30.6% goats) [131]. The most recent (fourth) survey wave report has just been published; it reported 84.1% of the nation's livestock-owning households kept cattle, followed by 61.7% poultry, 40.4% donkeys, 38.9% sheep, 32.2% goats, 10.4% bees, 8.1% horses, 1.7% camels and 1.5% mules. These data were also collected by region, and gender of head

of household. Livestock acquisition data were also collected, specifically births on holding, purchases, gifts, given away, losses, live sales and slaughters [132].

The Ethiopian government suspended donkey slaughterhouses in 2017, recognising the socio-economic value of donkeys [133]. The LSMS-ISA survey reported 1.9% of livestock-owning households losing any donkeys and 1.4% selling live donkeys, but no report of any slaughter [131]. Despite their high numbers and acknowledged contributions to employment, health and status, the economic contribution of donkeys in Ethiopia has been described as 'urgently undervalued', with a lack of evidence for decision-makers. As such, donkeys are excluded from all livestock development programmes and policies in Ethiopia [134].

Ghana

The total equid population was reported to be 17,839 in 2019, of which 14,914 were donkeys [1](Figure 15).

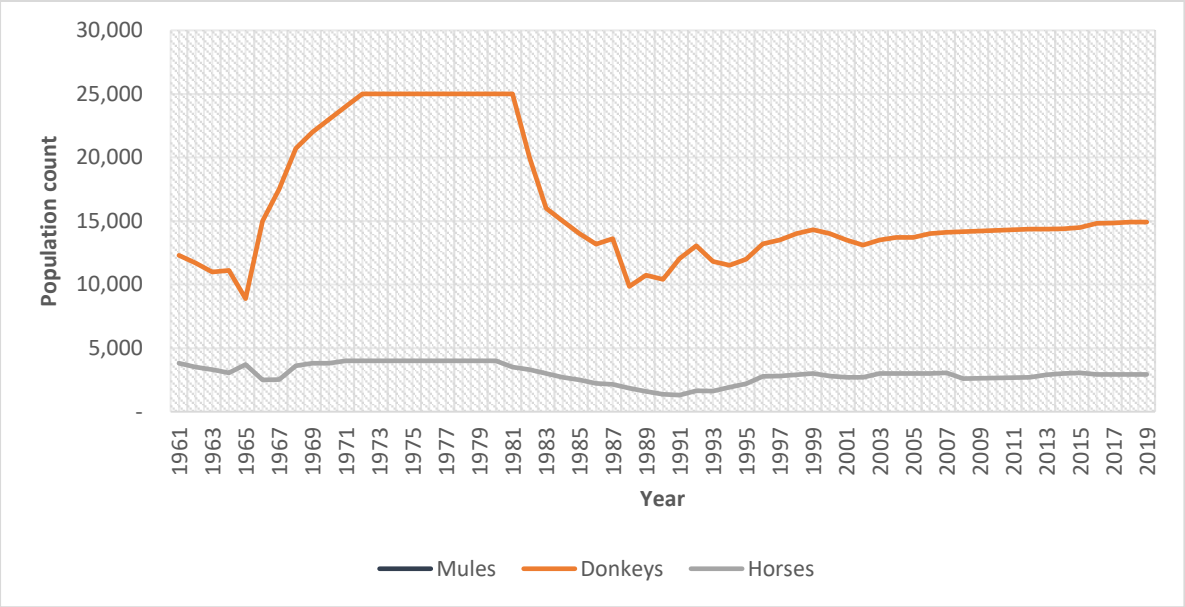

Figure 15. Population counts for donkeys and horses in Ghana, between 1961 and 2019.Source: FAOSTAT. ***Donkeys*** *1961-1963 FAO estimate; 1964-1965 official data; 1966-1967 FAO estimate; 1968 official data; 1969-1985 FAO estimate; 1986-1994 official data; 1995 FAO estimate; 1996 official data; 1997-2001 FAO estimate; 2002 official data; 2003-2014 FAO estimate; 2015-2019 FAO data based on imputation.* ***Horses*** *same apart from 1967 official data and 2008-2010 official data*

Farming is the principal occupation in northern Ghana with focus on food crops and livestock only kept in a minor capacity for a range of purposes [135]. Donkeys are kept solely for draught purposes, specifically transporting produce as well as people. When ranked in importance, 71% considered donkeys as 'not yet important', followed by 14% who thought they were becoming less important and only 7% regarding them as important and becoming important [136]. The Food and agriculture data network 'CountrySTAT' does not include any equids in their livestock data (only goats, pigs, poultry, cattle and sheep).

Since 2013, the Walewale slaughterhouse in northeast Ghana was reportedly slaughtering donkeys from not only Ghana, but also from Burkina Faso, Mali and Senegal. The Directorate of Veterinary Services issued a directive to ban donkey slaughter in 2017, on realisation of a rapid decline in the donkey population [137], however the trade is active in other regions [138]. A donkey census was

reportedly carried out in 2015, estimating 14,500 animals [138], a far higher figure than the 5,624 donkeys reported in the 2017/18 agricultural census (1.1% of total livestock population). The goat population was estimated to be 1.8 million, followed by sheep (1.1 million), cattle (769,804) and pigs (513,412). A total of 334 horses were reported and 195 mules [139]. Having held its previous census over thirty year prior, the Ghanaian government have acknowledged the lack of timely and accurate data and the subsequent restrictions on effective intervention programmes [139].

Guatemala

In Guatemala there were reported to be 182,437 equids in 2019, consisting of 133,448 horses, 38,959 mules and 10,031 donkeys in 2019 [1](Figure 16).

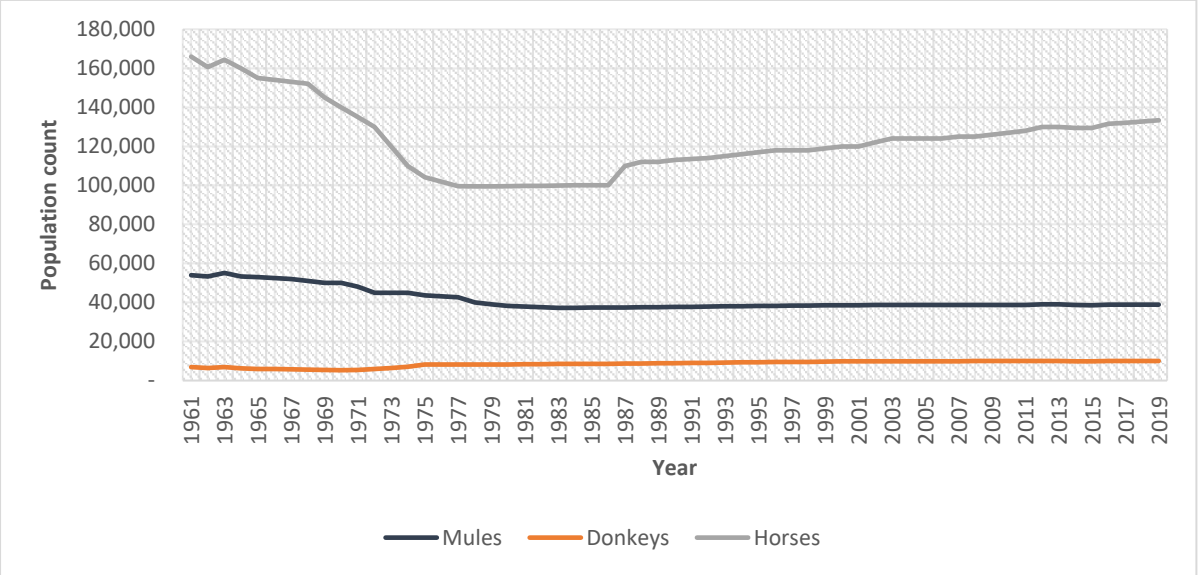

Figure 16. Population counts for donkeys, horses and mules in Guatemala, between 1961 and 2019.Source: FAOSTAT. ***Donkeys*** *– 1961-1963 official data; 1964-1965 unofficial figure; 1966-1974 FAO estimate; 1975-1977 official data; 1978-1980 FAO estimate; 1981 official data; 1982-2014 FAO estimate; 2015-2019 FAO data based on imputation.* ***Horses*** *– 1961-1963 official data; 1964-1965 unofficial figure; 1966-1974 FAO estimate; 1975-1977 official data; 1978-1980 FAO estimate; 1981 official data; 1982-2014 FAO estimate; 2015-2019 FAO data based on imputation.* ***Mules*** *– 1961-1963 official data; 1964-1965 unofficial figure; 1966-1974 FAO estimate; 1975-1977 official data; 1978-1979 FAO estimate; 1980-1983 official data; 1984-2014 FAO estimate; 2015-2019 FAO data based on imputation.*

The most recent agricultural census was conducted in 2003; a total of 21 million chickens were enumerated, followed by 1,627,522 cattle, 419,170 pigs, 313,504 sheep, 160,813 horses, 50,152 goats, 47,624 mules, 27,178 camelids (vicuñas, guanacos, alpacas and llamas enumerated separately), 10,238 donkeys and 1,948 buffalo [94]. The full report includes donkeys, horses and mules but is written in Spanish so detail has not been studied [140]. A higher population estimate of 228,000 equids has been described for 2018 [141].

Equids provide transportation for coffee, corn and vegetable crops, contributing economically to low-income communities [142]. The United States Agency for International Development (USAID) created an initiative in 2010, to reduce malnutrition and poverty in Guatemala, with specific focus on the Western Highlands where these issues are most prevalent [143]. A recent study in the Western Highlands observed 77.8% of households kept poultry, 36.3% reared pigs, 9.8% had cows, and 9.2% owned small ruminants [144].

Honduras

The total equid population in 2019 was reportedly 274,786 in 2019, with 181,267 horses, 70,190 mules and 23,329 donkeys [1](Figure 17).

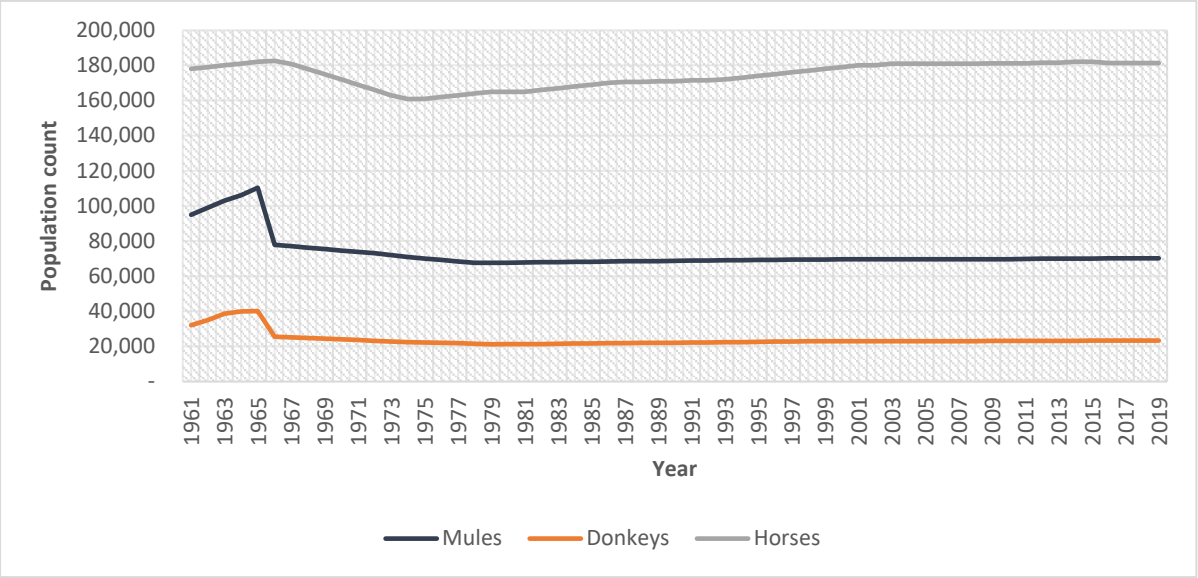

Figure 17. Population counts for donkeys, horses and mules in Honduras, between 1961 and 2019.Source: FAOSTAT. ***Donkeys*** *– 1961-1962 unofficial figure; 1963-1966 official data; 1967-1973 FAO estimate; 1974 official data; 1975-2014 FAO estimate; 2015-2019 FAO data based on imputation.* ***Horses*** *– 1961-1965 FAO estimate; 1966 official data; 1967-1973 FAO estimate; 1974 official data; 1975-2015 FAO estimate; 2015-2019 FAO data based on imputation.* ***Mules*** *– 1961-1962 unofficial figure; 1963-1966 official data; 1967-1973 FAO estimate; 1974official data; 1975-2014 FAO estimate; 2015-2019 FAO data based on imputation.*

Honduras last held a full agricultural census in 1993, reporting 11.6 million poultry, 2 million cattle, 479,434 pigs, 232,492 horses, 73,784 mules, 27,259 donkeys, 27,077 goats and 13,145 sheep [94]. An agricultural census was intended for 2021 [94] but the planning was suspended due to the COVID-19 pandemic [145].

Equids predominantly transport people and products between markets in Honduras [146] as well as transporting children to school [147]. A partnership between World Horse Welfare and Equinos de Honduras (EQUHS) is working to improve service provision to equid owners and furthering the provision of equine welfare training within the veterinary curriculum [148].

India

A livestock census was carried out for India in 2019, reporting the total population of horses, ponies, mules and donkeys to be 0.55 million, having decreased by 51.74% since the previous livestock census in 2012 [149](Table 3).

Table 3. Livestock Population census counts (in million) for horses & ponies, mules and donkeys in rural and urban India, in 2012 and 2019 and percentage change between these years [149]

Species	**Population 2012**			**Population 2019**			**% Change**		
	Rural	**Urban**	**Total**	**Rural**	**Urban**	**Total**	**Rural**	**Urban**	**Total**
Horses & ponies	0.56	0.06	0.62	0.30	0.04	0.34	-46.04	-37.68	-45.22
Mules	0.18	0.01	0.20	0.08	0.01	0.08	-58.09	-43.63	-57.09
Donkeys	0.27	0.05	0.32	0.10	0.02	0.12	-60.99	-62.48	-61.23
Total	1.01	0.13	**1.14**	0.48	0.07	**0.54**	-52.16	-48.39	**-51.74**

This total equid figure is slightly lower than that reported by FAO in 2019, around 0.62 million (342,226 horses, 194,344 donkeys, 84,261 mules) [1](Figure 18). To put this in the context of India's other livestock species, the poultry population was 851 million in 2019, total bovine (cattle and buffalo) population was 302 million, followed by 148 million goats, 74 million sheep, 9 million pigs [150].

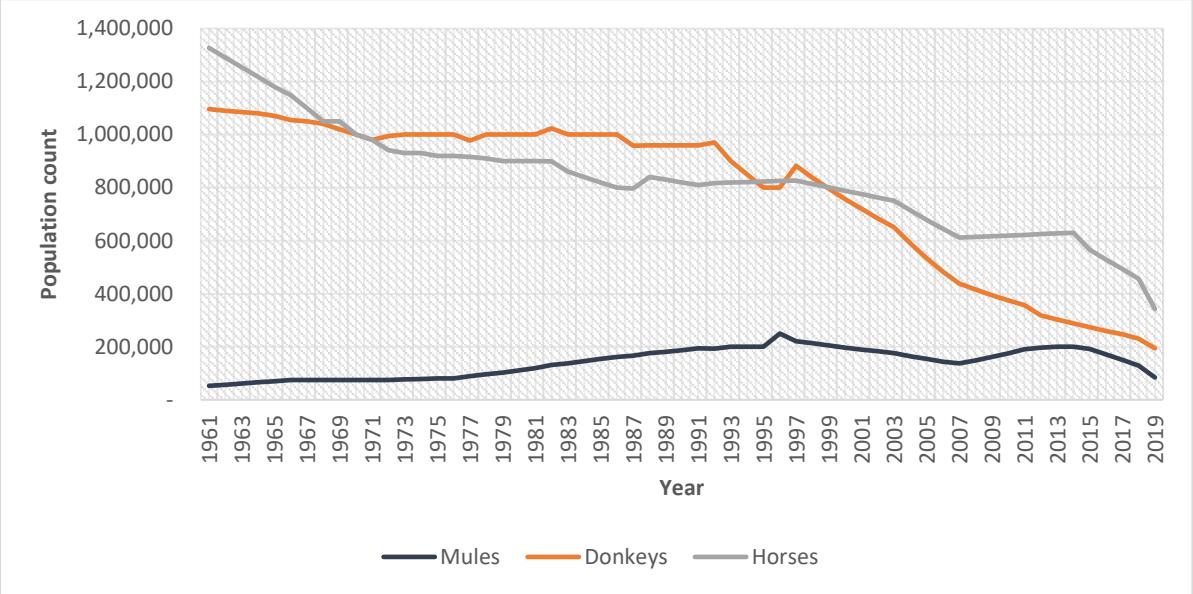

Figure 18. Population counts for donkeys, horses and mules in India, between 1961 and 2019.Source: FAOSTAT. ***Donkeys****: 1961 – Official data; 1962-1965 – FAO estimate; 1966 – Official data; 1967-1971 – FAO estimate; 1972 – Official data; 1973-1976 – FAO estimate; 1977 – Official data; 1978-1981 – FAO estimate; 1982 – Official data; 1983-1986 – Unofficial figure; 1987 – Official data; 1988-1991 – Unofficial figure; 1992 – Official data; 1993-1996 – FAO estimate; 1997-2007 – Official data; 2008-2011 – Unofficial figure; 2012 – Official data; 2013-2017 – FAO estimate; 2018-2019 – FAO data based on imputation methodology.*
Horses*: 1961 – Official data; 1962-1965 – FAO estimate; 1966 – Official data; 1967-1971 – FAO estimate; 1972 – Official data; 1973-1976 – FAO estimate; 1977 – Official data; 1978-1981 – FAO estimate; 1982 – Official data; 1983-1986 – FAO estimate; 1987 – Official data; 1988-1991 – FAO estimate; 1992 – Official data; 1993-1996 – FAO estimate; 1997-2007 – Official data; 2008-2011 – Unofficial figure; 2012 – Official figure; 2013-2014 – FAO estimate; 2015-2018 – FAO data based on imputation methodology; 2019 – official data.*
Mules*: 1961 – Official data; 1962-1965 – FAO estimate; 1966 – Official data; 1967-1971 – Unofficial figure; 1972 – Official data; 1973-1976 – Unofficial figure; 1977 – Official data; 1978-1981 – Unofficial figure; 1982 – Official data; 1983-1986 – Unofficial figure; 1987 – Official data; 1988-1991 – Unofficial figure; 1992 – Official; 1993-1996 – FAO estimate; 1997-2007 – Official data; 2008-2011 – Unofficial figure; 2012 – Official data; 2013-2014 – FAO estimate; 2015-2018 – FAO data based on imputation methodology; 2019 – official data.*

Most equids in India are involved in supporting livelihoods in rural communities and make direct (transportation of bricks and people in brick kilns) and indirect (transportation of produce and people to markets, amongst other transportation services) economic contributions [13].

The donkey population in India reduced drastically in the inter-censal period between 2012 and 2019, by more than 61 percent [151](Figure 19). This reduction is considered to be associated with donkeys being used less for short-distance transportation in India's more remote parts, but there is concern that the decline in the donkey population could be attributed to the donkey skin trade [152], with a reported one hundred Indian export companies trading in donkey skins [153]. Regardless of the skin trade, donkeys are often injured by traffic and it is rare for donkeys to survive beyond four years of age [154].

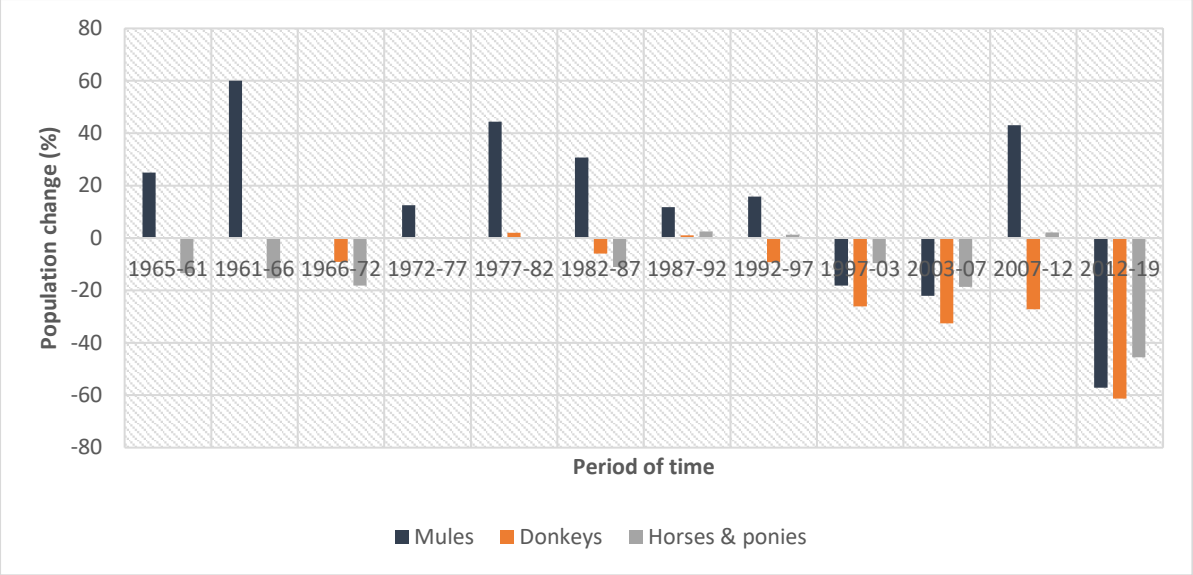

Figure 19. Percentage change in population numbers (in millions) of donkeys, horses & ponies, and mules for all India, for four/five-year periods between 1956 and 2019

In addition to publishing the national livestock census, a 'Basic Animal Husbandry Statistics' report was also published in 2019, presenting livestock population and production estimates, 'useful for policy makers, researchers, government agencies and other stakeholders globally' [155]. The report, based on an Integrated Sample Survey and statistics from the Central Statistics Office, included detailed tabulated population data from 1956 until 2019, including disaggregated figures for mules, donkeys and horses (Table 4)(Figure 20).

Table 4. Livestock population numbers for all India, from 1956 to 2019.Excerpt from Livestock & Poultry Population during 1956 to 2019 – All India, Table 43. [155]

Species	1956	1961	1966	1972	1977	1982	1987	1992	1997	2003	2007	2012	2019
Mules	0.04	0.05	0.08	0.08	0.09	0.13	0.17	0.19	0.22	0.18	0.14	0.20	0.08
Donkeys	1.10	1.10	1.10	1.00	1.00	1.02	0.96	0.97	0.88	0.65	0.44	0.32	0.12
Horses & ponies	1.50	1.30	1.10	0.90	0.90	0.90	0.80	0.82	0.83	0.75	0.61	0.63	0.34
Total livestock	306.60	335.40	344.10	353.60	369.00	419.59	445.29	470.86	485.39	485.00	529.70	512.06	535.82

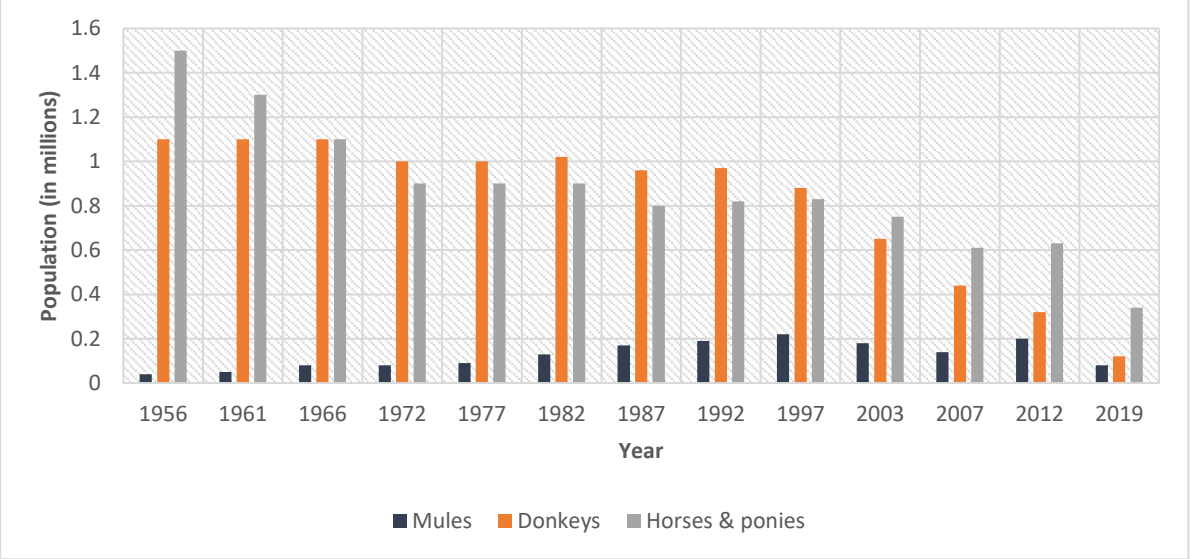

Figure 20. Population numbers (in millions) of donkeys, horses & ponies, and mules for all India, from 1956 to 2019.Source: FAOSTAT data presented in Department of Animal Husbandry & Dairying India, 2019.

Similar to the livestock census' presentation of percentage change for livestock populations between 2012 and 2019, the Basic Animal Husbandry Statistics report presented population data percentage changes for five-year periods between 1956 and 2019, including for all equids (Table 5).

Table 5. Percentage change of population numbers for all India, from 1956 to 2019.Excerpt from Percentage change of Livestock & Poultry Population during 1956 to 2019 – All India, Table 44. [155]

Species	1956-61	1961-66	1966-72	1972-77	1977-82	1982-87	1987-92	1992-97	1997-03	2003-07	2007-12	2012-19
Mules	**25.00**	**60.00**	**0.00**	**12.50**	**44.44**	**30.77**	**11.76**	**15.79**	**-18.18**	**-22.10**	**43.07**	**-57.09**
Donkeys	**0.00**	**0.00**	**-9.09**	**0.00**	**2.00**	**-5.88**	**1.04**	**-9.28**	**-26.14**	**-32.62**	**-27.17**	**-61.23**
Horses & ponies	**-13.33**	**-15.38**	**-18.18**	**0.00**	**0.00**	**-11.11**	**2.50**	**1.22**	**-9.64**	**-18.60**	**2.12**	**-45.58**
Total livestock	**9.39**	**2.59**	**2.76**	**4.36**	**13.71**	**6.13**	**5.74**	**3.09**	**-0.08**	**9.22**	**-3.33**	**4.64**

The livestock census collected population data at state level (although some villages and urban wards were excluded in some states due to administrative reasons). The states with the highest donkey populations in 2019 ranged from 5,000 in each of Himachal Pradesh and Andhra Pradesh, to around 23,000 in Rajasthan [151](Figure 21).

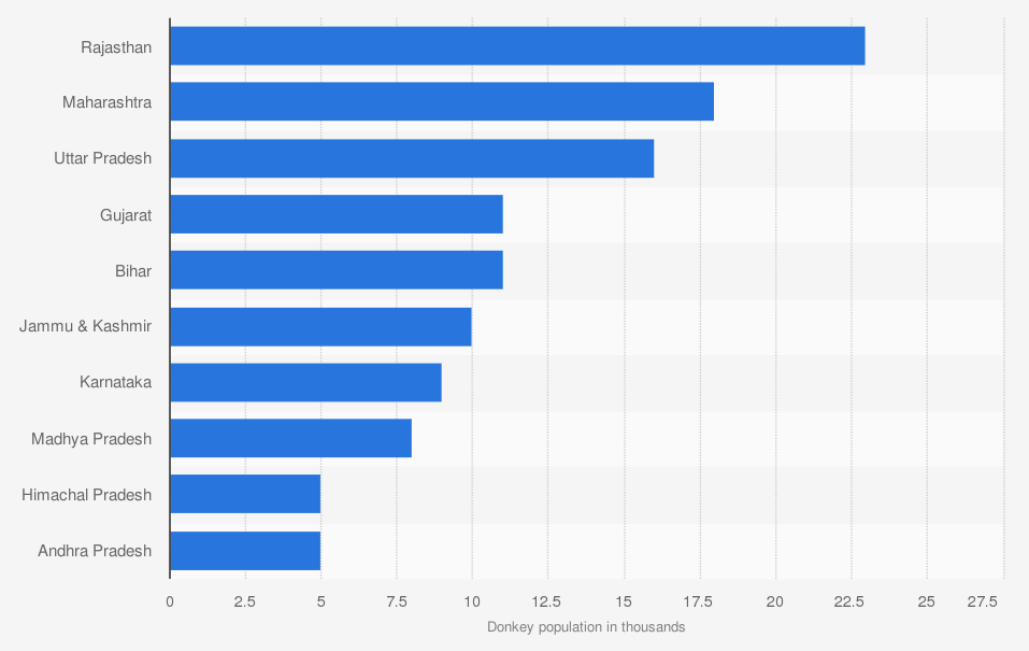

Figure 21. Indian states with the highest number of donkeys in 2019 (shown in thousands) [151]

Husbandry statistics were presented in the Basic Animal Husbandry Statistics report. The value of live exports of horses, asses, mules and hinnies has grown greatly since 2017-18, from 17,739,715 INR (~£182,047) to 47,970,155 INR (£492,276) in 2018-19. There has also been an increase in the value of export of raw hides and skins of bovine (including buffalo) or equines (fresh, salted, dried, limed, pickled, or other) from 14,724,126 INR (£151,208) to 15,186,251 INR (£155,954)[155].

Looking at import data, there was a reduction in the import value of live horses, asses, mules and hinnies between the same time period; 197,868,203 INR (£2,030,638) to 179,212,753 INR (£1,839,185). Import of raw hides and skins of bovines (including buffalo) or equines reduced in value from 1,920,736,170 INR (£19,724,152) to 1,531,680,055 INR (£15,728,912) and tanned/crust hides and skins of bovines (including buffalo) or equines without hair increased slightly from 13,905,422,364 INR (£142,814,966) to 13,942,098,816 INR (£143,191,650)[155].

The Department of Animal Husbandry & Dairying India presented species-wise world livestock population data (sourced from FAOSTAT) from 2011-2017, including horses, asses and mules and indicated all are remaining stable globally. However, when moving to present region-wise (continent) livestock population data, there is no data on any equid species, only listing cattle, buffalo, sheep, goats and pigs [155]. The livestock population in the most recent census was almost 536.76 million (an increase of 4.8% since the previous census in 2012), made up in the most part by cattle, buffalo and goats [149]. Despite their vital role as working livestock, donkey population numbers are comparatively low, making up less than 0.23% of the total livestock population (Figure 22).

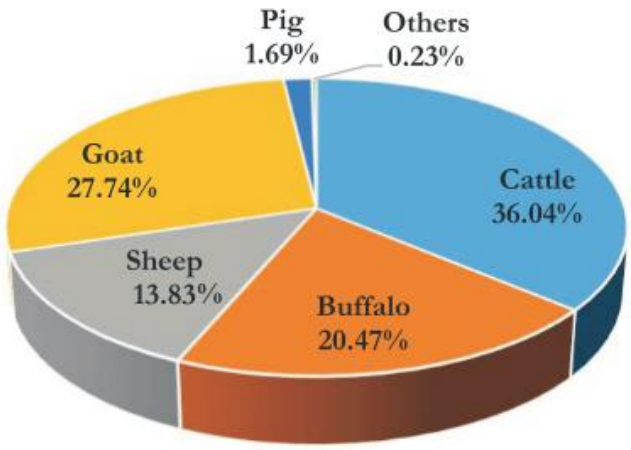

Figure 22. Livestock population 2019 showing share of major species.'Others' includes mithuns, yak, horses, ponies, mules, donkeys and camels [149].

A 2010 study described the Indian equid population to be around 20 million but there is no citation for where this figure was sourced [156].

Kenya

The donkey population of Kenya was reported to be 1.9 million in 2019 [1]. There are no figures given to FAO for the donkey population (horses are reported, mules are not reported) (Figure 23). No information was available at the OIE interface [103].

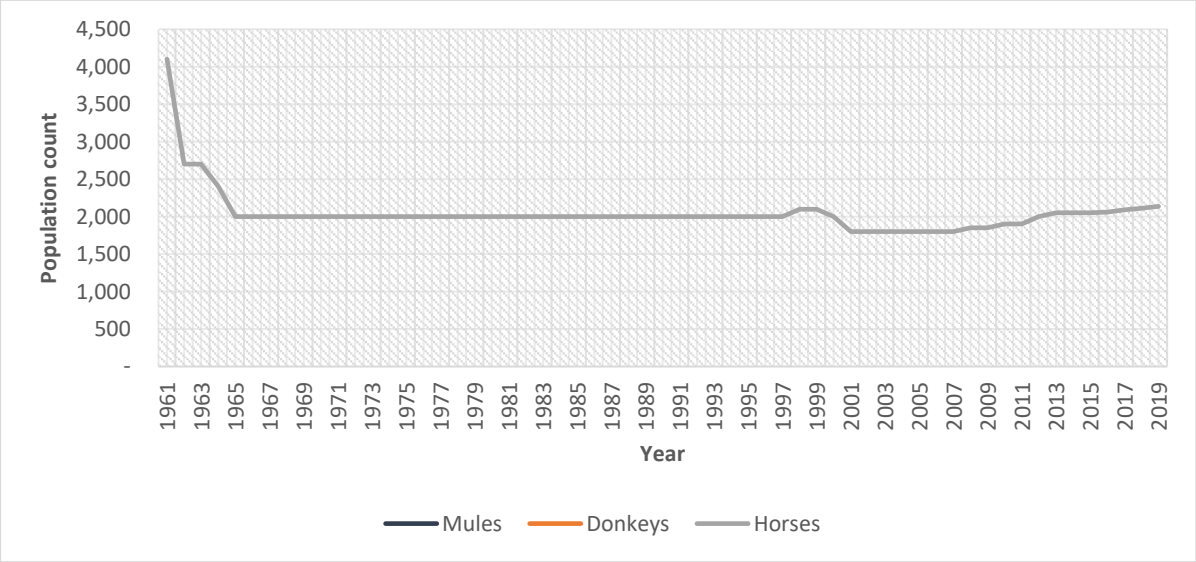

Figure 23. Population counts for horses in Kenya, between 1961 and 2019.Source: FAOSTAT. ***Horses*** *1961-1964 official data;1965-2014 FAO estimate;2015-2019 FAO based on imputation*

The most recent livestock survey was part of the 2019 Kenya Population and Housing Census (PHC), and reported 1,176,374 donkeys. Horses were not included. The predominant livestock species were indigenous chickens (30 million), followed by goats (28 million), sheep (19 million), indigenous cattle (13 million), camels (4.6 million) and exotic dairy cattle (2.2 million). Of the 6.3 million farming households, just over half a million reared donkeys. Livestock populations were reported at county and sub-county levels [157].

The previous Kenya PHC of 2009, reported 1.8 million donkeys [158]. Livestock populations, including donkeys, are reported at district level. The predominant livestock species were goats (27.7 million), followed by cattle (17.5 million), sheep (17.1 million) and camels (2.9 million) [158]. Kenya last conducted an agriculture census in 1977-79 [94].

In Kenya, donkeys are kept for transportation in rural and urban areas [159]. They provide income and assist women in particular with household chores, and as such are often considered to be the most important livestock species to women [160]. They are also considered food animals [161], legalised in 1999 [162], and considered a delicacy in the Kenyan Turkana community [163].

The donkey skin trade is posing a real challenge to the donkey population in Kenya, with theft and slaughter to provide skin and meat [17][23]. It is contributing to the threat to the African, and global, donkey population [164] and of course is a serious welfare concern [159]. A recent study revealed the rate of donkey decline was five-fold higher than its growth rate, and indicated that there would be no donkeys remaining in Kenya beyond 2022 [164].

The majority of participants (70.9%) in a recent study into the perceptions of the donkey hide trade in Kenya reported the hide trade to have been operational for longer than two years in their community and approximately a third of participants reported a reduction in their donkey herd, while a third reported an increase, and a third had seen no change [24]. There was general support for a ban or management of the hide trade, with the overall view of regulations and legislation being insufficient [24]. Despite their importance in contributing to livelihoods in Kenya, donkeys have historically been slaughtered for meat in Kenya, and many donkeys are smuggled from Ethiopia and Somalia for slaughter [165].

The Kenyan government conveyed concern about the high slaughter rate (estimation of 378,000 donkeys per annum) [17] while there were four operational donkey abattoirs and an estimation that the donkey population could be less than one million [166]. In 2020, the government introduced a directive forcing the donkey abattoirs to close, realising the donkey population, vital to so many, required due protection [167].

Kyrgyzstan

The total equid population in 2019 was reported to be 551,551, with 28,441 donkeys [1](Figure 24). Although this is a relatively small population, compared to many other country's populations, around seventy percent of Kyrgyzstan's population reside in rural parts and are reliant on donkeys for draught and transportation [17].

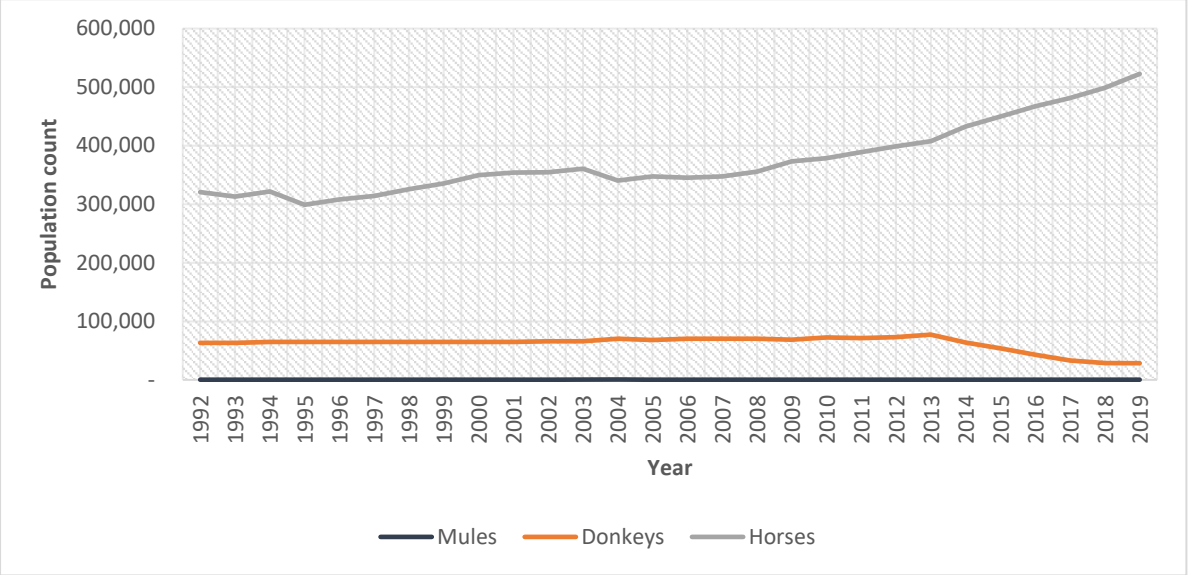

Figure 24. Population counts for donkeys, horses and mules in Kyrgyzstan, between 1992 and 2019.Source: FAOSTAT. ***Donkeys*** *– 1992-2008 FAO estimate; 2009-2019 official data.* ***Horses*** *- 1992-2019 official data.* ***Mules*** *1992-2002 FAO estimate;2003-2005 unofficial figure; 2006-2014 FAO estimate; 2015-2019 FAO data based on imputation.*

The national donkey population has experienced a 60% reduction between 2010 and 2018 [1], leaving communities without the livelihoods that donkeys so vitally contribute to [17]. There appears to be a lack of regard by the Environmental Protection Agency for the dwindling donkey population, despite the unregulated import of donkeys from Tajikistan and the associated risk of disease transmission [168].

While agriculture is of real importance to the Kyrgyzstan economy, providing social security to a significant proportion of the population, productivity has been slow since political instability around 2005 [169].

Kyrgyzstan carried out an agricultural census in 2002, reporting 361,141 horses and 48,561 mules and asses (aggregate). The predominant livestock populations reported were chickens (4.7 million), sheep (3 million), cattle (1 million) and goats (0.9 million). The census presented national and regional data [170]. In 2018, the Kyrgyzstan government estimated its donkey population to have been 770,000 in 2012 and reduced to 33,000 by the end of 2017. It reported the exportation of 17,000 donkeys [168].

It is thought that the growth in the horse population since the beginning of the century is associated with changes in Soviet rule; before independence (1991), pastoralism was discouraged, nomadic groups were forced to settle [171] and animal numbers restricted [172]. After this time, the horse population increased as vehicles could not be maintained without subsidised parts [173].

Today equids are involved in agriculture and transportation, and provide milk, meat and hair [174]. The National Statistical Committee reported the horse population to be 522,611 in 2019 [175]. Other livestock species numbers for the same period were 6.2 million poultry, 6.2 million sheep and goats, 1.6 cattle ruminants and 34,750 pigs [176]. Nomadism underwent a revival post-independence [177], as did horsemanship, resulting in the trend of a growing horse population [172].

Malawi

The total equid population was estimated to be 6,448 in 2019 (6,376 donkeys, 72 horses) [1](Figure 25). The 2006/07 agriculture and livestock census reported 14,191 donkeys (a far greater figure than the 2,200 reported by FAO in 2007).

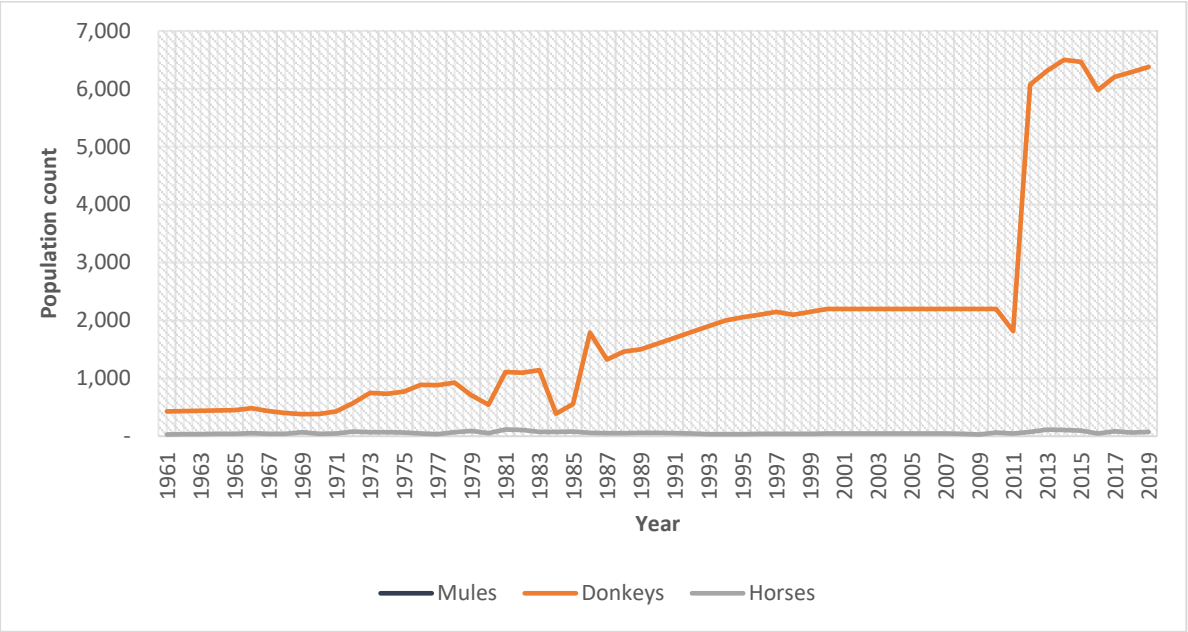

Figure 25. Population counts for donkeys and horses in Malawi, between 1961 and 2019.Source: FAOSTAT. ***Donkeys*** *– 1961-1965 FAO estimate; 1966-1967 official data; 1968 FAO estimate; 1969-1988 official data; 1989-1994 FAO estimate; 1995 official data; 1996-2010 FAO estimate; 2011-2013 official data; 2014 FAO estimate; 2015-2019 FAO data based on imputation.* ***Horses*** *– 1961-1965 FAO estimate; 1966-1987 official data; 1988-1994 FAO estimate; 1995official data; 1996-2008 FAO estimate; 2009-2018 official data; 2019 FAO data based on imputation.*

The census reported 7.5 million chickens, 2.6 million goats, 884,132 cattle, 792,364 pigs and 76,613 sheep. It was reported that six percent of villages used donkeys or oxen to transport farm produce to market [178]. The census collected data at national, regional and district levels from a randomised sample of 25,000 small holder farming households across the country [178].

The Malawi Integrated Household Survey (HIS) Program is carried out by the Malawi National Statistics Office and is extended technical and financial assistance by the LSMS-ISA project. The fourth survey in 2016/2017 sampled 12,480 households over one year [36]. The questionnaire collected data on donkeys/mules/hoses grouped together [179]. In the only final report (2010-2011) there is no mention of equids [180]. In Malawi's Fifth Integrated Household Survey 2019/2020, there was only reference made to 'core livestock', namely cattle, goats, pigs, sheep and chickens [181].

Donkeys were brought into Malawi from Zimbabwe in 1957, are found predominantly in the Central Region of Malawi, and are traditionally used for draught power. The expense of horses means they are reserved for riding and sports [182].

Mali

The FAO figure for total equids in 2019 was 1,728,520 [1](Figure 26).

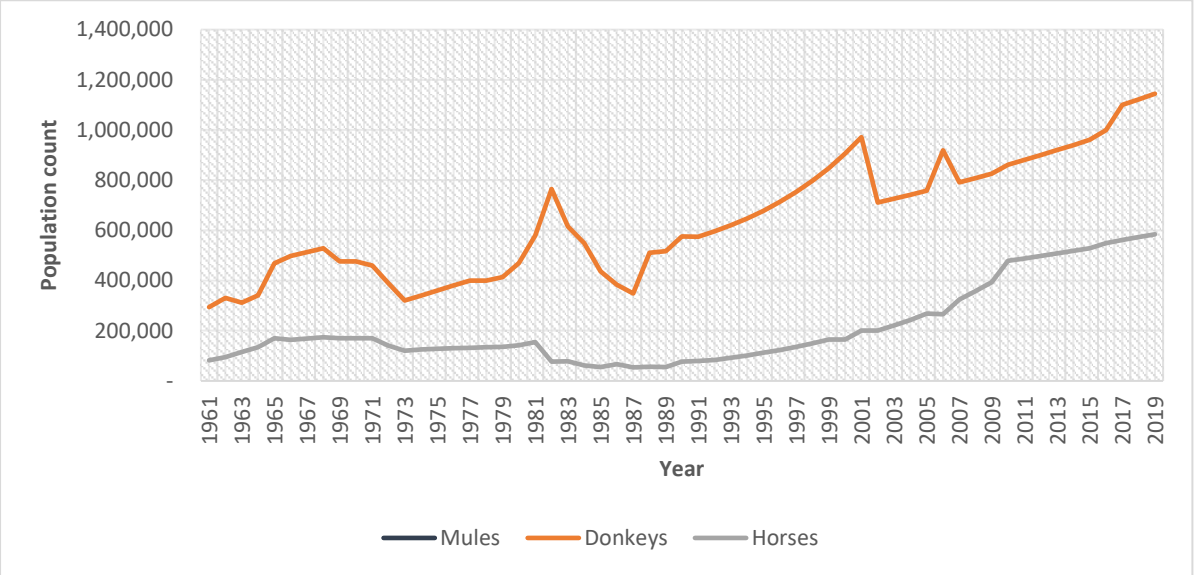

Figure 26. Population counts for donkeys and horses in Mali, between 1961 and 2019.Source: FAOSTAT. ***Donkeys*** *– 1961-1970 official data; 1971-1978 FAO estimate; 1979-2019 official data.* ***Horses*** *– 1961-1970 official data; 1971-1978 FAO estimate; 1979-1999 official data; 2000 FAO estimate; 2001-2019 official data.*

The economy of Mali is dependent on agriculture and agropastoralism [183], and the agricultural sector is highly reliant upon donkeys, mostly for traction and to a lesser degree, ploughing [184]. As Mali has a large donkey population [17] it is one of several sSA countries targeted by the donkey skin trade and there are real concerns about populations being wiped out completely, with reports of the sale of 400 donkeys weekly [185]. Donkey slaughter was banned in 2016 [17].

The most recent agriculture census was implemented in 2005, reporting 8.2 million goats, 7.2 million sheep, 7.1 million chickens, 6.8 million cattle, 1.5 million guinea fowl, 1.1 million donkeys, 0.6 million camels, 84,600 pigs, 81,240 million other fowls, 73,304 horses and 31,826 turkeys [186]. The figures for donkeys and horses differ significantly to those presented by FAO for this same period (donkeys: 758,184; horses: 267,605) [1]. Cattle and camels are considered the most valuable animals, bringing significant economic security, but poorer households rather keep sheep, goats, donkeys or chickens, with the poorest keeping a single sheep, donkey or poultry [187].

Mali intends to take on sector-wide agricultural development instead of its 'project-oriented' approach, and is committed to the Agriculture Development Policy, an initiative to promote the socio-economic progress of those in both rural and suburban parts, the reduction of rural poverty, and growth in the rural sector's economic contribution [183]. An agriculture census was planned for 2016 but was reported to have been postponed [94].

A multi-topic household panel survey, the Enquête Agricole de Conjoncture Intégrée aux Conditions de Vie des Ménages (EAC-I), is supported by the LSMS-ISA project to improve the capacity for carrying out household surveys in Mali [36]. The project, initiated in 2014-2015, aims to improve the collection methods, quality and timeliness of household agricultural statistics, and is funded by the United States Agency for International Development (USAID) [36].

The household survey collects information on livestock numbers, including for horses and donkeys separately, as well as their purchase value and whether any have been stolen, and if they have been used for draught or transportation and associated earnings [188]. Following on from the first edition

of the Mali LSMS-ISA in 2014, improvements were introduced to the methods of data collection, by use of Computer Assisted Personal Interview (CAPS) and importantly agricultural income was measured [189]. The only reference to equines in the summary report[7] of the main findings was regarding animal treatment methods, with 28% equines being vaccinated, 24% being dewormed and 8% receiving curative treatments. The figures for equine treatments are lower than for large ruminants, small ruminants and poultry species [190].

Mexico

The working equid population in Mexico is large [191] although reliable population figures are considered scarce, and those that have been presented to the FAO by the Mexican Ministry of Agriculture are lacking transparency as to whether they represent all sectors of the population or only agricultural working equids [192]. Mexico has the world's largest equid population, reported to be 12,955,040 in 2019, made up of 3,287,994 mules (also the largest population globally), 3,284,347 donkeys, and 6,382,699 horses [1] (Figure 27). FAO reported 35 million cattle, 18 million pigs and 8 million sheep in Mexico in 2019 [1].

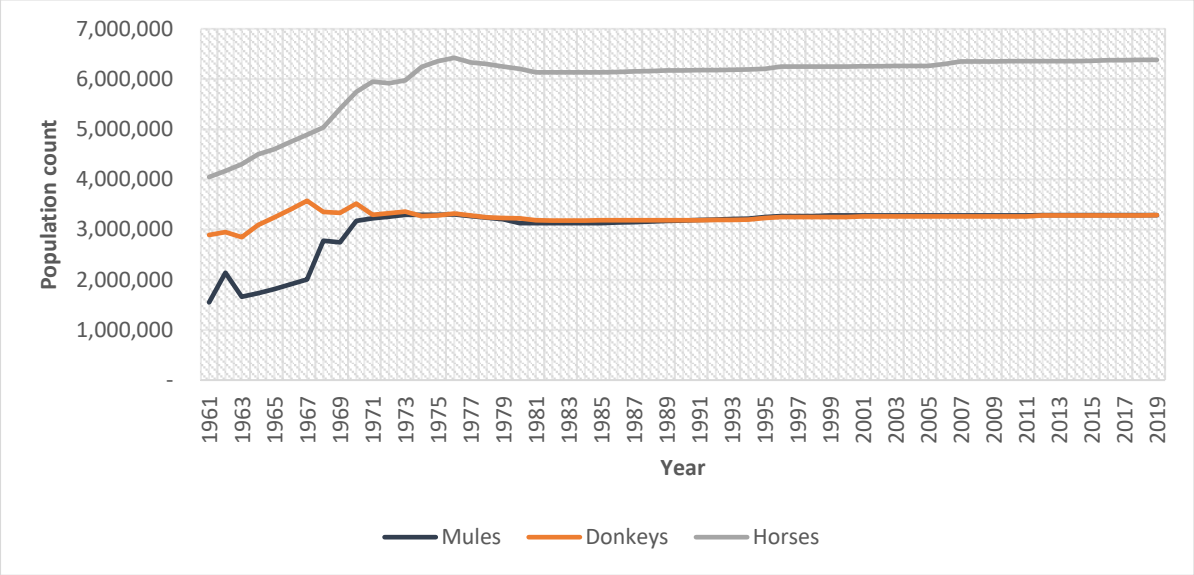

Figure 27. Population counts for donkeys, horses and mules in Mexico, between 1961 and 2019.Source: FAOSTAT. ***Donkeys*** *- 1961-1984 – official data; 1985-2014 – FAO estimate; 2015-2019 – FAO data based on imputation methodology.* ***Horses*** *- 1961-1962 – official data; 1963-1967 – FAO estimate; 1968-1984 – official data; 1985-2014 – FAO estimate; 2015-2019 – FAO data based on imputation methodology.* ***Mules*** *- 1961-1984 – official data; 1985-2014 – FAO estimate; 2015-2019 – FAO data based on imputation methodology.*

The most recent census of Agriculture, Livestock and Forestry was carried out in 2006-2007. Data was collected for mares, mules and donkeys but the questionnaire and accompanying documentation is written in Spanish. The questionnaire also collected data on exportation of animals and farm produce, including destination country [193]. The census, which covered the whole of Mexico, reported 23 million cattle, 9 million pits, 7.3 million sheep, 3.6 million goats, 1,328,524 horses, 581,401 donkeys and 234,009 mules. The statistical unit was production units including land with or without agricultural or forestry use in rural, or with agricultural use in urban parts, and animals kept for agricultural use [77].

[7] Report written in French and was translated using Google Translate.

It was not possible to find a final report detailing results, however a report of the census with methodology and main results[8] made no mention to equid populations, only describing cattle, pig and poultry populations, but did report on types of traction used, stating that 17.1% worked animals (compared to 30.4% used only mechanical and 10.2% used a combination of mechanised and working animals) [194]. The 2017 agriculture census was suspended [94] but a National Agriculture Survey was implemented in 2019, although the questionnaire does not appear to collect any equid data [195].

Mexico's agricultural statistics office (SIAP) experienced significant financial and staffing losses in 2019 and 2020, impacting the quality and extent of official statistics published [196].

Working equids are essential to agriculture as well as rural livelihoods [197], with more than fifty percent of rural households having a donkey [198] and ninety percent of households in the hills of central Mexico depending upon draught power [199]. The mule population is reported to be declining, whilst donkeys are still commonplace [197]. Donkeys are predominantly used as pack animals, mules are mostly used to carry agroforestry loads as well as being ridden, and horses are primarily used for riding [200,201]. Despite this, Mexico has been a longstanding global supplier of horse meat [202].

Mongolia

The total equid population in Mongolia was estimated to be 4,214,858 in 2019, made up almost entirely of horses (4,214,818). The donkey population, although never large like many other countries, has reduced steadily from 1,067 in 1989 to only 40 in 2019 [1](Figure 28).

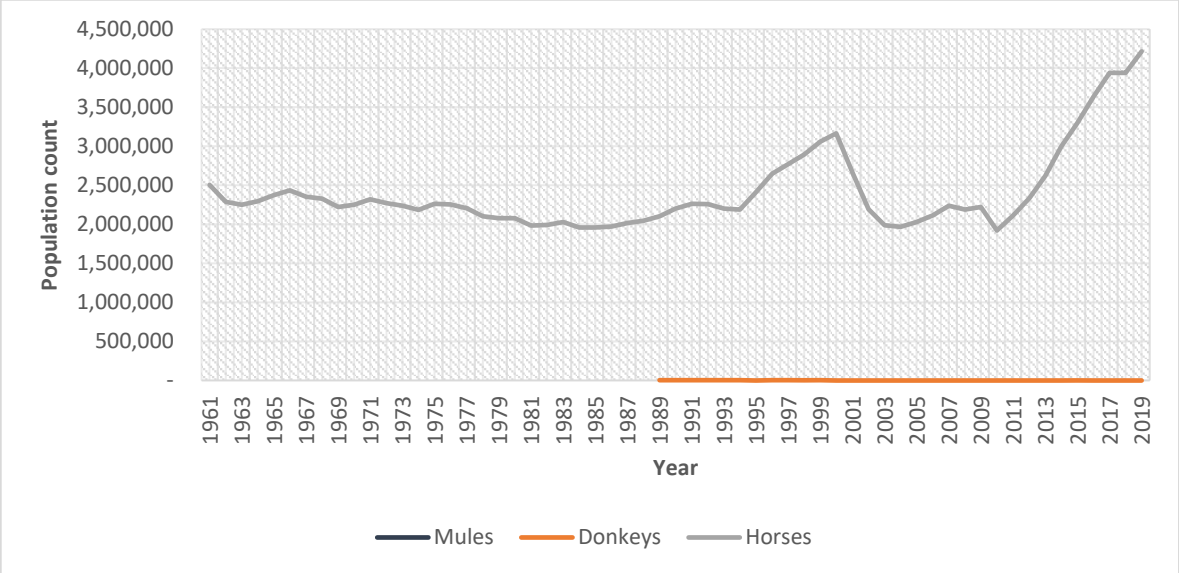

Figure 28. Population counts for donkeys and horses in Mongolia, between 1961 and 2019.Source: FAOSTAT. ***Donkeys*** *– 1961-1988 data not available; 1989-1990 official data; 1991-1994 FAO estimate; 1995-2000 official data; 2001-2005 FAO estimate; 2006-2009 official data; 2010 FAO estimate; 2011 official data; 2012-2014 FAO estimate; 2015-2019 official data.* ***Horses*** *– 1961-2019 official data.*

There are native wild equids in Mongolia, namely the Przewalski's horse and the Mongolian wild ass. There are relatively small groups of Przewalski's horses living in the wild after reintroduction as part of captive breeding programmes, based on 13 founder horses [203]. In 2002, the status of the Mongolian wild ass in the Equid Action Plan of the International Union for Conservation of Nature (IUCN) was classed as vulnerable [204] and is now listed as endangered, due to their drastic decline

[8] Written in Spanish

and anticipated further decline [205]. The total wild ass population has reduced greatly over the past century [204]. In 2003, there was an estimated 18,411 Mongolian khulan (wild ass subspecies) [206], having previously been estimated between 33,367-62,902 in 1997 [207]. A series of khulan population studies were carried out in the 1990s [208–210].

All populations of the wild ass are threatened [211], with poaching a significant risk [212]. A national survey in 2005 indicated that around 2,000 wild asses could be poached annually [213]. Additional threats posed are overgrazing and the competition for water sources [204]. There have been reports of thousands of Mongolian wild donkeys moving to the Inner Mongolia Autonomous Region of China, after drought reduced the available grazing [214].

Mongolia carried out an agricultural census in 2011, reporting 15.9 million goats, 15.6 million sheep, 2.3 million cattle, 2.1 million horses and 0.28 million camels. There is no mention of donkeys. The horse population had increased by 192,600 since the previous year [215]. Data were collected on regional horse prices, regional horse meat prices, and regional horse hide prices. A total of 11,695 horses were used for hair [215]. The next agricultural census is planned for 2022 [94].

Namibia

The total equid population in 2019 was reported to be 204,417, comprised predominantly of donkeys (154,007) and a smaller population of horses (43,631) and mules (6,779) [1](Figure 29).

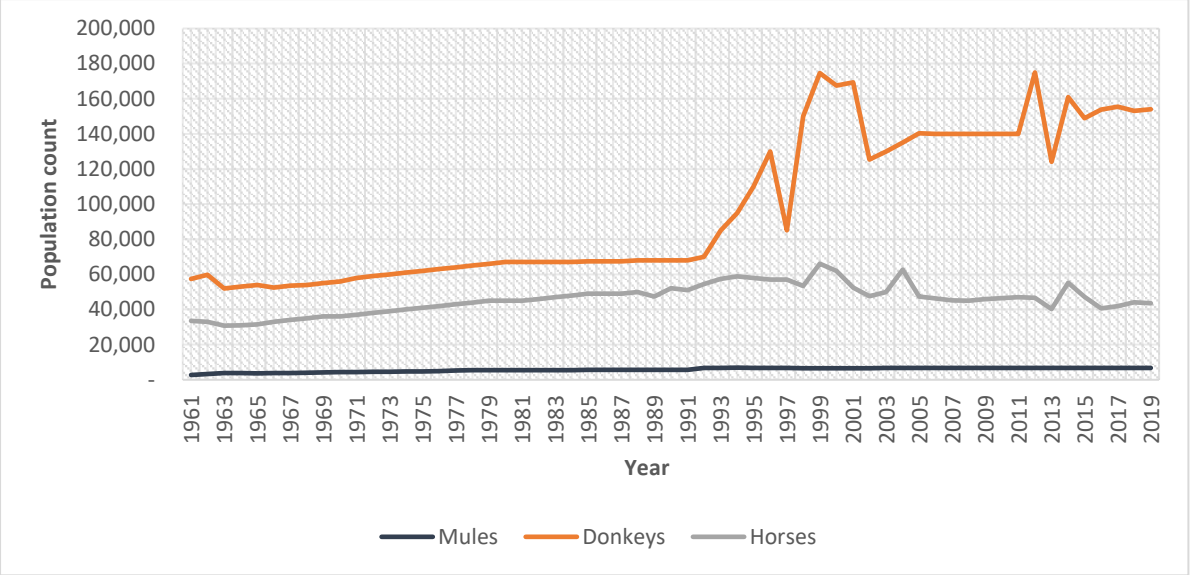

Figure 29. Population counts for donkeys, horses and mules in Namibia, between 1961 and 2019.Source: FAOSTAT. ***Donkeys*** *– 1961-1963 official data; 1964-1991 FAO estimate; 1992 unofficial figure; 1993-1996 FAO estimate; 1997 official data; 1998 FAO estimate; 1999-2002 official data; 2003-2004 FAO estimate; 2005 official data; 2006-2011 FAO estimate; 2012-2015 official data; 2016-2019 FAO data based on imputation.* ***Horses*** *– 1961-1963 official data; 1964-1988 FAO estimate; 1989-2002 official data; 2003 FAO estimate; 2004-2007 official data; 2008-2011 FAO estimate; 2012-2016 official data; 2017-2019 FAO data based on imputation.* ***Mules*** *– 1961-1963 official data; 1964-1991 FAO estimate; 1992 unofficial figure; 1993-2014 FAO estimate; 2015-2019 FAO data based on imputation.*

In Namibia, subsistence farming is the predominant type of agriculture [216]. The most recent agriculture census was carried out in 2013/2014 [217]. Cattle, goats and poultry were the predominant livestock farmed, with pigs and sheep in lesser numbers. Population data were collected for donkeys/mules, and horses, under the heading 'other livestock' [217].

The census reported goats to be the predominant livestock species (1,759,086) followed by cattle (1,140,769), sheep (793,013), donkeys and mules (161,738), pigs (87,783), horses (18,242) and chickens (1,438) [77].

A proposed donkey abattoir in Okahandja (north of Windhoek) reported its hope to slaughter more than 100 donkeys daily; based on an anticipated 300 operational days per annum, the Namibian donkey population would reduce by 30,000 each year [218]. Thankfully, applications were refused for both the Okahandja and a second slaughterhouse in Outjo in 2018, based on the anticipated "serious long-term socio-economic impacts" [17].

In 2011 an estimated 10% of Namibia's horse population was lost to African horse sickness (AHS) [219]. Studies on donkey population figures in Namibia are scarce and present varied estimates [220].

Nicaragua

In 2019 the total equid population was estimated to be 325,173, comprised of horses (268,076), mules (48,016) and donkeys (9,081) [1](Figure 30).

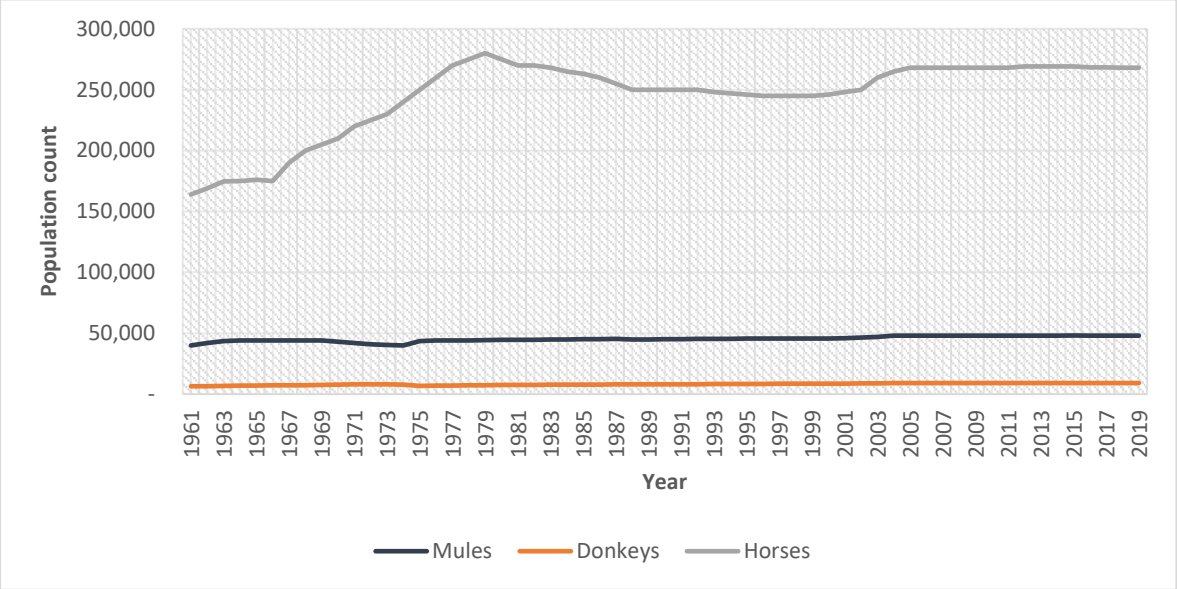

Figure 30. Population counts for donkeys, horses and mules in Nicaragua, between 1961 and 2019.Source: FAOSTAT. ***Donkeys*** *– 1961-1962 FAO estimate; 1963 official data; 1964-1974 FAO estimate; 1975 unofficial figure; 1976-2014 FAO estimate; 2015-2019 FAO data based on imputation.* ***Horses*** *– 1961-1962 FAO estimate; 1963 official data; 1964-1965 FAO estimate; 1966 official data; 1967-1974 FAO estimate; 1975-1981 unofficial figure; 1982-2014 FAO estimate; 2015-2019 FAO data based on imputation.* ***Mules*** *– 1961-1962 FAO estimate; 1963 official data; 1964-1974 FAO estimate; 1975 unofficial figure; 1976-2014 FAO estimate; 2015-2019 FAO data based on imputation.*

Horses are used, especially in low income households [221] in urban areas for transportation of people and products, including in the tourist industry (riding and carriage horses), and in rural parts they are also used for transportation as well as in agriculture, although the numbers working are unknown [222].

In 2011 and agricultural census was conducted, which included the collection of disaggregated data for horses, mules and donkeys. However, the final report[9] presented livestock numbers for only cattle (4.1 million), pigs (418,485), birds (12 million), beehives (26,189) and 'other animals' (614,848) [223].

[9] Report written in Spanish

Niger

The total equid population reported by FAO in 2019 was 2,167,382, of which 1,911,661 were donkeys and 255,721 horses [1](Figure 31).

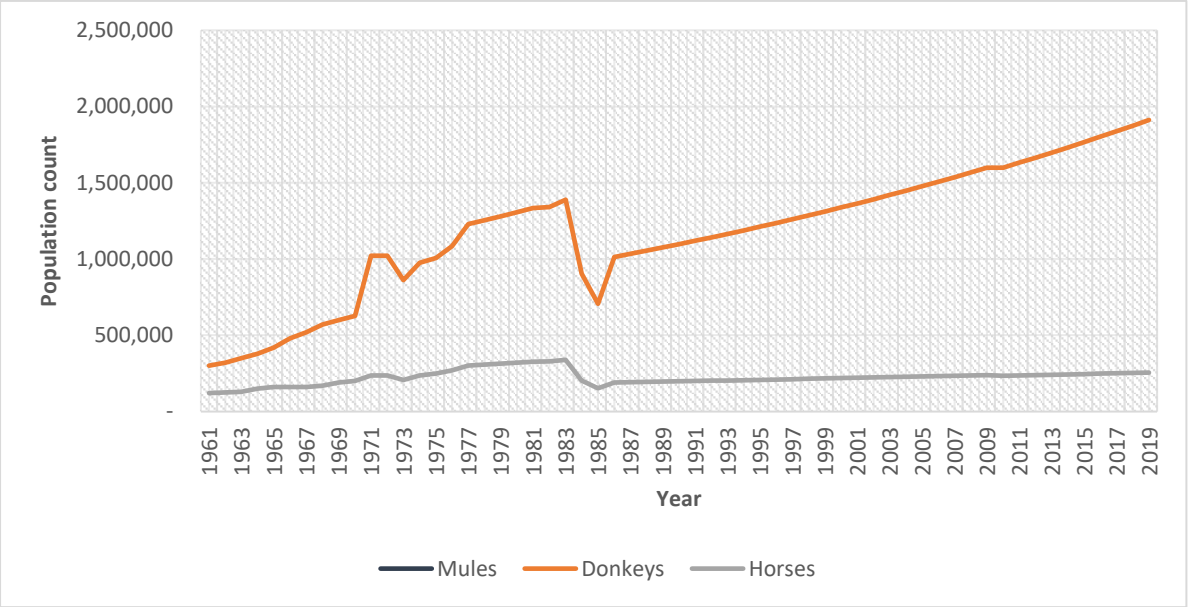

Figure 31. Population counts for donkeys and horses in Niger, between 1961 and 2019.Source: FAO. ***Donkeys*** *– 1961 official data; 1962-1969 FAO estimate; 1970-2019 official data.* ***Horses*** *– 1961-2019 official data.*

Niger is one of the countries being supported by the LSMS-ISA project, to carry out the National Household Living Conditions and Agriculture Survey and to assure the collection of agricultural and livestock data in the future [36]. Implemented in 2011 and 2014 by the Niger Institut National de la Statistique (INS) and supported by the LSMS team in its design and technical assistance, the agriculture survey[10] collected livestock population data, including for horses and donkeys separately [224].

Niger is also being supported by the Global Strategy to improve agricultural and rural statistics (GSARS), an initiative established to improve the capacity for reliable food and agricultural data in LMICs [225]. The livestock statistics requirements of the country were assessed in 2017 and a project was initiated between the GSARS and the Ministry of Agriculture and Livestock, to train livestock experts on livestock statistic methods, assist with the development of questionnaires for livestock production and enumeration, and improving the development of CAPI questionnaires [226].

Between 2004 and 2008 Niger carried out an agricultural census, reporting 11,238,268 goats, 9,192,017 sheep, 7,336,088 cattle, 1,565,420 camels, 1,477,073 donkeys and 230,174 horses [77].

Niger was previously regarded as a substantial trader of donkeys to countries further south [227]. However, in 2016, Niger introduced a ban on the export of donkeys but livestock sellers are believed to be moving into the trade of donkeys due to their sale value increasing from $34 to $145 due to the demand from China, and an estimated 80,000 donkeys were exported in 2016 [228].

[10] Questionnaire written in French

Nigeria

The total equid population of Nigeria was reported to be 1,445,093 in 2019, of which 1,342,609 donkeys and 102,484 horses [1](Figure 32).

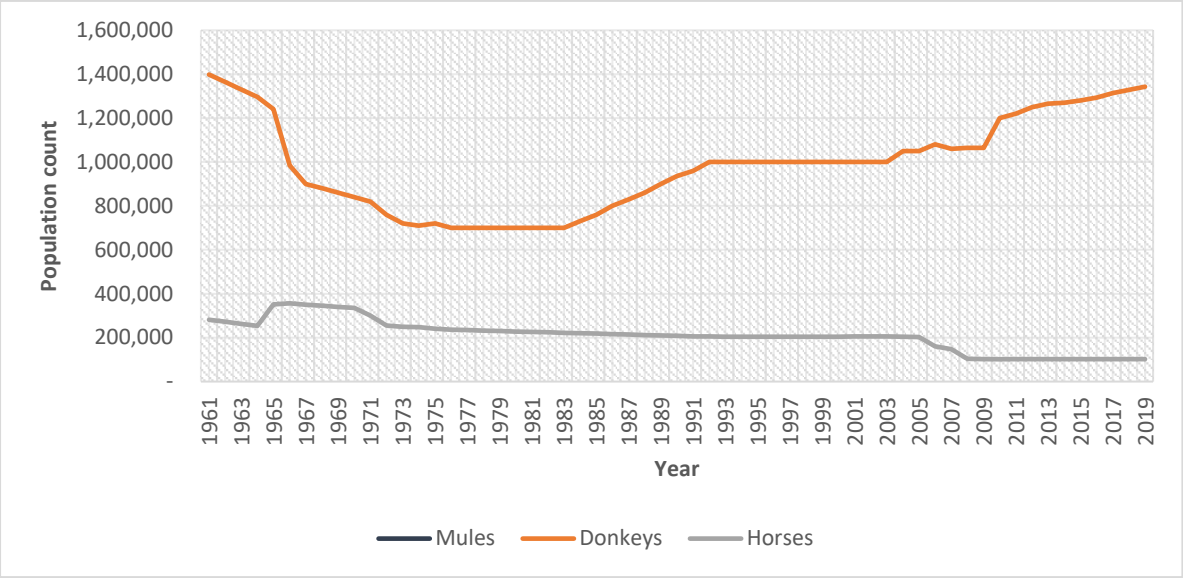

Figure 32. Population counts for donkeys and horses in Nigeria, between 1961 and 2019.Source: FAO. ***Donkeys*** *1961-1963 FAO estimate; 1964-1966 official data; 1967-1989 FAO estimate; 1990 official data; 1991-2014 FAO estimate; 2015-2019 FAO data based on imputation.* ***Horses*** *1961-1963 FAO estimate; 1964-1966 official data; 1967-1989 FAO estimate; 1990 official data; 1991-2003 FAO estimate; 2004-2009 FAO data based on imputation; 2010-2017 official data; 2018 FAO estimate; 2019 FAO data based on imputation*

During the oil boom in the 1970s, the donkey's primary role as a pack animal declined, as vehicles and fuel prices were extremely low and donkeys became associated with being old-fashioned. After a recession in the 1980s, however, vehicle use reduced and the donkey's popularity increased [229]. Throughout the country, donkeys provide transportation of people and resources such as water in rural areas, and assist the Fulani herdsmen when they migrate, and in urban settings, they transport grains and building resources. There is, however, no 'promotion' of donkeys and as such, governmental policy makers, as well as society, devalue donkeys compared to other livestock [230]. Farmers have reported several perceived constraints to donkeys in the agricultural system; low social status, association with poverty, and neglect of donkeys from livestock extension work [230]. Social status could be elevated by promotion of the 'image' of donkeys within donkey farmers' associations, as seen in studies [231] and policy makers are required to properly acknowledge the contribution that donkeys make if social change is to occur [126]. Additionally, negative societal perceptions, often passed through the generations, should be addressed in order to promote the status of donkeys [230].

In Nigeria, the General Household Survey (GHS) is supported by the LSMS-ISA project, to include household agriculture data linked with non-agriculture household welfare and behaviour. The survey is implemented every year, to provide state-level estimates from 22,000 households [36]. The most recent General Household Survey-Panel Agriculture Questionnaire (2018/2019) collected data on 'equines' separately for donkeys and horses (not mules)[232]. In the final survey report (2018/2019) horses, ox, bulls, steers and donkeys were grouped together for purpose of describing 'holdings by size of livestock'. Of livestock-owning households with horses, ox, bull, steer and/or donkeys, 34.2% kept 1-2 animals, 32.9% kept 3-4, 18% kept 5-9 and 15% kept more than 10 [233].

Nigeria has been described as having a "checkered history of census taking" and 'historical problems with data collection' [234]. The last agricultural census was reportedly carried out in 1984 [94],

however, a National Agricultural Sample Census was carried out in 2007, to address the 'weak agricultural data in Nigeria' [235]. The survey questionnaire asked about donkey numbers and horse numbers amongst other livestock species [236]. It was not possible to find a final results report. It would appear that another National Agriculture Sample Survey took place in 2010/2011, also collecting data on donkeys and horses at national and state level. The results reported 65 million goats, 37 million sheep, 18 million cattle and 6 million pigs. The donkey population was reported as 970,610 and the horse population (least reared livestock species) estimated to be 101,509. No figures were presented for number of horses or donkeys slaughtered, but 155,814 donkeys were reported to be born, 102,107 bought and 76,779 donkeys were reported to be sold in the year [237].

A smallholder household survey was conducted by the Consultative Group to Assist the Poor (CGAP) in 2016/2017, in collaboration with the Nigeria National Bureau of Statistics [238]. The purpose of the survey was to establish the interests and activities, as well as the barriers and concerns of smallholders in Nigeria (sample of 3,000 households). Only 1% of the livestock-owning farmers reared donkeys [238].

Data quality and timeliness are both problematic for Nigeria, however, investment in agricultural extension services and political involvement are required in strategies to improve the situation [239].

Pakistan

The total equid population in 2019 was reported to be 5,984,000, with the majority of those donkeys (5,417,000); the third largest donkey population in the world [1](Figure 33).

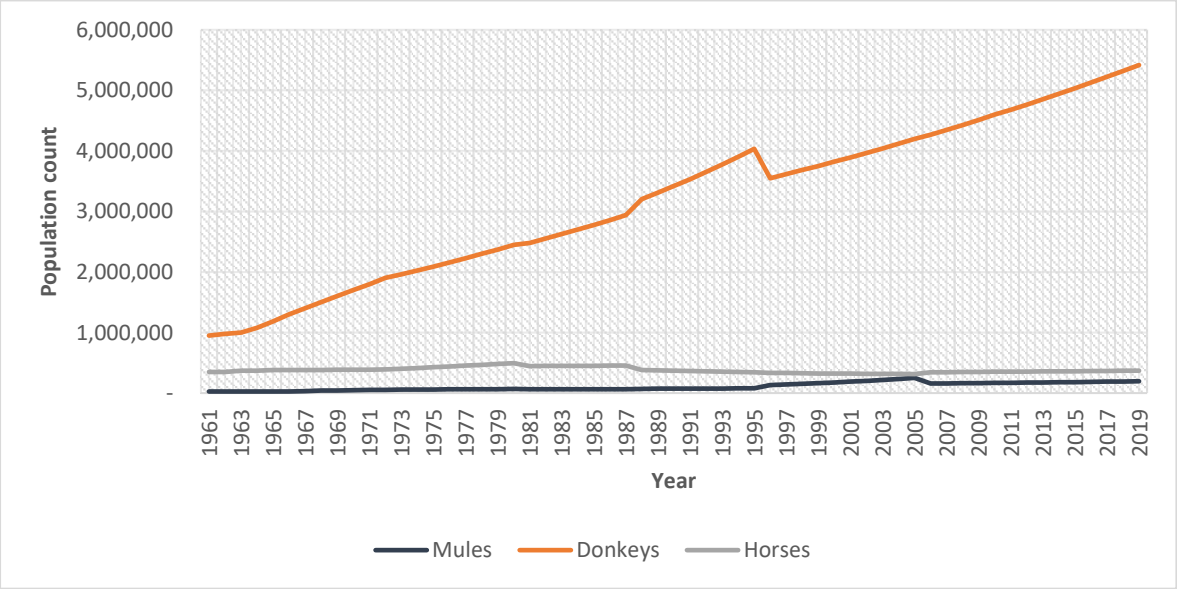

Figure 33. Population counts for donkeys, horses and mules in Pakistan, between 1961 and 2019.Source: FAOSTAT. ***Donkeys****: 1661-1964 – FAO estimate; 1965 – official data; 1966-1971 – FAO estimate; 1972-2019 – official data.* ***Horses****: 1961-1971 – FAO estimate; 1972-2019 – official data.* ***Mules****: 1961-1965 – official data; 1966-1971 – FAO estimate; 1972-2019 – official data.*

An agricultural census was carried out in 2010 but only presented data for goats (45 million), cattle (24 million), buffalo (23 million) and sheep (15 million). The report described draught animals (298,308) but there was no reference to which species were included in this figure [240].

The most recent livestock census was implemented in 2006 [241]. The survey reported a 19.9% increase in the country's donkey population between 1996 and 2006, growing from 3,559,011 to

4,268,472 (the mule population also had grown by 18.1%, from 131,848 to 155,698, and the horse population had remained stable, increasing by 3.1%, from 333,944 to 344,253). As the data demonstrates, donkeys represent the majority of the equids, as well as the animals used for draught (camel population 920,868). Livestock populations were also presented at the provincial level, with more than half (52%) of all donkeys being in the Punjab. The scope of the census included age, sex and breed distribution for cattle, buffalo, sheep and goats. For equids and domestic poultry, however, data was only collected by age [241].

The Pakistan government reported to be focusing on the livestock sector to improve food security, rural socio-economic elevation and overall growth of the economy and reduction in poverty. Estimated livestock populations for 2019-2020 were provided by the Ministry of National Food Security & Research, based on inter-censal growth rates; 78 million goats, 49 million cattle, 41 million buffalo, 31 million sheep, 5.5 million donkeys, 1 million camels, 0.4 million horses and 0.2 million mules [242].

In 2015 Pakistan was the first country in Asia to ban donkey skin exportation, however, there have been reports of skin sourced from Pakistan [17], donkey farms being established in Dera Ismail Khan and Mansehra, and plans for the government to export up to 80,000 donkeys to China during the first three years [243]. Pakistan has since banned the export of donkey skins to China [244]

Peru

In rural Peru, many livestock species are considered important to livelihoods, including cattle, sheep and goats, camelids, pigs, guinea pigs, mules, donkeys, horses and chickens [245]. FAO reported the total equid population to be 1,718,595 in 2019 (650,008 donkeys, 751,076 horses and 317,511 mules) [1](Figure 34).

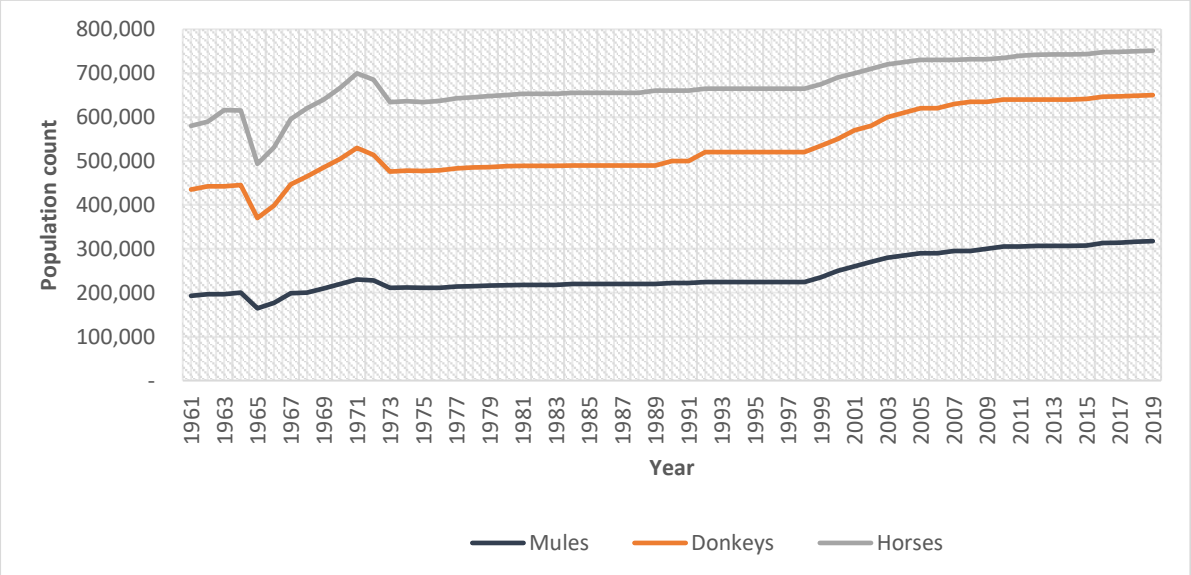

Figure 34. Population counts for donkeys, horses and mules in Peru, between 1961 and 2019.Source: FAOSTAT. ***Donkeys*** *– 1961-1967 unofficial figure; 1968-1969 FAO estimate; 1970-1983 unofficial figure; 1984-2014 FAO estimate; 2015-2019 FAO data based on imputation.* ***Horses*** *– 1961-1967 unofficial figure, 1968-1969 FAO estimate, 1970-1983 unofficial figure, 1984-2014 FAO estimate, 2015-2019 FAO data based on imputation.* ***Mules*** *– 1961-1967 unofficial figure, 1968-1969 FAO estimate, 1970-1983 unofficial figure, 1984-2014 FAO estimate, 2015-2019 FAO data based on imputation.*

In the poor and rural parts of Peru, a range of livestock species are kept, including cattle, sheep, pigs, goats, chickens, alpacas and guinea pigs [246]. The Peruvian government National Statistics Office

(NSO) is responsible for conducting the agricultural census [53]. In 2013, the fourth Agricultural Census was published by the Ministry of Agriculture and Irrigation, reporting 5.2 million cattle, 9.5 million sheep, 3.7 million alpaca and 2.2 million hogs [247]. Results from the census [247,248] and a livestock sector brief [249] did not appear to present any data for equids.

The 2013 census reported 22.7% of farmers using tractors [250]. Similar to arid parts of African countries, working equids continue to be useful in regions of Peru, as they can provide diverse sources of income; when a harvest is poor and donkeys are not being used to carry crops, they can instead be used to transport tourists [251]. Peru and Mexico are thought to be potential suppliers of donkey skins to China, as African sources are lost [252].

Senegal

The equid population of Senegal is reported to be steadily growing, with 1,054,560 reported in 2019, with 45.8% of those donkeys (482,594) [1](Figure 35).

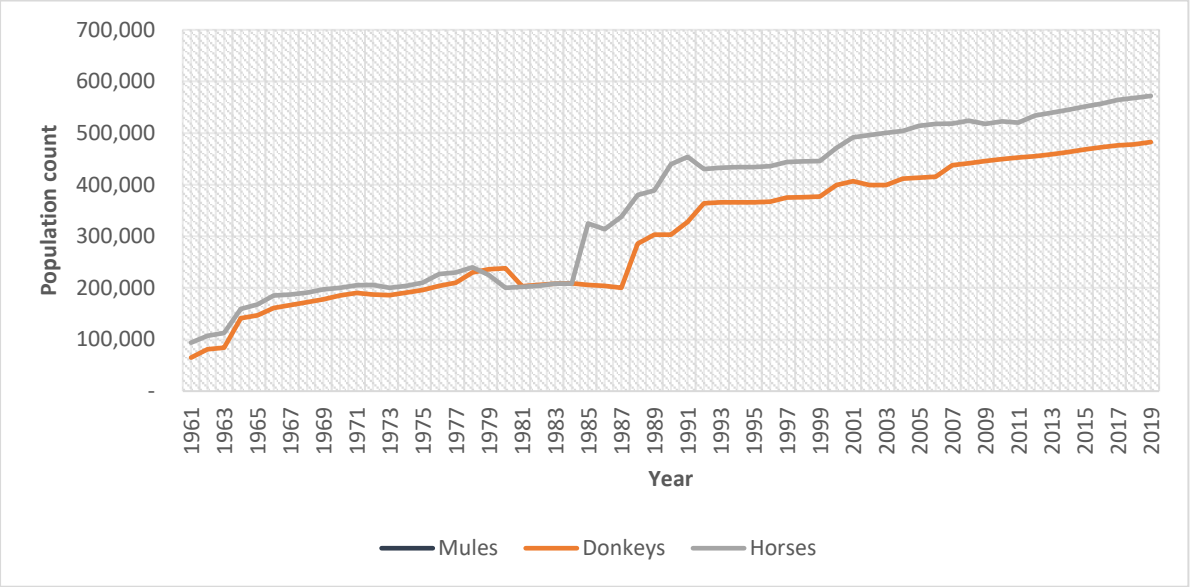

Figure 35. Population counts for donkeys and horses in Senegal, between 1961 and 2019.Source: FAOSTAT. ***Donkeys*** *– 1961-2014 official data; 2015-2016 FAO data based on imputation; 2017-2018 official data; 2019 FAO data based on imputation.* ***Horses*** *– 1961-2014 official data; 2015-2016 FAO data based on imputation; 2-17-2018 official data; 2019 FAO data based on imputation.*

Equids have an essential role in Senegal, used for transportation and for agricultural work, and yet their societal status is low, with donkeys considered the most lowly and cared for the least [253].

The fourth General Census of Population and Housing, Agriculture and Livestock was carried out in Senegal in 2013, with an agricultural module to assess livestock keeping, as well as crops, aquaculture, fisheries and forestry [254]. A total of 211,548 households reared livestock, 27% with poultry, 23% with sheep, 18% with goats, 12% with cattle, 9% with asses, 7% with horses, 2% with pigs and 1% with 'other animals'. In order to carry out quality assessment of the data collected, a post-enumeration survey was also carried out the following year (2014) [254]. Senegal was able to implement its census digitally, using handheld computers, in a cooperative partnership between the National Agency of Statistics and Demography (ANSD) and the Brazilian Institute of Geography and Cartography (IBGE), and between the ANSD and the National Institute of Statistics of Cape Verde, assisted by United Nations Population Fund (UNFPA); on completion of the census in Senegal, the handheld computers were then used by Côte d'Ivoire [255].

An Agricultural Integrated Survey (AGRIS) was conducted in 2017-2018 (sample size 6,349 households) and reported 2.2 million sheep, 1.8 million domestic hens, and 1.8 million goats and 1.7 million cattle. There were reported to be 320,100 horses and 287,700 donkeys [256].

The donkey population was acknowledged to have increased over the past twenty years in both pastoral units of a recent study (Amaly and Thiel in the sylvo-pastoral zone) and it was also recognised that the use of donkeys for water transportation had also increased [257]. The export of donkey meat and skins was banned by the government in 2016 [258].

South Africa

The total equid population was estimated to be 491,534 in 2019, consisting of 146,136 donkeys, 329,992 horses and 15,406 mules [1](Figure 36).

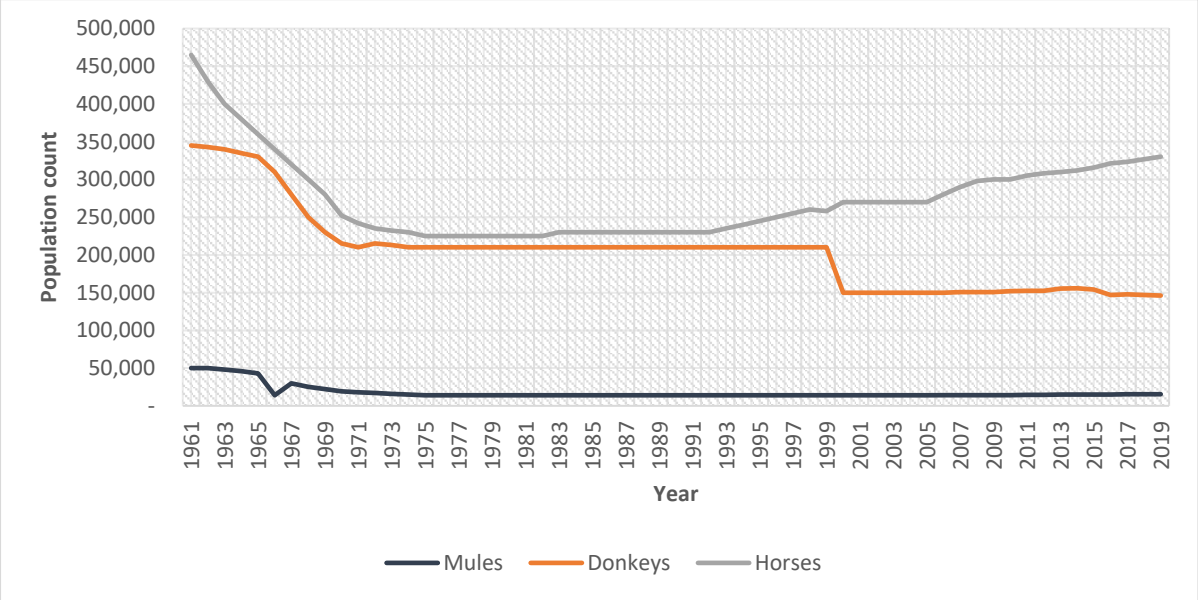

Figure 36. Population counts for donkeys, horses and mules in South Africa, between 1961 and 2019. ***Donkeys*** *– 1961 official data; 1962-1969 FAO estimate; 1970-1977 official data; 1978-1999 FAO estimate; 2000 unofficial figure; 2001-2014 FAO estimate; 2015-2019 FAO data based on imputation.* ***Horses*** *– 1961 – official data; 1962-1969 FAO estimate; 1970-1975 official data; 1976-1999 FAO estimate; 2000 – unofficial figure; 2001-2014 FAO estimate; 2014-2019 FAO data based on imputation.* ***Mules*** *– 1961 official data; 1962-1969 FAO estimate; 1970-1977 official data; 1978-2014 FAO estimate; 2015-2019 FAO data based on imputation.*

South Africa has been said to have developed "on the back of the working equid", despite both horses and donkeys being non-native species [259]. The horse population of South Africa was considered excessive by the 1940s, due to export restrictions created by the Second World War, as well as rapid mechanisation of farm machinery [260]. Following mechanisation, all equid populations reduced dramatically, from over a million in total [261]. With the decline in donkey numbers, they were no longer included in education and training, and no longer appeared in official documents as they were not regarded as livestock [262]. A more recent increase in the horse population came with increased interest in sport horses [261]. Around twenty percent of the horse population are registered purebreds, with some 20,000 being racehorses. There are modest numbers of wild horses and donkeys in some wildlife reserves [263]; poor nutrition and lacking veterinary attention meant feral populations struggled to establish [264]. There are frequent outbreaks of African horse sickness (AHS), with the more resistant donkey acting as a reservoir to the horse population [259]. The mortality rate in unvaccinated horses is between 50 and 95% [265].

Following the Bophuthatswana donkey massacre in the 1980s, a study highlighted a reluctance of owners to provide accurate numbers of donkeys in their possession; once they were reassured the research was to provide assistance and no threat, owners extended details about their donkeys, although they were more willing to describe other animals such as cattle, goats and dogs [266]. The use of donkeys increased after droughts in the 1990s, providing draught power and transportation [267]. There are communities in the Cape Flats informal settlements who depend upon cart horses to provide income [268]. Additionally, these working animals provide positive social impacts from transportation, health benefits by improving owners lives, and support the environment by facilitating waste removal [3].

A census of commercial[11] agriculture was conducted in 2007, reporting 243 million poultry, 11.8 million sheep, 5.3 million cattle, 909,521 pigs, 854,187 goats and 20,520 horses [94]. A study of the quality, depth and breadth, and frequency of the agricultural statistics in South Africa in 2009 highlighted inadequacies; there was a lack of data for smallholder and subsistence farming, as well as an insufficient farmer list (frame) covering all agricultural activities [269]. Three agricultural questions were added to the Population census 2011, in order to establish all households with agricultural activities and to create a frame for an agricultural census. The questions were i) what agricultural activity is the household involved with, ii) how many livestock does the household own, and iii) where does the household operate its agricultural activities. The key results presented data for cattle, sheep, goats, pigs, poultry and 'other livestock' [269]. The most recent commercial agricultural census was implemented in 2017, collecting data at national and provincial levels; it estimated the national populations to be 134 million broilers, 22.9 million layers, 8 million sheep, 5.9 million cattle, 1.4 million pigs, 627,603 goats, 164,484 ostriches and 18,190 horses [270].

Donkey slaughter is legal in South Africa, with the exportation of skins restricted to 7,300 per annum [17]. There have been reports of 15,000 skins traded in less than one year, from a single company [271].

[11] Subsistence and smallholder households were not included in the census

Sudan

Donkeys make up 90.6% (7,620,268) of the total equid population of 8,413,365 (fourth largest total equid population globally) reported in 2019 [1](Figure 37).

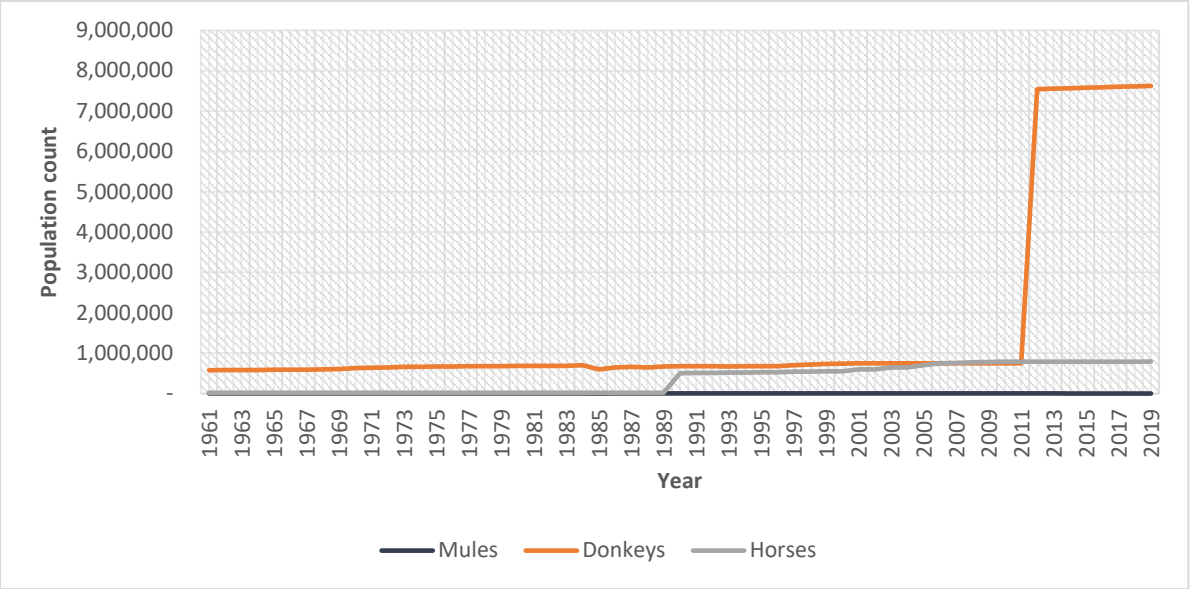

Figure 37. Population counts for donkeys, horses and mules in Sudan, between 2012 and 2019.Source: FAOSTAT. ***Sudan former**: **Donkeys** – 1961-1962 official data; 1963-1964 FAO estimate; 1965-1967 unofficial figure; 1968-1981 FAO estimate; 1982-1984 unofficial figure; 1985-2011 FAO estimate. **Horses** – 1961-1962 official data; 1963-1981 FAO estimate; 1982-1983 official data; 1984-2004 – FAO estimate; 2005-2011 official data. **Mules** – 1961-1981 FAO estimate; 1982-1984 unofficial figure; 1985-2011 FAO estimate.*
***Sudan: Donkeys** – 2012-2013 FAO estimate; 2014-2015 FAO data based on imputation; 2016-2019 official data. **Horses** – 2012-2019 official data. **Mules** – 2012-2014 FAO estimate; 2015-2019 FAO data based on imputation.*

The domestic animals of Sudan make up a sizeable proportion of all African livestock and Sudan ranks at the top for cattle, sheep, goats and camel populations, with poultry near the top, and the second largest donkey population, after Ethiopia [1]. Official estimates in 2011 reported 52 million sheep, 43.4 million goats, 41.7 million cattle, 7.5 million donkeys, 4.6 million camels and 785,363 horses [272].

Despite their association with "backwardness and underdevelopment", donkeys provide a means of transport and help in urbanisation in Sudan, and importantly provide income even for the least educated [273]. The slaughter of donkeys was banned in 2018 [17].

Pack donkeys are the predominant equids in Sudan, carrying most loads on their backs as well as providing a means of transport in urban settings and pulling carts. Donkeys in rural areas of Sudan carry water and firewood, and transport crops to market. Most horses are working equids, ridden in rural settings and used for transportation in urban areas [274]. Due to conflict, remote areas have been cut off, but with donkeys as a means of transportation, humanitarian aid can be provided [275]. Therefore, with the exception of a few sport horses, all equids in Sudan are working equids [276].

There is requirement for reliable data on cross-border livestock trading [277] as it is known that livestock move from South Sudan to northern Kenya and Uganda. Despite their vital contributions to transportation, there is inadequate data on the social uses of donkeys to provide economic analyses of draught power [277–279].

The Ministry of Animal Resources and Fisheries (MARF) is the main source of official livestock data, but as there has not been a recent livestock census carried out (the last was reportedly forty six years

ago) there is a grave lack of current and accurate data on the livestock population in Sudan [279,280]. State-level surveys have been carried out during this time but are inconsistent, and the official estimates of the livestock population are based on dubious models. It is therefore crucial that a livestock census be implemented in north and south Sudan, if there is to be an accurate understanding of the contribution of livestock to the economy, and it has been advised that a national survey be carried out to establish the contributions of animal power in rural and urban livelihoods [279].

The National Population Census of 2008 captured data on animal populations (cattle, camels, sheep, goats, horses, donkeys, pigs and poultry) [281] but no results report was published. Unpublished figures[12] compiled by the Central Bureau of Statistics estimated the total donkey population for northern Sudan to be 4,434,893 and the total horse population 870,070 in 2008. Additionally, households by animal ownership data were collected, with more than 2 million households keeping <10 donkeys (136,085 urban; 1,498,576 rural; 404,653 nomad households) and 389,050 households keeping <10 horses (26,123 urban; 194,659 rural; 168,268 nomad households) from a total of 5.3 million households (personal communication, Jon Hales). Animal ownership household data was also collated at State level. Approximately 80% of livestock households are in the regions of Darfur and Kordofan; in these regions in 2008, 22.1% kept cattle and horses or >3 camels, 17.3% kept sheep or goats with donkeys, and 10.7% kept cattle with only donkeys, 9.1% had no breeding animals but kept donkeys, and 6.5% kept sheep or goats with horses or male camels (riding animals) i.e., around two thirds of livestock were working animals (25.6% not breeding or working; 8.3% breeding only, not working) (unpublished data). The 1975-77 national livestock census (enumerated by low-level aerial sampling) estimated the donkey population to be 783,946 and the combined horse and mule population to be 89,832 (unpublished data, Sudan Central Bureau of Statistics).

Livestock population data for Sudan is considered highly unreliable [282] and a livestock census or a sizeable sample survey is urgently required in Sudan [283]. An opinion survey conducted in 2018, reported 58.7% of respondents believed that agriculture and rural development would make the greatest contribution to poverty reduction in Sudan [284]. In 2020 the government of Sudan initiated plans for a census, with the aims to enumerate the population, livestock and farm lands and to help Sudan's development and poverty reduction, as well as easing conflict [285].

Drought and floods have recurrently resulted in substantial populations being displaced, as well as high levels of livestock mortality [280]. There are 'forgotten populations' of working equids, displaced with their families by natural disaster and conflict. An estimated 14,000 donkeys travelled to a refugee camp in Darfur, Sudan in 2003; after eighteen months, only 2,300 had survived [286].

[12] Analysis involved household weighting, therefore caution should be taken in interpretation

South Sudan

There were 397,787 donkeys reported to be in South Sudan in 2019 [1](Figure 38).

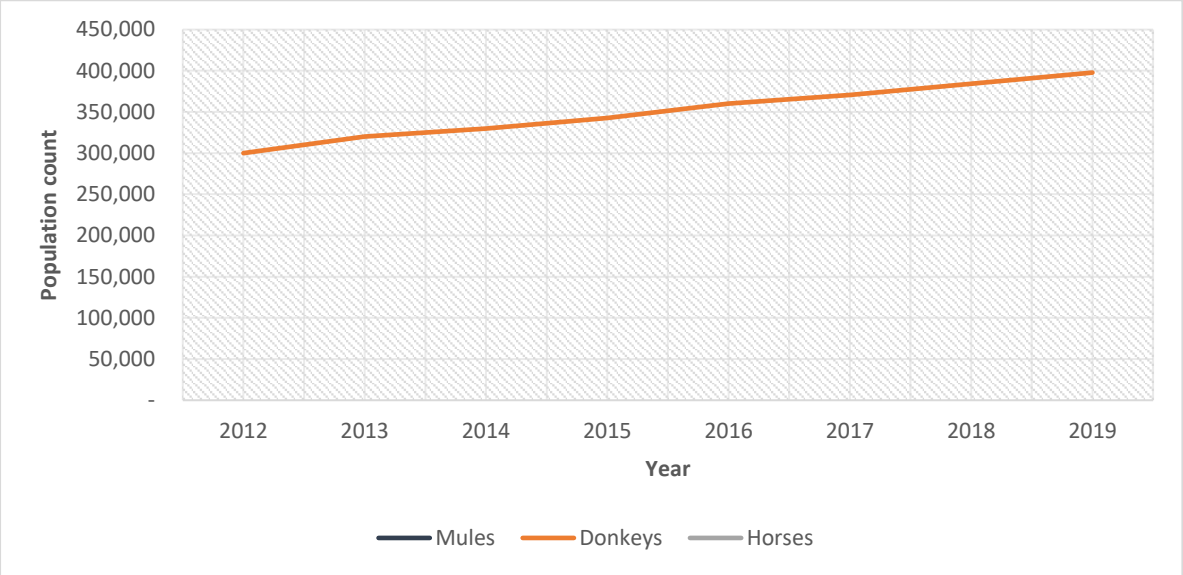

Figure 38. Population counts for donkeys in South Sudan, between 2012 and 2019.Source: FAOSTAT. ***Donkeys*** *– 2012-2014 FAO estimate; 2015-2019 FAO data based on imputation.*

South Sudan became independent in 2011; yet the separation was not peaceful, with conflict causing around 125,000 people, and their thousands of livestock, to flee from the southern state of Blue Nile in Sudan into South Sudan [287]. In was thought there were approximately 100,000 cattle and 150,000 sheep and goats brought to camps in Maban Country, Upper Nile state, South Sudan by the middle of 2012, with around only half of the animals surviving by the end of the year. Refugee and Maban community interactions were strained, with the additional influx of livestock causing damage to Maban crops and grazing [287].

Agropastoralism supports the majority of those living in rural parts of South Sudan, with livestock representing the financial capital of households. Livestock population data for South Sudan have been described as 'very unreliable' and there is sparse livestock production data available [282]. There is reference made to various population and housing censuses for South Sudan on their National Bureau of Statistics website, however it was not possible to access any. A nationally representative household survey to assess poverty was carried out in 2009 and the World Bank assisted the National Bureau of Statistics to conduct a High Frequency Survey between 2015 and 2017, also updating on poverty [288]. The 2009 household survey described 72% of all households keeping at least one livestock or poultry species, with goats and cattle being most commonly reared (69 and 63% respectively), and camel, donkey, pig and horse ownership being 'negligible' (a total of 5% of livestock-keeping households owned donkeys and/or mules) [289]. The National Population census for Sudan 2008 estimated 406,305 donkeys and 13,602 horses for southern Sudan and also captured households by animal ownership; 32,987 households kept <10 donkeys (1,787 urban; 31,200 rural) and 2,487 households kept <10 horses (256 urban; 2,231 rural) from a total 1.3 million households[13] (unpublished data[14], Sudan Central Bureau of Statistics). In the 1975-77 livestock census of Sudan, 5,118 donkeys were estimated and 3,179 horses and mules (combined) (unpublished data, Sudan Central Bureau of Statistics).

[13] Cattle camp populations were excluded

[14] Analysis involved household weighting, therefore caution should be taken in interpretation.

The Ministry of Animal Resources and Fisheries (MARF) uses FAO estimates as their official statistics, reporting 11.7 million cattle and 24.3 million sheep and goats in 2009 [290]. However, these figures are based on the last census, an aerial survey conducted forty six years ago, and a flawed growth model [279]. Donkeys, horses and mules are classified within 'minor and emerging' livestock (the donkey population was estimated to be 10,000 in 2013) and it has been acknowledged that there is a lack of information on them [291]. A livestock census or adequate sample survey is, therefore, urgently required in South Sudan [283].

The UK-based Data Science Hub, established in 2019 by the Office for National Statistics (ONS) and Foreign Commonwealth Development Office (FCDO), investigated the use of satellite imagery to carry out a cattle census, in recognition of the requirement for current cattle population estimates and the challenging setting of South Sudan; funding was granted to allow field sample survey data collection and purchase of imagery, and was due to be conducted in 2021 [292].

Donkeys are hugely important for transporting loads and people as well as in provision of draught in South Sudan, and their use in agriculture is increasing [293]. However, there are reports of them being mistreated and neglected [291]. The slaughter and export of donkeys from South Sudan was made illegal in 2019 [17], however, there are reports of donkeys being stolen and cross-border smuggling from South Sudan to meet demand [294].

Tanzania

Population data for donkeys is presented by FAO, but not for mules (there are no mules in the country [295]) or horses). The 2019 figure reported was 187,885 donkeys [1](Figure 39), far lower than that presented in the most recent census.

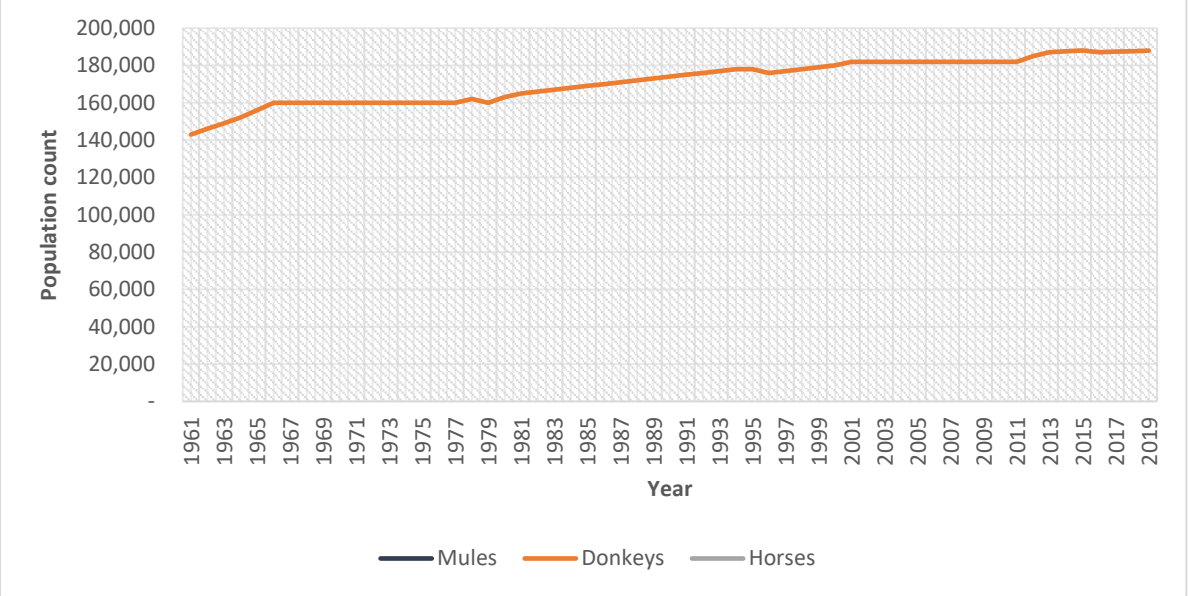

Figure 39. Population counts for donkeys in Tanzania, between 1961 and 2019.Source: FAOSTAT. ***Donkeys*** *– 1961-1979 official data; 1971-2014 FAO estimate; 2015-2019 FAO data based on imputation*

The major livestock species are cattle, goats, sheep, pigs, chickens and donkeys [296]. The most recent[15] livestock survey was carried out in 2016/17 and reported that donkeys were the fifth most

[15] A National Sample Census of Agriculture, Livestock and Fisheries was carried out in 2019/20 but does not yet have a published report available.

prominent species after cattle (30,672,001), goats (19,055,651) sheep (5,565,986) and pigs (1,952,801). Although the donkey population is comparatively small at 580,238[16], it is first acknowledged to be a 'main type of livestock' but subsequently referred to under 'Other Livestock' [297]. The donkey population in the previous 2014/15 livestock census was 457,579 [298]. These reports present donkey population figures at regional level. On the Tanzania National Bureau of Statistics website, an interactive dashboard allows for livestock data from the Ministry of Livestock and Fisheries to be visualised, however donkeys are not included [299].

The most recent agriculture census was conducted in 2007/08, reporting 21 million cattle, 15 million goats, 5.7 million sheep, 1.5 million pigs, 616,614 guinea pigs, 292,107 donkeys and 16,272 horses [77]. Agricultural holdings were those 'economic units of agricultural production under single management, of all livestock and all land used for agricultural production, without regard to title, legal form or size' and the census included only rural smallholders as well as large farms i.e., urban and peri-urban holdings were excluded. Large-scale farms were covered fully, whereas small-scale farms were sampled, to provide district-level estimates, and used PAPI methodology [77].

The Tanzania National Panel Survey (TZNPS) is supported by the LSMS-ISA project, to assist with data improvement and mainstreaming an expanded agricultural data collection. The survey has been carried out every two years since 2008, with financial support from the Kingdom of Denmark, United Nations Population Fund (UNFPA), United Nations Children's Fund (UNICEF) as well as the Tanzanian Government, and latterly the European Union (EU), the World Bank and the Bill and Melinda Gates Foundation [36]. The most recent national panel survey livestock questionnaire asked about large ruminants, small ruminants, pigs, poultry and other animals, which included rabbits, donkeys, dogs and others [300]. Similar to the national livestock census, mules and horses were not included. Neither of the most recent surveys final reports (2012-2013 and 2014-2015) available describe livestock [301,302]. Interestingly, the first survey report listed donkeys as a variable in its household consumption data model[17], along with livestock, poultry, tractors and cell phones, amongst many others [303].

Although the donkey population is comparatively small in livestock terms, they contribute socially and economically to pastoralists and agropastoralists [304,305]. Horses are not reported (personal communication Aluna Chawala, Ministry of Livestock and Fisheries Development) but the few that are in the country are mainly used in the safari industry [295]. The Tanzanian government acknowledges equids play a role in providing draught power [306] and yet they are given minimal official recognition, perhaps being considered 'lesser' than oxen as draught animals and because draught power is regarded as "backwards" [295].

Despite the closure of donkey slaughterhouses and a ban on trade in 2017, in recognition that the rate of slaughter was not sustainable [17], slaughterhouses were once again opened in 2018, due in part to the rise in donkey theft since the ban [307]. The government reportedly had no donkey population figures when licensed slaughter began in 2014. On closing the abattoirs, the Ministry of Livestock and Fisheries was reported to have the intention of establishing the donkey population by survey. On reversing the ban, in attempt to combat the theft and cross-border smuggling, the government was to determine approaches to regulate a sustainable donkey skin trade [307].

[16] An alternative figure of 547,081 is also given in the same document.

[17] A regression model of consumption, estimated using 2007 Household Budget Survey data to construct predicted consumption

Uganda

FAO presents population figures for donkeys only, with the most recent 2019 count being 19,587 [1](Figure 40).

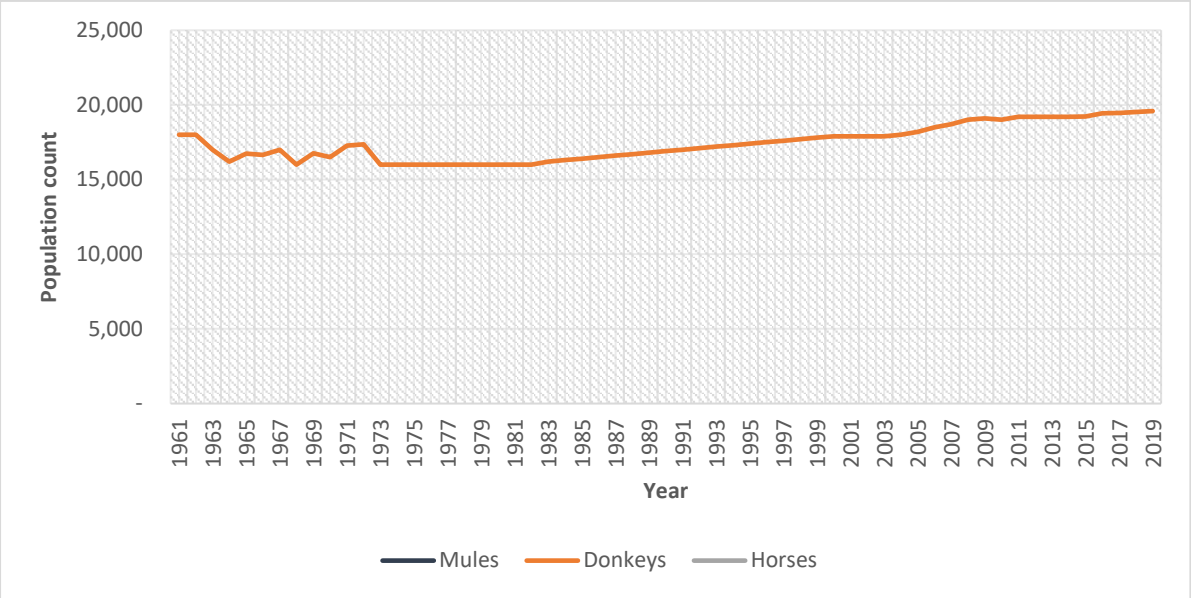

Figure 40. Population counts for donkeys in Uganda, between 1961 and 2018.Source: FAOSTAT. ***Donkeys*** *– 1961-1963 FAO estimate; 1964-1968 official data; 1969-1970 FAO estimate; 1971-1972 official data; 1973-2014 FAO estimate; 2015-2019 FAO data based on imputation*

The Uganda National Panel Survey (UNPS) is supported by the LSMS-ISA project, aiming to improve livestock data, as well as agricultural, food and nutrition data, and ensuring quality and relevant data collection. Implementation of the UNPS has been annual since 2009 and carried out nationally by the Uganda Bureau of Statistics [36]. The panel survey agriculture questionnaire for 2018/19 (sample size 3,176) collected data on animal ownership, draught power and associated income, grouping donkeys and mules together and horses separately [308]. The most recent (2011/2012) final report, presenting key findings, detailed the collection of data on whether households owned cattle and pack animals (aggregated), small animals (goats, sheep and pigs) and poultry, when discussing livestock rearing [309]. A National Panel Survey was conducted in 2018-2019, similarly collecting data on ownership of cattle and pack animals, small animals, and poultry and other animals [310].

The most recent livestock census was implemented in 2008-2009; it collected data on horses, donkeys and camels (appear to be aggregated), however these species were included in a list still to be analysed [311]. An annual agriculture survey was conducted in 2018, using the Agriculture Integrated Survey (AGRIS) approach; the survey reported 1.2% of livestock-raising households kept donkeys (61.3% goats, 41% broilers, 33.2% cows, 33.1% layers, 29% pigs, 24.8% calves, 18.3% bulls, 15.6% sheep, 12.8% heifers and 10.3% oxen). Poultry were the predominant species (38.3 million), followed by goats (15.5 million), cattle (12.1 million), pigs (4.5 million), sheep (4.4 million), rabbits (628,060) and donkeys (146,492). An average of 2.34 donkeys were kept per agricultural household. Donkey and horse data was collected separately, for births, purchases, sales, prices, illness and slaughter. The sample design used ten Zonal Agricultural Research and Development Institutes (ZARDI), to provide national, regional and sub-regional estimates [312].

Donkeys have been used mostly as pack animals in Uganda for hundreds of year, with some pulling carts and for draught purposes [313]. The sale of donkeys for slaughter was banned in 2017, in part due to the falling population and recognition of their contribution to agriculture and the rural

economy [314] and the detrimental impact to women in particular, using donkeys for transportation in areas otherwise inaccessible [17].

United Kingdom

Numerous surveys have been carried out to establish equine population demographics [315–318]. There is, however, often a wide range given; the FAO population figure for horses in the United Kingdom (UK) in 2019 was 418,856 [1](Figure 41), whereas the National Equestrian Survey 2019 estimated the British horse population to be 847,000 [318]. In 2004, a similarly wide range of between 600,000 and 975,000 was presented [319].

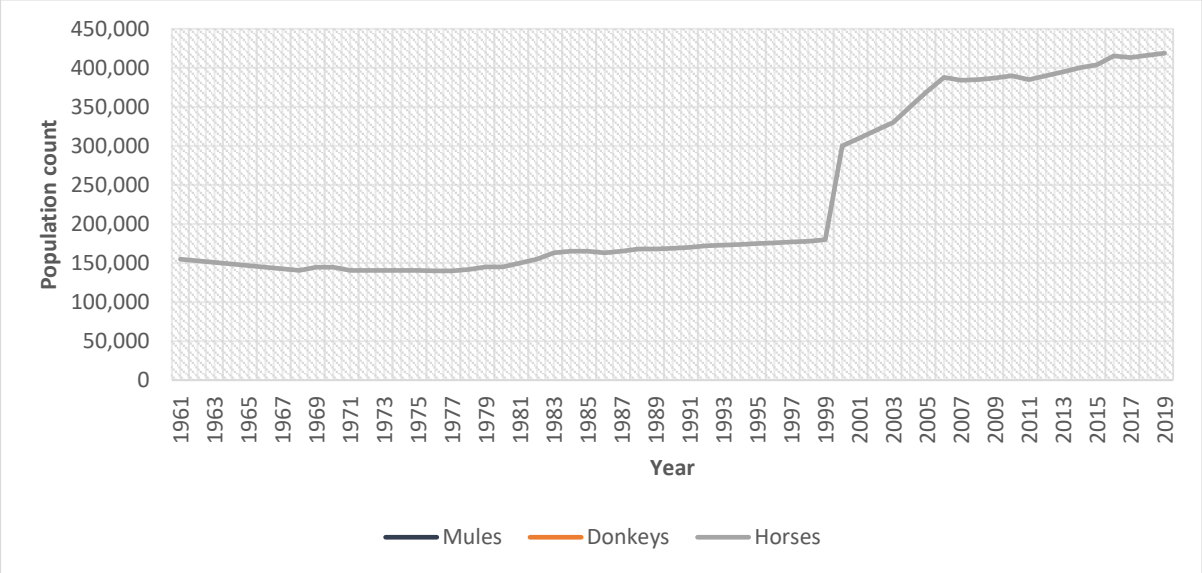

Figure 41. Population counts for horses in the United Kingdom, between 1961 and 2019.Source: FAOSTAT. ***Horses*** *– 1961-1976 official data; 1977-1982 FAO estimate; 1983 official data; 1984-2005 FAO estimate; 2006-2007 official data; 2008-2014 FAO estimate; 2015-2019 FAO data based on imputation.*

Caution must be taken in interpreting surveys, due to a lack of disaggregation of regional data as well as a lack of differentiation between rural and urban areas [319] and relatively small numbers of survey participants [320]. That said, the annual collection of survey data provides a dynamic representation of horse numbers which is useful for monitoring population-based trends and disease modelling [321]. In 2004, equid passports were introduced for all horses [321], followed by regulations in 2009 for microchip identification of equids in England, Scotland, Wales and Northern Ireland [322,323]. The National Equine Database (NED) contract with DEFRA ended in 2012 and so the National Equine Database detailing the British horse population ceased to exist [324]. The now Central Equine Database (CED) is managed by Equine Register on behalf of the government, collating data from all equid passports [325]. Interestingly, Equine Register is linked to the Livestock Information Programme (LIP), providing expertise and data tools for a database of 60 million livestock records (cattle, sheep and pigs) for UK farms [325]. Despite the legislative requirement for equid passports, there is the need for improved owner compliance if the CED is to be an accurate reflection of equid data [16].

The horse population of Britain was estimated to be around 8 million pre-First World War, with many donkeys and mules as well. Heavy breeds such as the Suffolk Punch have reduced drastically with the closure of breweries [326]. There is, however, still a population of working horses in the UK – Shires, native ponies and working crosses – and although small-scale, their activities are diverse and maintain their place in agriculture, showing, leisure and marketing sectors [327]. Horses are used in rural areas

such as the New Forest to gather thousands of semi-wild ponies (estimated between 3,000 [328] and 5,000 [329]) and other livestock, as well as working within the Armed Forces and police force [326].

Although equids are not generally considered as 'agricultural animals' in the UK, their reclassification as such has been frequently discussed [330]. Livestock is described as animals reared for "the production of food, wool, skins or fur or for the purpose of its use in the farming of land" and as such does not include recreational, stud or equestrian use [331]. Until the late 1950s, the Census of Agriculture was implemented annually by the Ministry of Agriculture, Food and Fisheries (MAFF) and included capturing detailed data regarding the horse population on agricultural holdings. Minimal population data were then collected every five years between 1960 and 1975, until the early 2000s when the Department for Environment, Food and Rural Affairs (DEFRA) reinstated horse population data collection on agricultural holdings [330].

The June Survey of Agriculture and Horticulture in England was started in 1866, and until 1995 was carried out as a full census annually, then reducing to an annual sample survey, and full censuses being implemented decennially [332]. Since 2011, the survey has been online (with a paper postal version available)[333]. DEFRA's 2019 June Survey of livestock populations report for England surveyed 35,000 commercial holdings[18] in 2019, reporting 162,000 horses[19], a slight reduction from 170,000 in 2017. Donkeys, mules and hinnies were included with camelids in 'any livestock not recorded elsewhere' and reported to be 26,000 in 2019 [334].

In the Welsh Survey of Agriculture and Horticulture 2019, data for horses were not presented, being of 'less interest than other livestock…in an agricultural context for Wales' [335]. An accompanying spreadsheet reported the horse population as 45,220 for 2019 [336].

Similarly, in the 2018 Scottish Agricultural Survey, there was no mention of any equids, only reporting figures for cattle, sheep, poultry and pigs [337]. The Scottish agriculture tables economic report, presented population data for livestock[20] – cattle, sheep, pigs, poultry, goats, deer, horses, camelids, beehives and 'other' – and reported the Scottish horse population to be 34,422 in 2019 [338]. The British Horse Society, however, estimated the Scottish horse population to be greater than 70,000 in 2019 [339] so there is significant variation in figures.

Equid data are also absent from the Agricultural Census report of Northern Ireland 2020, which reports on cattle, sheep, pigs and poultry [340]. The Department of Agriculture, Environment and Rural Affairs (DAERA) does, however, produce details of farm animal numbers collected in its Agricultural Census, for cattle, sheep, pigs, poultry and horses, and reported the horse population to be 8,707 in 2019 [341].

DEFRA collates surveys from all of the countries of the UK in order to publish UK-level statistics [332](Figure 42). How horses are distributed on other (non-agricultural) types of premises is unknown [342].

[18] A commercial holding is defined as "one with significant farming activity i.e. holdings with more than five hectares of agricultural land, one hectare of orchards, 0.5 hectares of vegetables or 0.1 hectares of protected crops, or more than 10 cows, 50 pigs, 20 sheep, 20 goats or 1,000 poultry" [333].

[19] This figure is for 2018, with plans to publish 2019 figure in October 2019

[20] Livestock population data are presented for all four nations; the horse population figure presented in this report for Wales is the same as that presented in the Welsh Government spreadsheet [336], however the figure presented for England is 161,878 (slightly lower than that presented in DEFRAs report)[333] and for Northern Ireland is 9,696 (slightly higher than that presented by DAERA)[341].

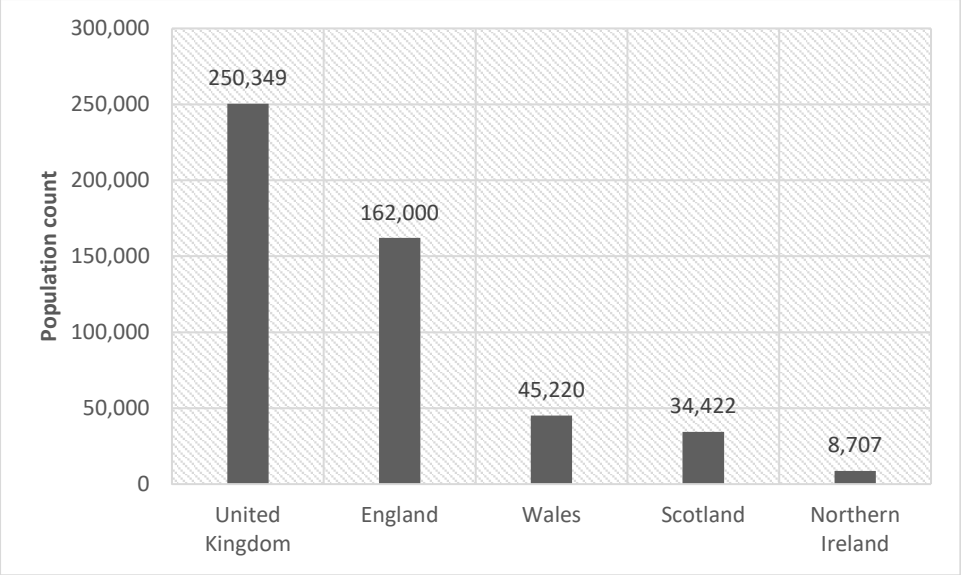

Figure 42. Number of horses in the countries of the United Kingdom, 2019.
Data sources: [333,336,338,341]

An agriculture census was conducted for the UK in 2010, with each devolved administration collecting their own data. It reported 139,000 holdings with livestock; poultry (162 million), sheep (31 million), cattle (10 million), pigs (4.4 million), horses (294,900) and goats (89,810). The scope was 'agricultural holdings, producing agricultural products' and used a sample of 31,000 holdings, using a classical approach [77].

Demographic data is available for British livestock, but similar data for the equine population is considered lacking [321]. The FAO does not present population figures for mules or donkeys, but the UK donkey population was estimated to be around 8,900 in 2008 [343] and in 2020, the CED estimated there to be 27,592 donkeys [344], but there is generally limited information on the UK's donkey population [345].

United States of America

The FAO's most recent total equid population (made up predominantly of horses) was reported as 10,754,770 in 2019 [1](Figure 43).

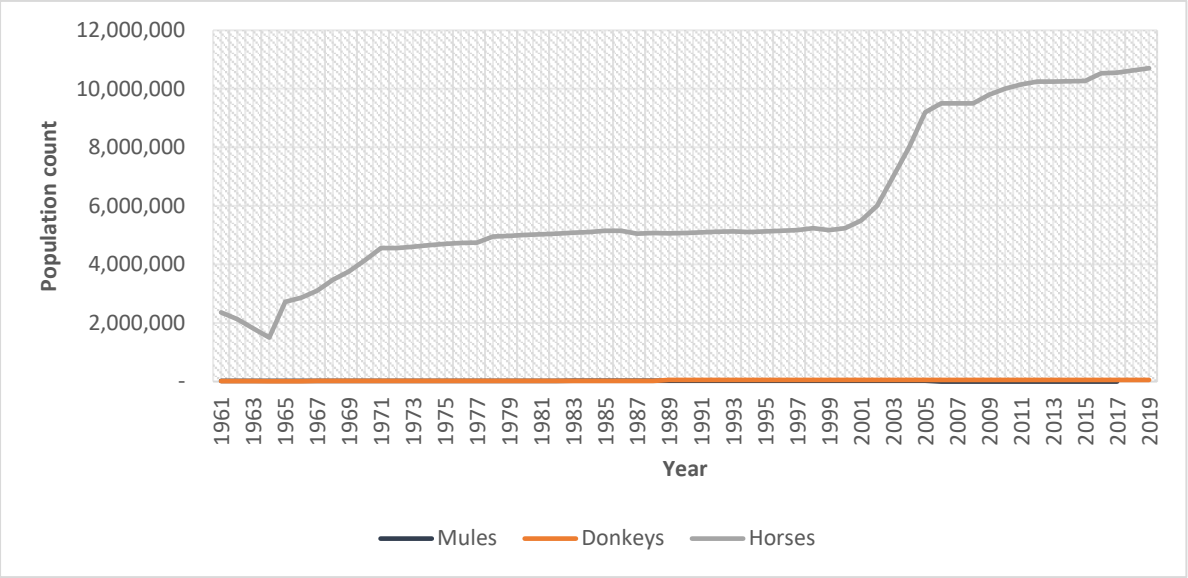

Figure 43. Population counts for donkeys, horses and mules in the United States of America between 1961 and 2019.Source: FAOSTAT. ***Donkeys*** *– 1961-1984 FAO estimate; 1985 official data; 1986-2014 FAO estimate; 2015-2019 FAO data based on imputation.* ***Horses*** *– 1961-1984 FAO estimate; 1985 unofficial figure; 1986-1996 FAO estimate; 1997-1998 unofficial figure; 1999-2000 official data; 2001-2004 FAO estimate; 2005 official data; 2006-2014 FAO estimate; 2015-2019 FAO data based on imputation.* ***Mules*** *– 1961-1984 FAO estimate; 1985 official data; 1986-2017 FAO estimate; 2018-2019 data not available.*

Horse population data is collected and published by three main organisations, namely the American Horse Council (AHC) Foundation, the United States Department of Agriculture (USDA), and the American Veterinary Medical Association (AVMA)[346]. The AHC produces what is considered the most comprehensive figure, from its National Economic Impact of the US Horse Population survey, and reported 7,246,835 horses in the United States in 2017 [347]. The USDA's National Agriculture Statistic Service (NASS) carried out its most recent agriculture census in 2017 to enumerate horses working on farms and reported a national population of 2,847,289 [347,348]. The AVMA reports on the pet population and reported 1,914,394 horses. Additionally, the Food and Drug Administration (FDA) combined surveys from the AVMA and the USDA, estimating the horse population to be 3.8 million [347]. So, as with many other countries, there is diverse population data available.

As well as the general equid population being inaccurately enumerated, there are two defined groups of the US equine population that are thought to be particularly 'invisible'; Amish horses, mules and donkeys; and horses on Indian reservations [349]. The 2017 US Census of Agriculture reported 317,563 mules, burros and donkeys [348]. There are reported to be 81,951 wild horses and burros living across ten western states, managed by the Bureau of Land Management [350].

In 2007, the USA banned the slaughter of horses and burros in Texas and Illinois, where the three remaining slaughter plants were; there is currently a bill introduced for a full federal ban on slaughter and export for slaughter (personal communication, The Humane Society of the United States). The wild horse and burro population was reported to triple since the ban [351], however, reports of between 81,000 [351] and 150,000 horses were exported for slaughter annually [350] and in 2016 there were reports of weekly increases in the numbers of donkeys for exportation from the USA for

slaughter in Mexico [352]. In 2019, the Safeguard American Food Exports (SAFE) Act, H.R. 961 was reinstated, banning the transportation of all equids to be slaughtered abroad [353].

The United States Department of Agriculture does not have a designated equine statistics programme, and as such equine demographic statistics are considered sparse [354]. The Census of Agriculture, which presents state and county-level data [348], does not include non-farm[21] equids [354]. The most recent agricultural census for the USA was implemented in 2012 by the National Agricultural Statistics Service of the USDA, extending to farms with crop and livestock production (minimum $1000 products annually) and used a classical approach with no sampling. The census reported 89 million cattle, 66 million pigs, 5 million sheep, 3,621,348 horses, 2, 621,514 goats, 292,590 mules, burros and donkeys, 140,601 alpacas and 76,086 llamas [77].

Venezuela (Bolivian Republic of)

The total equid population was reported to be 1,037,515 in 2019, made up of 440,000 donkeys, 525,515 horses and 72,000 mules [1](Figure 44).

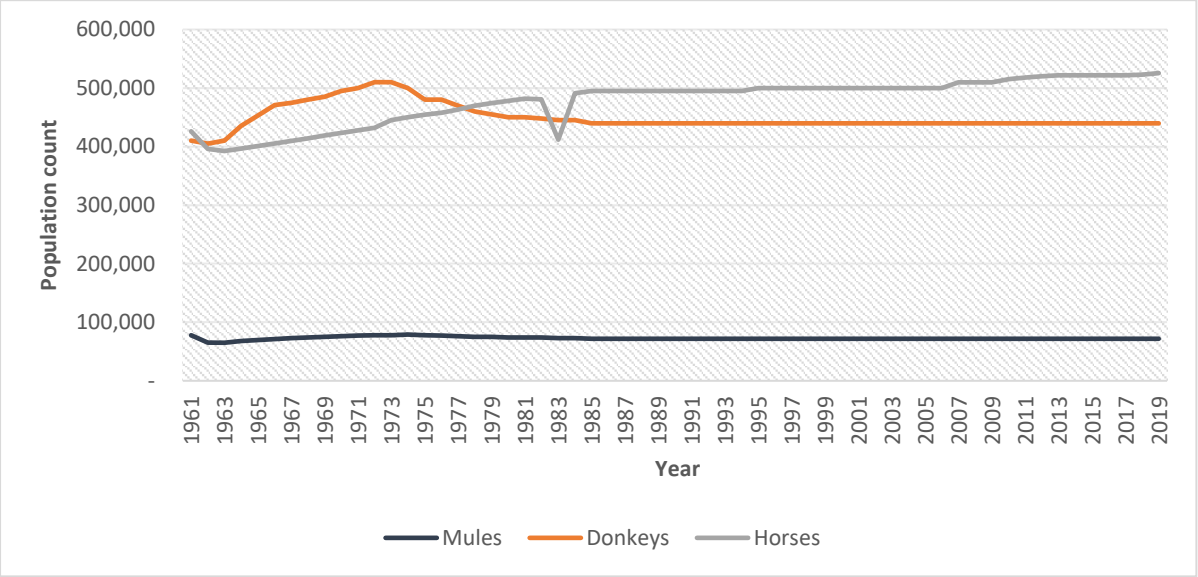

Figure 44. Population counts for donkeys, horses and mules in the Bolivarian Republic of Venezuela between 1961 and 2019.Source: FAOSTAT. ***Donkeys*** *– 1961 FAO estimate; 1962 official data; 1963 unofficial figure; 1964-1966 official data; 1967-2014 FAO estimate; 2015-1029 FAO data based on imputation.* ***Horses*** *– 1961 FAO estimate; 1962-1975 official data; 1976-1985 unofficial figure; 1986-2014 FAO estimate; 2015 FAO data based on imputation; 2016-2017 FAO estimate; 2018-2019 FAO data based on imputation.* ***Mules –*** *1961 FAO estimate; 1962 official data; 1963 unofficial figure; 1964-1966 official data; 1967-2014 FAO estimate; 2015-2019 FAO data based on imputation.*

An agricultural census was carried out for Venezuela in 2008, establishing livestock numbers; poultry were the most populous (97 million), followed by cattle (12.6 million), pigs (2.7 million), goats (1 million), sheep (600,988), buffalo (225,790), and horses (163,433) [355]. Prior to this, an agricultural census was carried out in Venezuela in 1997 and reported 113,421 smallholder farmers[22], of approximately 400,000 Venezuelan farmers, but these figures are unclear [356]. There are similarly varied estimates for the cattle population in the country, with official government data indicating 15 million in 2018, and the Venezuelan Livestock Federation suggesting 9.5 million [357].

[21] A farm is defined as selling $1,000 of agricultural products annually [354]

[22] Cultivating less than two hectares of land each.

The 1996/97 agricultural census reported a total equid population of 477,129 [358], which is less than half the total population estimated by FAO (1,012,000) for the same period [1].

Donkey herds have reduced in size drastically in recent years, due to high numbers being slaughtered for meat; with the downturn in the Venezuelan economy, food shortages forced the population to eat donkey meat, despite them being a protected species used for draught or freight [359].

Zambia

FAO's most recent estimate was 2,200 donkeys in 2019 [1](Figure 45).

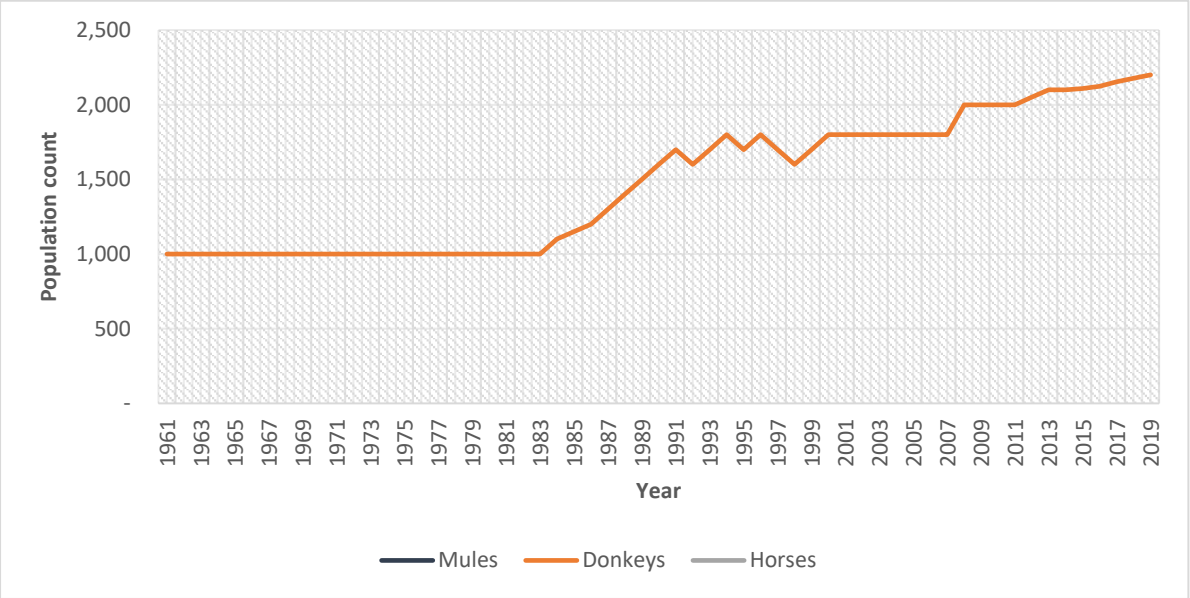

Figure 45. Population counts for donkeys in Zambia, between 1961 and 2019.Source: FAOSTAT. ***Donkeys*** *– 1961-1962 official data; 1963-1988 FAO estimate; 1989 official data; 1990-2014 FAO estimate; 2015-2010 FAO data based on imputation*

In Zambia's most recent livestock census (2017-18), donkeys and horses were included in 'Other Livestock', with 13,967 donkeys and 493 horses reported as at January 2018 [360]. This figure is far greater than that presented by FAO for the same period (2,169), however, it is an improvement on past census collection, where there was no mention of equids of any type, with livestock being exclusively cattle, goats, pigs and sheep [361]. The livestock census reported 3.7 million cattle, 3.5 million goats, 1 million pigs, and 170,262 sheep [360]. An agricultural census was carried out in 2000 but only presented data on numbers of livestock holdings;, reporting 4,208 holdings with donkeys [94].

The donkey population is relatively low in Zambia, for reasons unknown. However, those who do own donkeys, mostly in Southern and Western Provinces, value them greatly [362]. Demand for donkeys for draught power increased in the 1990s in Zambia, prompting investigation into their importation from neighbouring Botswana and Zimbabwe [362]. Donkeys are a replacement source of traction for small-scale farmers who have lost cattle and as such are often considered lesser draught animals due to their reduced size and capacity [363]. Due to their relatively small numbers, the price of donkeys in Zambia is considered quite high (~$70-100 in 2004) and yet they are often regarded as low status animals. However, as they are well suited for women to work with them, it is often thought that the low status of donkeys reduces the status of women in society, resulting in a reluctance for such an

association. It has also been said that as donkeys are used in Zambia, it will be regarded as poor by other countries [363].

Zimbabwe

The total equid population was estimated to be 629,311 in 2019, with the majority being donkeys (599,780) [1](Figure 46).

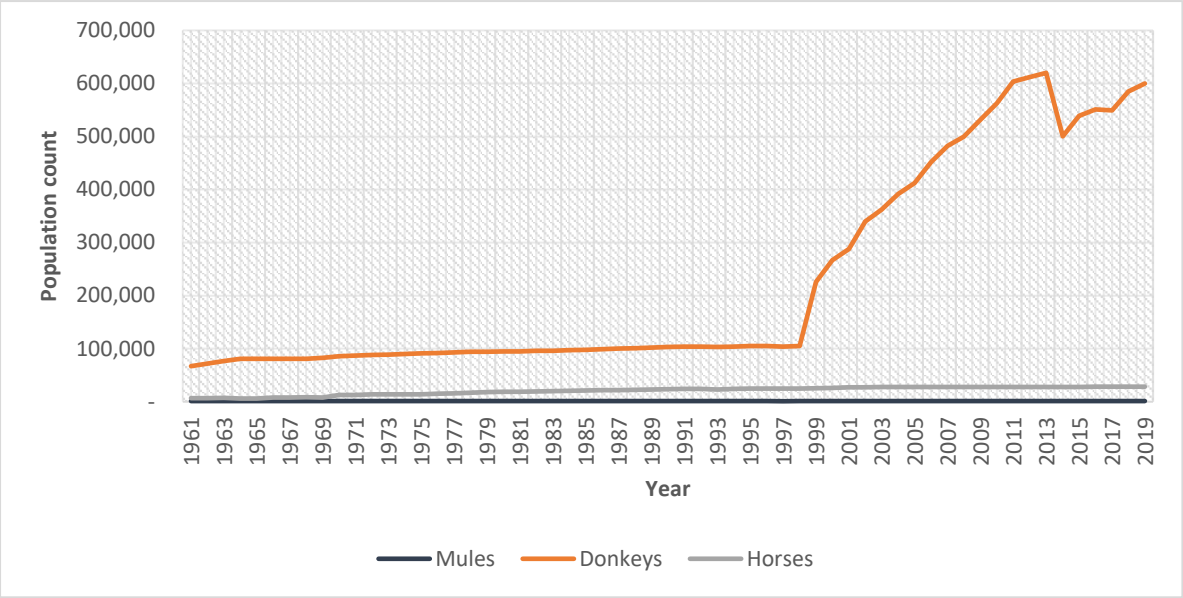

Figure 46. Population counts for donkeys, horses and mules in Zimbabwe between 1961 and 2019.Source: FAOSTAT. ***Donkeys*** *– 1961-2009 FAO estimate; 2010-2011 official data; 2012-2013 FAO estimate; 2014 official data; 2015-2016 FAO data based on imputation; 2017 official data; 2018-2019 FAO data based on imputation.* ***Horses*** *– 1961-1962 official data; 1963-1964 FAO estimate; 1965-1976 official data; 1977-1985 FAO estimate; 1986 unofficial figure; 1987-2014 FAO estimate; 2015-2019 FAO data based on imputation.* ***Mules –*** *1961-1962 official data; 1963 FAO estimate; 1964 official data; 1965-2014 FAO estimate; 2015-2019 FAO data based on imputation.*

It is unclear when Zimbabwe last carried out an agricultural census. It is indicated that a national census is planned for 2023 [94]. As part of the Poverty, Income, Consumption and Expenditure Survey (PICES) 2017, an Agricultural Productivity Module (APM) was implemented, with assistance from the World Bank. The APM gathered agricultural production data from smallholder farmers (a subsample of 2,528 from the PICES), providing national estimates [364]. Most households reported keeping cattle (1,095 households), followed by chickens (indigenous) (1,024), goats or sheep (701), donkeys (153), other poultry (107), chickens (broiler) (58) and pigs (50). The survey also collected information on animal input expenditure, vaccinations and ownership of animal-drawn (oxen and donkey) equipment; interestingly male head of households tended to use tractors compared to female-headed households. An average of 3.7 donkeys were kept per household [364].

Smallholder livestock are essential in contributing draught power, manure and transportation in Zimbabwe. While cattle have been predominant in provision of draught power, donkeys are more tolerant of droughts and their population has been growing since the mid-1970s. In 2004, there were a reported 420,000 donkeys in Zimbabwe's main rural areas [365].

Despite those in rural communities being highly dependent on donkeys [366], and being of greater value in provision of draught compared to a 'slaughter animal', a donkey abattoir was planned in 2017 [367]. However, the registration of donkey slaughterhouses was banned in Zimbabwe, based in part

on public outrage [17,368] and restrictions and bans have been established on export and slaughter of donkeys in response to the donkey skin trade threat [369].

Impressions of Equid Data Collection

It has been reported that European countries generally provide reasonable data on their horse populations to FAO, in comparison to other continents [31]. However, the highly diverse purposes of keeping horses, donkeys and mules in these countries provides challenges in implementing equine censuses [370]. In 2015, World Horse Welfare and Eurogroup for Animals published a report, 'Removing the Blinkers', in attempt to address gaps in data regarding the equine population of the EU. The report aimed to improve equid population data collection as it was lacking or unreliable for many countries, even with identification legislation in place [371]. Due to the diverse nature of the equine sector in the EU, it is essentially impossible to establish accurate population data, with data collected for the specific requirements of organisations, and notably minimal, if any, data collated for working equids. Indeed it is often those populations of less economic value or less formally categorised (pets, leisure or working equids) whose data are frequently absent [371].

There are estimated to be around 4.8 million equids in the EU [1]. In order to provide comparisons to the population presented for LMICs, the equid populations for all EU countries, as well as the UK, are presented (Figure 47).

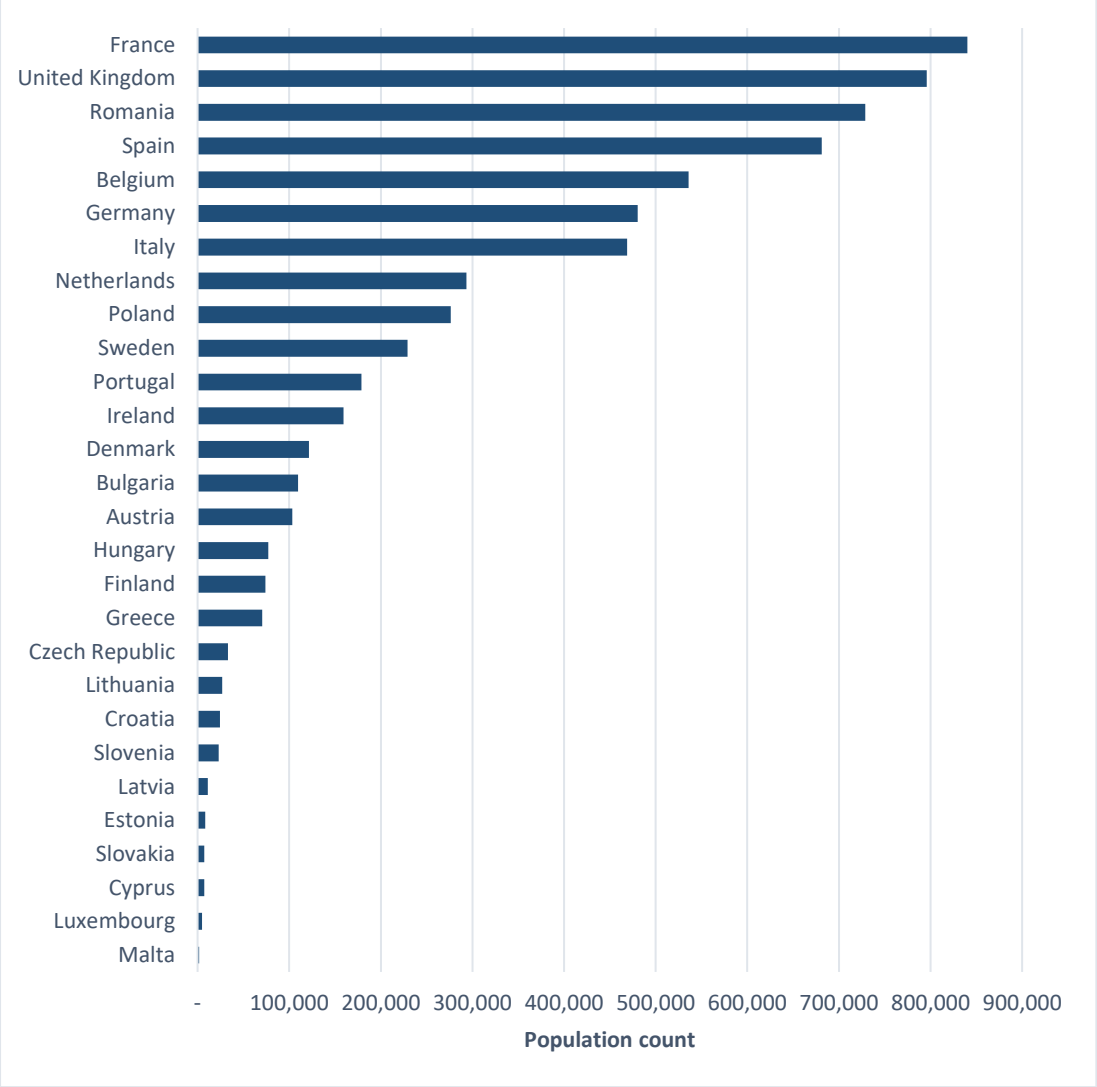

Figure 47. Mean estimate equid populations for EU Member States, as well as the UK
Data source: World Horse Welfare and Eurogroup for Animals, 2015

There is a lack of clarity over who is actually enumerating equids in some instances. There are varying aggregated and disaggregated equid population figures reported in many of the agricultural censuses; eight of the 36 countries collected disaggregated data for all of horses, donkeys and mules in their agricultural censuses (Brazil, Egypt, Ethiopia, Ghana, Guatemala, Honduras, India and Mexico), and although it does not collect any equid data in its agricultural census, China does produce completely disaggregated population data in its annual agricultural statistical yearbook. Additionally, Nicaragua's census questionnaire included disaggregated enumeration of equids, but did not report on any figures.

Several countries' agricultural censuses collected population data for horses and aggregated data for donkeys and mules (Botswana, Kyrgyzstan, Namibia and the USA). Disaggregated population data for horses and donkeys only are collected in Afghanistan, Burkina Faso, Mali, Niger, Senegal, Tanzania, Uganda and Zambia. The Malawi census collected population data only for donkeys, as did the Kenyan PHC livestock module. Mongolia, South Africa and Venezuela only collected data for horses. Colombia and the UK collected aggregated equid/equine data. Pakistan and Peru did not collect any equid data in their agricultural censuses and equid data, as with all livestock data, for Chad, Nigeria, Sudan, South Sudan and Zimbabwe are unknown.

When FAOSTAT 'Live Animals' asses, horses and mules data are counted for 'World List', the population figure is 115,939,027 (Appendix Table 8) which differs to the total count for asses, horses and mules in 'World Total' (117,562,275) (Appendix Table 7). This discrepancy is essentially a difference of 1.6 million in the horse population (as well as comparatively minor differences in the ass and mule populations) using the different Region filters. It was not possible to discern why, but the 'World Total' data is flagged as aggregated, and imputation may have been used resulting in the higher figure.

The review identified very limited data and related information (both peer-reviewed publications and grey literature) on equid use in Chad, Guatemala, Honduras, Malawi, Namibia, Nicaragua and Venezuela.

Best practices

Where census reports often describe problems and challenges faced, there is far less reporting of successes per se. The 2009 Kenyan PHC survey reported on some 'best practices', namely an effective management structure, with participation from both public and private sector organisations; the linking of development goals to the census theme, which helped to raise the profile of the census, and attracted political leadership, demonstrating the national importance of the census; and a public holiday was designated in order to allow citizens to be at home for enumeration. Other measures attributed to the successful enumeration included an effective communication strategy; preferential enumeration of dignitaries; a robust recruitment, training and enumeration process; a comprehensive security scheme; and independent monitoring of the census [158].

Of the case studies described, two countries stand out as somewhat exemplar in their equid data collection, namely Ethiopia and India. With regards to Ethiopia, it could be expected that a country with the second largest global equid population, and the largest donkey population, should take an active interest in its equid population data. Although the most recent agricultural census was conducted in 2001/02, collecting disaggregated equid data, an agricultural sample survey was implemented in 2010/11 which captured data on the equid population and, importantly, purpose (transportation, draught and 'other' purposes), as well as variable data such as age and sex, diseases,

treatments, births, purchases, sales and slaughters - far more detail than most census reports provide. As well as national data, the survey reported regional numbers for horses and donkeys, as well as number of holdings by size per region. Additionally, Ethiopia is a partner country of the LSMS-ISA, with recent surveys (2015/2016 and 2018/2019) collecting disaggregated data on household equid ownership. It is thought that the livestock population of Ethiopia is the largest in Africa [372,373]. In Ethiopia, equines are considered to contribute greatly to rural and urban economic development [374] and this is reflected in their inclusion of livestock data collection, as detailed. Additionally, with regards to their reliability, Ethiopia's livestock statistics have been considered to be reasonable [22].

The equid population of India sits in 31st place of FAO's figures, at around 0.55-0.62 million (342,226 horses, 194,344 donkeys, 84,261 mules[1]), so is comparatively small in global terms. However, this population is also small in terms of India's other livestock species, with 851 million poultry, 302 million bovine (cattle and buffalo), 148 million goats, 74 million sheep and 9 million pigs [150], depicted well in Figure 22. And yet, the Indian livestock census collected detailed disaggregated data for equids, reporting population figure trends over time, state level data, and export and import data for equids (including numbers and value of hides). Prior to the 2019 census, India conducted a livestock census in 2012, so the country's widescale livestock data collection is relatively frequent.

These examples demonstrate that it is possible to include equid data collection – disaggregated and detailed - regardless of how significant their presence may be within individual countries livestock populations.

Surveys and Initiatives

Agricultural data is often gathered by census, occurring approximately every ten years, resulting in policies being made using data that can be ten years old. Data is also collected in administrative reporting systems which rely on subjective assessments by veterinary extension officers and as such the quality of data collected is dependent upon their level of experience and knowledge. Well-designed sample surveys, therefore, are an important alternative method of collecting timely, accurate and cost-effective data from representative households and farms that can allow governments to identify and react to situations quickly and develop policies based on what is actually happening. In order to carry out sample surveys effectively, however, it is essential that comprehensive sampling frames are used to ensure households are linked to farms accordingly, allowing for socio-economic links to be made. This has been addressed in the creation of the 'Global Strategy Handbook on Master Sampling Frame for Agriculture', and provides a robust framework for countries sample surveys [225,375].

A Master Sampling Frame can also be applied to Agricultural Integrated Survey (AGRIS) methodology which assists with improving on-farm data quality. AGRIS generates quality, disaggregated data on technical, environmental and socio-economic aspects via a cost-effective, modular, multi-year survey programme, informing policy and research and aiding market efficiency [375].

The *Livestock in Africa: Improving Data for Better Policies* Project was set up to aid African governments in their collection and analysis of data supporting investments in the livestock sector, as well as integrating livestock data into national statistical systems, ensuring livestock statistics are available to create appropriate investments in the livestock sector [376].

As already described, the LSMS-ISA program has created household level surveys to improve knowledge about sSA agriculture and to this end is providing support in four main ways;

1. A multisectoral framework, extending beyond rural areas, will assist the collection of statistical data required to create agricultural policies.

2. A suitable institutional framework is required to support statistical data collection and be applicable to the integration of sources of data and collaboration. A multifaceted approach should allow for collaboration between sectors which is currently constrained.
3. Analytical expertise must be improved in order to achieve reliable data, and links between producers and users of data strengthened. Suitably reliable data must be made public in good time.
4. Active dissemination of statistics to assist in policy-making based on statistical analyses.

The project aims to survey a panel of households in its member countries every three years, while assuring that the sampling methodology will allow for the collection of quality, representative data, whilst managing the questionnaire complexity and panel size [377].

Rating system

A rating system was created based on three criteria, namely when the most recent agricultural[23] census was conducted, the type of equid data collected (and presented) and involvement in the LSMS-ISA or other poverty reduction schemes. As already stated, the rating system (Table 6) is to provide a general impression only.

Table 6. Rating system to provide an overview for data collection.
Data collection methods are rated for each country as either poor (red), average (orange), good (yellow) or very good (green). Points are assigned next to Rationale criteria in superscript. 0-2 points = poor; 3 points = average; 4 point = good; 5-6 points = very good. Equid species are in parentheses to demonstrate disaggregation.

Country	**Rating**				**Rationale**
	poor	average	good	very good	
	1	**2**	**3**	**4**	
Afghanistan					2002/03 census[1] (but living conditions survey 2016-17), disaggregated data for (horses) and (donkeys)[2], CLAP-Kuchi poverty reduction project[1]
Botswana					2015 census[3], disaggregated data for (horses), and (donkeys & mules)[2]
Brazil					2017 agricultural census[3], collecting disaggregated data for (horses), (donkeys) and (mules)[2]
Burkina Faso					2006-10 census[2], disaggregated equid data (horses) and (donkeys)[2] and part of LSMS-ISA[1]
Chad					No known census[0], no equid data[0]
China					2016 agricultural census[3], although no published report identified. Annual detailed statistical yearbooks with disaggregated equid population data for (horses), (donkeys) and (mules)[2]
Colombia					2014 census[3], aggregated equid data (equids)[1]
Egypt					2009/10 census[2], disaggregated equid data (horses), (donkeys) and (mules)[2]
Ethiopia					2001/02 census[1] (but sample survey in 2011/12) and LSMS-ISA[1] (in 2015) with disaggregated equid data (horses), (donkeys) and (mules)[2]
Ghana					2017/18 census[3] and disaggregated equid data (horses), (donkeys) and (mules)[2]
Guatemala					2003 census[1], disaggregated equid data (horses), (donkeys) and (mules)[2], part of Feed the Future, and Global Health Initiatives[1]
Honduras					1993 census[0], collecting disaggregated equid data (horses), (donkeys) and (mules)[2]
India					2019 livestock census[3], collecting disaggregated equid data (horses), (donkeys) and (mules)[2], and recent husbandry statistics (2019)
Kenya					2019 HPC with livestock[3], Only donkey data[1]
Kyrgyzstan					2002 census[1] and disaggregated equid data (horses) and (donkeys & mules)[2]
Malawi					2006/07 census[2]. Part of LSMS-ISA[1]. Data for donkeys only[1]
Mali					2005 census[1], disaggregated data for equids (horses) and (donkeys)[2], part of the LSMS-ISA[1] and the Agricultural Development Policy
Mexico					2006 census[2] and disaggregated equid data (horses), (donkeys) and (mules)[2]

[23] Or more appropriate census to particular countries, for example a livestock census where livestock are not included in the agricultural census

Country	Rating poor 1	 average 2	 good 3	 very good 4	Rationale
Mongolia					2011 census[3] with detailed data collected for horses only[1] (donkey population small and reducing)
Namibia					2013/14 census[3] and disaggregated equid data (horses) and (donkeys & mules)[2]
Nicaragua					2011 census[3], disaggregated equid data collected but not presented in results[0]
Niger					2004-08 census[2], disaggregated equid data (horses)(donkeys)[2], part of LSMS as well as GSARS initiatives to improve agricultural data capacity[1].
Nigeria					1984/85 census[0]. No known equid data[0]. Part of LSMS[1]
Pakistan					2010 census[2], no equid data collected[0]
Peru					2012 census[3], no equid data collected[0]
Senegal					2013 census[3], disaggregated equid data (horses) and (donkeys)[2]
South Africa					2017 census[3], only horse data[1]
Sudan					No recent agricultural census[0]. 2008 population census collected livestock data including equids but no results report available[0].
South Sudan					No recent agricultural census[0]. 2008 population census collected livestock data including equids but no results report available[0]. Household surveys 2009, 2015/17[1]
Tanzania					2007/08 census[2] (livestock survey 2017/18) Disaggregated equid data (horses) and (donkeys)[2], part of LSMS-ISA[1]
Uganda					2008/09 census[2], disaggregated equid data (horses) and (donkeys) collected but no figures[0], part of LSMS-ISA[1]. Agriculture survey (AGRIS) 2018 collected disaggregated equid data[2]
United Kingdom					2010 census[2], aggregated equid data[1]
United States of America					2012 census[3], disaggregated equid data (horses) and (mules, burros and donkeys)[2]
Venezuela					2008 census[2], only horse data[1]
Zambia					2017/18 livestock census[3], disaggregated equid data (horses) and (donkeys)[2]
Zimbabwe					No census data available[0] but census planned for 2023. Smallholder survey (PICES)[1] implemented in 2017.

Due to variation between countries in data collection methods and thresholds, there are discrepancies; for example, equids in the UK are not considered agricultural and as such the agricultural census is not really capturing the true equid population, with annual surveys and the CED collating equid population data instead. With the limitations in mind, seven countries were rated 'poor', six were rated 'average', 10 rated 'good' and 13 rated 'very good' with regards to their equid data collection. It is very important to note that the rating does not take into consideration the *accuracy* of data collection, merely how recently livestock data has been collected and whether equid data is included. Thus, being considered 'good' or 'very good' is indicative of equid data collection, but the scope of the review is unable to assess the data accuracy.

Problems in data collection

Capacity

Quantitative analysis of data is difficult due to capacity gaps - it has been said that most LMICs 'lack the capacity to produce and report even the minimum set of agricultural data necessary to monitor national trends or inform the international development debate' [225]. Where there is a lack of analytical expertise, a weak demand for quality statistical data is maintained and 'accepted' as the norm. There is frequent reference to weak capacity for the collection of rural statistics, as described by Loening [107].

Census frequency/Timeliness

There is the obligation for UN member countries to provide official statistics to fulfil the entitlement of citizens to public information [378]. All 36 case study countries (Figure 48) included in this report are UN member states, yet only fourteen have conducted an agricultural or livestock census in the past ten years i.e., since and including 2011, namely Botswana (2015), Brazil (2017), China (2016), Colombia (2014), Ghana (2017/18), India (2019), Mongolia (2011), Namibia (2013/14), Nicaragua (2011), Peru (2012), Senegal (2013), South Africa (2017), United States of America (2012) and Zambia (2017/18). Kenya included an agriculture module in the PHC of 2019; a stand-alone agricultural census was last reported in 1977-1979.

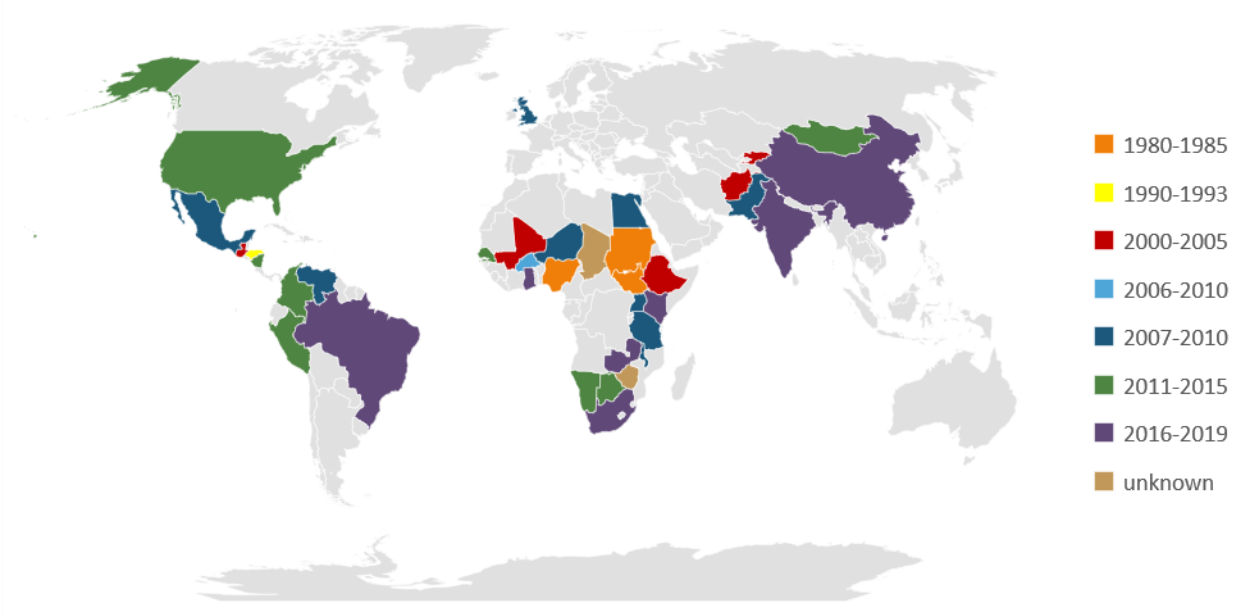

Figure 48. Map highlighting all 32 case study countries, by date of most recent agricultural censusCountries are coloured as per the legend, to depict when the census was implemented. The 2006-2010 group was established specifically for Burkina Faso as its modular census was conducted over these years and as such it did not fit into another grouping. Countries indicated in grey are not included, due to being high-income countries, or being beyond the scope of the project. Censuses were identified in the scoping review. It is possible that there may be more recent census data that is not published/accessible and, as such, the scoping review has not identified.

Eleven countries have implemented agricultural or livestock censuses in the past eleven to fifteen years – Burkina Faso (2006-2010), Egypt (2009/10), Mali (2005), Malawi (2006/07), Mexico (2006/07), Niger (2004-08), Pakistan (2010), Tanzania (2007/08), Uganda (2008/09), United Kingdom (2010) and Venezuela (2008), and four countries in the past 16 to 20 years - Afghanistan (2002/03), Ethiopia (2001/02), Guatemala (2003), and Kyrgyzstan (2002). Four countries censuses were held more than

20 years ago – Honduras (1993), Sudan (1980), South Sudan (1980) and Nigeria (1984). No census history was identified for either Chad or Zimbabwe.

It is generally recommended that agricultural censuses are conducted every ten years [66] and as is described, less than half of the case study countries are meeting this recommendation. However, even with a census every ten years, there can be no available livestock data during the intercensal period [46], and the intercensal gap is too long for time sensitive data, such as the donkey skin trade, where populations may be rapidly changing. There is not regular collection of livestock data, and figures are often generated with extrapolation models which do not always allow for the highly dynamic nature of livestock populations [376].

Surveys are useful for data collection between censuses or for more frequent collection, but it is essential that they are of adequate scope to be nationally representative [65].

Reporting

It has been acknowledged that there must be coordination between international organisations and governments so as to minimise reporting and to prevent confused and duplicated outputs [379]. Both FAO and OIE present national population figures, with most case study countries reporting to FAO. FAO sends annual questionnaires to its member countries [380]. Data can be extracted by FAO from the National Bureau of Statistics or from national database portals, as official channels for data transfer between governments and FAO are lacking and thus there is a gap in reporting data to FAO (personal communication Aluna Chawala, Ministry of Livestock and Fisheries Development, Tanzania).

In general, the great majority of countries described here had equid data figures presented by FAO. In the instance of Kenya and the UK, it is unclear if they receive FAO's questionnaires and were not asked about donkeys or did not provide figures for donkeys. Horses were not included in Kenya's PHC but donkeys were, and yet FAO has provided estimated or imputed figures for Kenya's horse population since 1965 but there is no data for donkeys. The FAOSTAT dashboard is highly user-friendly, in comparison to the OIE interface. There is a lack of clarity over where public-facing data is reported to.

There are many broken or inactive links on government national statistic websites preventing access to census or survey reports. Those that are available are often very out of date, with the most recent yet to be publicly accessible. There are often non-intuitive locations for statistical data, for example, the Ghanaian agriculture census report is located on the 'indiaenvironmentalportal.org' website.

Due to the emotive and political nature of the donkey skin trade, there are many reported population figures presented in media reports, many of which originate from unknown sources. Whilst these figures may be impactful, there is the need for accurate and official data if real trends are to be established.

Obligation/enforcement

Regarding the situation in the UK, there are challenges and problems with the registration system; the National Equine Database was flawed, in part due to the nature of horse-owner locations being different to the residence of owners [342], who are often "landless keepers", and the frequency with which horses move around, for example change yards. Additionally, horses and livestock have different legislation. Even with the compulsory passport and microchip[24] legislation, compliance is dependent on the equine owning community, and enforcement. Failure to comply can be penalised

[24] All equines in England to be microchipped by 1st October 2020; Wales by 12th February 2021; Scotland 28th March 2021 [429]

with fines (<£5,000) [381] but legislation must be monitored in order to identify non-compliance. A study reported 41% of donkeys admitted to The Donkey Sanctuary between 2006 and 2007 did not have equid passports [345] and lack of enforcement of identification has been cited as one of the contributing factors to the 'horse crisis' in the UK [382].

Attitudes

There were objections to the 2007 Nigeria census which led to inaccurate reporting. Kenya reported controversy regarding some questions, in particular regarding ethnicity.

Questionnaire completeness

The Mongolia 2011 agricultural census reported one of the main problems being incomplete filling of the census questionnaire.

Survey coverage

There is wide variation of livestock data availability at country level [376], as is demonstrated in this report. Some counties, such as China, India and Ethiopia provide census data at regional level [108,129,149] and others such as Ghana and Uganda provide at district level [136,383]. Conversely, countries such as Chad and South Sudan are more difficult to find any detailed data [107,278].

It is reasonable to expect a country's census to change, ideally improving, over time, however there are instances where census or survey coverage changes mean that data is not comparable. As an example, the Kenya Population and Housing Census in 2009 collected at district level, whereas the Population and Housing Census in 2019 collected at county and sub-county level, making comparable analysis challenging. In this instance, it appears Constitutional change resulted in this restructuring [384], but there are frequent examples in other instances.

Local administrative units were sometimes reported to be poorly defined – this is a significant barrier to an accurate count as there could be missing or duplicating data if administrative units overlap. The Afghanistan census had issues with confusion over delineation of districts, as it had no consistent district database. Kenya reported boundary disputes of some administrative units which slowed the mapping process.

It is common for multiple ownership of livestock, which can be hugely problematic for reporting, based on whether they are reported on a farm or personal basis [38].

Survey scope

The scope of agriculture censuses is hugely important, with particular respect to inclusion of equid (and especially donkey) data in LMICs. Both the level of statistical development of a country and the significance of the livestock sector to its economy affect the scope of a livestock census [46]. Due to the household-level nature of keeping donkeys, in comparison to much larger commercial holdings, agricultural census data collection often under-estimates livestock numbers as they do not include livestock in non-farming households. Additionally, livestock on small-holdings (below a prescribed minimum size) are often missed, resulting in incomplete coverage. As there are estimated to be around 475 million farms of less than 2 ha (84% of farms globally) [385], there is great potential for excluding these smaller holdings from enumeration.

Working equids are usually kept in small numbers and may not be on a farming household; they may therefore be excluded from agriculture/livestock enumeration. And in rural parts, working equids may be used for non-agricultural means, for example transportation. Enumeration by agriculture/livestock

survey may exclude them (due to the nature of donkeys usually being owned in small numbers, it is household-level population data that is required)

Problems are not only in LMICs; the agriculture census of the United States of America, collected data from holdings producing or selling a minimum of $1,000 during the census year [386], thereby immediately under-estimating livestock populations by excluding the very small holdings, although to what degree is unknown. Similarly, the UK agriculture census collected equid data on commercial holdings only.

Several agricultural censuses had no minimal thresholds/restrictions (see Appendix Table 12). For example, Ethiopia's relaxed scope is more suitable for small holders in LMICs with a holding described as 'all land and/or livestock kept, used entirely or in part for agricultural production…regardless of management, organisation, size or location', and an agricultural household described as such when at least one member of the household cultivates crops and/or raises livestock' [128]. Nicaragua's agricultural census of 2011 reported problems with out-of-date cartography and coverage errors, both under-coverage whereby farms were missed from the register, and over-coverage whereby agricultural holdings were duplicated or non-agricultural holdings were included [223].

Sampling frame problems

The Afghanistan census was not able to develop a suitable sampling frame for random sampling to create 'gold standard' quality data but they acknowledged the issue to address in the future.

Ministry problems

Ineffective provision of services to rural populations from ministries, impaired by their highly centralised nature with a lack of internal coordination mechanisms, was reported for Chad.

However, there is a lack of clarity on the movement of data from a national level to the international level. While most countries carry out some form of agricultural or livestock census, these figures are not always reported to, or presented by, FAO. In some cases, governments may report to OIE; The World Animal Health Information System (OIE-WAHIS) has been undergoing renovation, to improve the exchange of information [387]. It is essential that there is coordination between these international organisations so as to streamline the reporting from member countries [379]. There is the requirement for clear protocols for the collection of data, generation of statistics and dissemination of information. Incentive schemes have been suggested to encourage accurate data collection [47].

What is considered livestock

Datasets vary greatly in content and date range, for each country, and within this variation there were different species considered 'livestock'. For example, in the Zambian National Census for Agriculture (1990-92), livestock were described as cattle, pigs, goats, sheep and chickens [361], with no mention of equids. Similarly in the Ugandan Population and Housing Census Report on the Agricultural Module (2002), the scope and coverage lists "number and type of cattle, number of goats, sheep, pigs and other domestic animals e.g. donkeys, camels etc" and then makes no further reference to donkeys (or any equids) [383]. Whilst it is recognised that livestock are essential to the livelihoods of millions, there is inadequate economic evidence on the interconnectedness of livestock development and poverty reduction, in part due to a lack of available and reliable data [26].

Neglected populations

There are neglected populations of working equids travelling with displaced people, for example in 2003, an estimated 14,000 donkeys transported displaced families to the refugee camps in Darfur,

Sudan; only 16% were reported to have survived after eighteen months [286]. Livestock are particularly vital assets to displaced people, as they are able to travel with, and indeed transport, their owners [26]. These displaced populations will almost certainly be excluded from enumeration.

Wild and free-roaming equid populations are unlikely to be included in census enumeration, unless they have active management policies. Nomadic livestock is notoriously challenging to enumerate, although there are recognised methods for enumerating these populations. Kenya reported enumeration of its nomadic population as being logistically problematic.

The Afghanistan livestock census attempted to establish the Kuchi nomadic livestock producers but acknowledged an underestimate due to irregular migratory patterns because of insecurity at the Pakistan border.

Export data lacking

FAO compiles and presents main results and metadata overviews for country censuses; these provide key results, but export data is lacking. Export data is essential for better understanding the donkey skin trade. Full census reports often report on export statistics, however these reports are much more difficult to locate and access fully in many instances.

Cross-border trade

There is massive informal livestock cross-border movement worldwide, particularly so in Africa – the Horn of Africa has one of the highest rates of live animal movements globally [388] and is predominantly unofficial and unrecorded by governments [389]. This unregulated trade and movement of livestock, including donkeys, makes enumeration challenging, with duplication or missed counts.

Data quality

The data that is collected is of varying quality (accuracy, completeness and comparability) and is infrequently incorporated into national agricultural statistic frameworks [376]. Importantly, while current livestock data can provide overall trends, they provide minimal insight on the socio-economic contributions that livestock make, thus constraining 'pro-poor' livestock development plans [376].

As can be seen from all FAO data presented, population figures are very often estimated or based on imputation methodology. The concern here is that for imputation/modelling to provide accurate outputs, they require up to date and accurate inputs. Where recent empirical/official data are missing or out of date, estimates can only be so accurate. Models, while hugely helpful, cannot replace ground truth data, and there are discrepancies in the FAO database.

Non-response data can cause huge problems with summary statistics, as demonstrated by the Afghanistan census; there was difficulty differentiating between true zero responses and no or missing responses.

Logistical

Staff training was cited as a challenge in the Ghana agriculture census 2017/2018. Lack of in-service training for ministry staff in Chad was reported as part of the problem in providing for rural populations. Numerous censuses reported "widespread logistical problems". Poor renumeration for ministry workers and high staff turnover rates were reported by Chad, and Kenya acknowledged delayed processing of payment of census personnel. Senegal could not implement its modular components due to budget constraints and Kenya reported delays due to financial constraints. Kenya reported poor network connectivity which slowed data transmission within digital tablets. Afghanistan reported security problems which restricted access to some areas during the census.

Similarly, Kenya also reported delays to mapping due to post-election violence. Some donors impose tight timelines, as demonstrated during the Afghanistan census whereby there was not time to wait for equipment to arrive.

The census report of Ghana [139] cited numerous challenges in its implementation, especially causing a reduced pace of work; some of the enumeration areas were larger than intended (sometimes double the planned size) which meant enumeration took much longer and required additional enumeration teams. This unexpected time delay meant that the census ran into the rainy season and areas became inaccessible due to flooding, and the extended time to complete the census brought additional costs. There was a lack of experience in the use of digital data collection means; several brands of devices, in large numbers (more than 4,000 tablets), with staff training was problematic and again caused delays. Additionally, field work was delayed due to insufficient preparation of the census before implementation, and enumeration of agricultural households was delayed, affecting coordination with participants.

Problematic attitudes

It is evident that problematic attitudes and practices with regards to the inclusion of equid data stem from several areas, including culture/tradition and economics, and across sectors. The socio-economic status of working equids is an important concept as a barrier to full recognition of working equids as livestock. While it is acknowledged how vital animals are to livelihoods, the focus is on livestock and not on *working animals* [4] i.e. animals do not need to be productive to contribute. Often the contributions that working animals make are not evident in direct financial gains but rather contributing immeasurably with chores or transportation, and freeing up time that can allow direct income generation.

Education

The review identified a potential theme that may be contributing to the exclusion of equid data within ministries. A recent review by the American Association of Equine Practitioners Foundation (AAEPF) and Supporting Evidence based Interventions (SEBI), University of Edinburgh, suggested that in Ethiopia there was 'minor emphasis on equids' in the veterinary curriculum, after visiting Addis Ababa University and University of Gondar. They found a definite gap in the teaching curriculum of all twelve veterinary colleges (which share 85% of their curriculum), as well as the associated negative impact on welfare and the economy. The review did, however, recognise the support from Agriculture and Education Ministers, University Deans, faculty members as well as representation by the embedded Society for the Protection of Animals Abroad (SPANA) clinic, for collaboration to improve equine training in Ethiopia [390]. It has been speculated that Ethiopia has the desire to conceal its high equid numbers which results in these populations being somewhat invisible to policy-makers and government departments, including the Ministry of Education, and so may be linked to gaps in curriculums [391]. There is currently a national revision of the veterinary curriculum in Ethiopia underway [392].

Similarly, a Brooke survey carried out in 2011, identified 50% of participating Brooke veterinarians reporting little, if any, equine veterinary education prior to working for Brooke, and 11% of participants reporting any previous training to be ineffective [393]. A similar description has been made of the veterinary curriculum at the Sokoine University of Agriculture Veterinary College, where students receive minimal equid training (personal communication, Esron Karimuribo).

There is, therefore, a requirement to review (and improve) veterinary education in these countries, primarily for the welfare of equids in receiving adequate veterinary care, but also to help elevate the status of working equids within government ministries and to extend data collection for equids routinely. Many veterinary graduates go on to careers in the Ministry of Agriculture, so it is essential that the importance of working equids is embedded, promoting positive perceptions towards them. They are vital livestock and yet there appears to be a lack of emphasis on teaching about them. There is a need to promote their importance in order to elevate their status, at University level. The addition of donkey husbandry and management practices curriculums to veterinary institutions (as well as to secondary schools and agricultural colleges) has previously been recommended in Mali, with regards to improving welfare [394].

It appears contradictive that the teaching of equids is being forgotten about in education, when they are contributing to SDG4, by transporting children to school in LMICs such as Honduras and The Gambia [147,395].

Importance of working animals and animal power

Animal power remains highly relevant to smallholder farmers, where it is suitable in terrains that modern machinery is not [26]. However, there has been a general lack of awareness regarding the economic importance of animal power, neglected by government agriculture monitoring as well as academic research [279]. While machinery such as tractors is subsidised, animal-powered transport is excluded [26]. Working animals are often considered to be of low status within communities as well as by governments, despite their significant economic contributions to livelihoods [4]. As well as lack of awareness with regards to socio-economic contributions, there is insufficient recognition of their roles in supporting the elimination of hunger and poverty, child health, gender equality and environmental sustainability [396].

It is thought that a major problem in the promotion of donkeys in developing countries, is a lack of knowledge regarding their socio-economic status, as well as their husbandry and health requirements [397]. In Africa, there is a scarcity of published studies on the socio-economic impacts of working equids [3], thought to be due to donkeys being considered of low status and thus minimal prioritisation of research given to them [397]. Animal owners, and particularly women, are acutely aware of the essential roles that working equids provide to their owners livelihoods, yet there is 'near invisibility at higher levels of policy, research, funding and programmatic decision-making'; these animals must not be forgotten [25].

Socio-economic data are inadequate, if available, for many communities dependent upon working animals, resulting in a poor evidence base for decision making by policy makers [39] and especially so for working donkeys, so often perceived as less valuable than ruminant livestock [12]. When the contributions to a country's economy and society are overlooked, policies and initiatives tend to exclude them, as is often the case with working donkeys [14,15,398].

Working equid status

Equid populations – donkeys, horses, working equids - are marginalised. For horses, this is due in part to the nature of their use in high income countries; the most valuable are 'counted', for example racehorses and eventers, but those with less economic recognition and with more fragmented purposes, often go uncounted [371]. Similarly, where working equids are not fully acknowledged as livestock, they are often omitted in an agricultural context (for example in agricultural censuses) and so are not counted. The tendency to keep one or two donkeys i.e., household level, means they fall

beneath the minimum count for some censuses and surveys and are excluded. There is no easy solution for more accurate enumeration of horses, but the full recognition of working equids as livestock would help their inclusion.

Until very recently, working equids were often not considered as 'traditional livestock', like cattle or sheep, but neither were they considered companion animals, like 'pets' [399], so it is timely that they should be extended due global attention and policy consideration [400].

Following on from the tremendous achievement of Brooke advocacy and the UN's recognition of working equids as livestock, Brooke's ex-CEO Petra Ingram made the statement that "the next challenge is to take this UN endorsement to national governments and help them adapt their livestock policies to include equine welfare" [40].

Agriculture and livestock censuses too often refer to equids as 'others', rather than being referred to in their own right; this reference does not help raise the status of equids within the wider livestock environment. As an example, although disaggregated data is collected in the Indian livestock census, and data are presented for export and import value, and included in livestock and poultry population data (1956-2019), global regional data are then only presented for cattle, buffalo, sheep, goats and pigs [155].

Negative perceptions towards donkeys

There are many attitudes that have resulted in people devaluing and dismissing donkeys. The list is long, but includes the belief that there are too many donkeys, and that they overgraze by eating all day, eating more than cattle. It has been said that they 'poison the ground', kill pasture and cause erosion. They are usually considered non-productive and farmers prefer to have cattle rather than donkeys. It is thought that donkeys are not owned and are not named, that they kick and bite and are stupid or stubborn. Sadly, there are also perceptions that donkeys do not become ill, but they cause road accidents and are expendable [262].

The literature constantly reports negative attitudes; it is rare that developing country governments allow budgetary expenditure on health or welfare of "less regarded species like donkeys" [220], and research of donkeys is thought to be 'backward and not glamorous' by agricultural scientists [401]. Despite their extensive use globally, working with donkeys is considered backwards, underdeveloped and of low status [12]. Where donkeys are considered of less value in comparison to other livestock, smallholder donkey farmers report being excluded from livestock development policies, with extension work excluding donkeys [230].

The small size and slow moving nature of donkeys have been perceived as 'inferiority', and their stubbornness seen as 'stupidity' [402]. Negative traits of donkeys are often not acknowledged as being part of their capacity to survive, and ironically it is their indomitability that allows them to be working animals, providing livelihoods [403]. Sadly, their perceived survivability can also result in their neglect [404]. There can be negative perceptions towards donkeys if they waste the time of their owners by misbehaving, as well as damaging goods. Similarly, owners have been reported to be irritated when donkeys are exhausted from work, due to their dependency on them in their livelihoods [127].

In Ethiopia, there have been perceptions that demonstrating the country's large equid population[25] would emphasize their extensive use of working equids, and be associated with underdevelopment and poverty and as such, potential donors would be disinterested due to perceived lack of

[25] Not specifically donkeys

mechanisation. It was thought better to de-emphasize working equids and promote the country's commercial livestock populations – and associated wealth – in order to attract investors [391]. A review also similarly described the importance of both horses and donkeys to livelihoods in Ethiopia but described them as having low social status [374].

Recommendations

To address data problems and gaps highlighted in the review, recommendations are suggested, to improve the status of working equid data, and to frame policies and programmes. Recommendations are a combination of suggestions identified from the literature as well as the author's own suggestions.

1. **Classification as livestock**. There is the pressing requirement for full and default recognition of working equids as livestock. By properly classifying working equids as livestock, these species should no longer be marginalised, resulting in better inclusion of their data collection. Only once they are fully included can data be consistently generated for them, and it is the provision of data that can then attract more attention and funding opportunities from policy makers. They need to be fully on the radar and agenda. Importantly, their data needs to be embedded in livestock data collection i.e., alongside ruminant livestock. As already advocated by Brooke and FEG, it is hugely important that equid data are collated in the same database as other livestock data [45].

2. **Purpose of equids** needs to be established i.e., agricultural, sporting, traction, companion, to ensure that they are included in appropriate enumeration methods. By capturing data on purpose, working animals are demarcated and can be enumerated specifically. Draught and traction purposes need to be highlighted and included in gross domestic product (GDP) calculations, as they are often intentionally excluded from national accounts, with contributions based on *goods produced* (milk, meat…) [405,406]. The FAO does "suggest that data are collected on births and natural losses of livestock categories, and further sub-divisions, according to age and/or *utilization*" [197].

3. **International standards.** There is the need for improved reporting from national to international level, with some countries currently not fulfilling their obligation to report national data to FAO. International standards, as well as classifications, for data collection should be agreed and implemented, if accurate statistics are to be created. These agreements need to take place at sub-regional level [37]. It is apparent that official census data is often very disparate to figures presented by FAO, which is indicative of a lack of reporting. Although individual census methodology has not been critiqued, official data are likely superior to the generation of an estimate, often based on outdated data - countries should be encouraged to report to FAO.
   The international community is required to continue providing financial and technical assistance, and guidance for suitable data collection methods, including sharing successful programmes.

4. **Link with the Sustainable Development Goals (SDGs)**. The exclusion of equid data is a long-standing issue and there appears to be lack of political will to respond to existing advocacy. Continue to demonstrate and evidence strong links between working equids and their contributions to achieving the SDGs. Promote that working equids allow children to attend school (SDG4) by relieving them of household chores [407]. Promote that equids are a sustainable energy source (SDG11 & 13), without the negative climate effects of ruminant livestock [276], and promote their empowerment of marginalised and vulnerable groups (SDG5) [407] and highlight the links between livestock and rural development [408].

   <u>What will focus attention?</u> Continue to demonstrate strong links to the SDGs. The literature describes the associations between women and donkeys, but with further emphasis on SDG5, it should be advocated for better disaggregated gender data in smallholder agriculture. If positive associations can be demonstrated between donkeys empowering and enabling women, this can

elevate the status of donkeys in the livestock sector. There is the need to demonstrate value in investing in working animals.

Another area that has to be on the political agenda is One Health; approaches should be encouraged in pressing for SDG3 with improved animal disease surveillance; there is the requirement for reliable animal identification and traceability systems, which in turn would aid animal enumeration and monitor trends in population numbers. Whilst the livestock data environment is being discussed, the inclusion of livestock health and disease data should be advocated for as well [37]. There is great potential for One Health collaborative approaches with humanitarian healthcare organisations in displaced migrant camps due to potential zoonoses and communicable disease transmission.

5. **Protect large donkey populations**. Chad and Sudan's apparent high donkey population figures must be protected as they could be targets for the donkey skin trade. Similarly, those donkey populations that appear to be decreasing, such as Botswana, China, Egypt and India, should be investigated as to why they are experiencing such trends and it is essential to create awareness of conservation concerns and publicise their plight. Their respective governments should be aware of this and consider 'pro-donkey' promotion and campaigns to demonstrate a donkey is worth more if kept than if sold to the hide trade, ensuring it is made clear that their value is far greater alive and contributing to livelihoods rather than sold for a quick income - selling productive assets typically puts people at even greater disadvantage in the future. A recent study estimated owner income from working donkeys to be 15-fold greater than the meat and skin value [164].

6. **Peer-reviewed publishing**. Publishing in peer-reviewed and open-access journals so as to allow the widest readership. This review highlights a lack of transparency and availability of data in many cases and there is the requirement to make data fully accessible and disseminated as widely as possible, to ensure the sharing of research, prevent the duplication of efforts and to demonstrate evidence and evidence gaps clearly. Allied organisations, who have the same end-goals, should view each other as colleagues and not as competition, with regular updates on areas of research, so as to avoid duplication.

7. **Improvements to censuses.**
   - **Improved reporting at country level.** In order to provide data for FAO to share internationally and to demonstrate global trends, there is a requirement for countries to cooperate and report population figures consistently. As highlighted, Kenya and the UK do not report donkey numbers to FAO. Strong links and contacts with the FAO should be fostered.
   - **Use of census technology**. Personal Digital Assistants (PDAs) have been reported to help streamline activities, optimise resources and provide quality information in good time, as demonstrated in the 2007 Mexican census. 'New technologies' should be investigated for improving census collection. While logistically challenging, there have been successes of sharing of technology, as seen in Senegal and Côte d'Ivoire [255].
   - **Invest in census communications**. Communication is essential to create a collaborative attitude towards involvement in a census. This should involve media, interpersonal and internal communications. There should be increased participation of local communities in planning and implementing of rural development activities. Ghana invested in a strong publicity strategy with promotional material and media coverage to sensitise the public.

- **Post-enumeration surveys** can be useful to identify shortfalls in census methodology, allowing for improved future approaches [409].
- **Regulatory frameworks** – poorly defined administrative units must be addressed, which requires changes to regulatory frameworks.
- **Checking of collected data** while in the field and during early data entry allows for corrections to be introduced and managed at the time, and is much easier than doing mass-correction post-hoc. The Pakistan census report described measures taken to protect against errors, including inter- and intra-cross checking of tables and comparing with historical data of the same series. Errors identified could be investigated and corrected accordingly, improving data quality.
- **Skills of enumerators** - appropriately skilled census staff make data entry and interpretation easier – adequate language and spelling are essential.
- **Improve data access and timeliness**. Country agriculture and livestock ministry websites and national statistics databases should be updated to include fully functional and active links or PDFs, located in intuitive positions, for most recent censuses or surveys, in a timely fashion. The open access repository 'livestockdata.org' was established to allow data to be 'findable, accessible, interoperable and reusable (FAIR)', to improve the livestock data environment [410] and this FAIR approach should be taken to improve data access. FAO suggests decennial agricultural censuses are conducted, or quinquennially as in the USA and Canada [53]. The latter frequency should be encouraged, in order to establish the most current data, as advocated by Brooke [411].
- **Default inclusion of disaggregated equid and other working livestock data**. The equid species have different roles from each other, different gender associations, and unique health and welfare concerns so grouping them together is not appropriate. Similarly, camels, cattle and equids are all working animals, but their data needs to be captured at species-level.

8. **Unified public-private approach** – in order for agricultural extension to be accessible to the majority of farmers, especially small-scale, there is the requirement for public-private alliances [412–414]. It has been acknowledged that the 'institutional environment' in the animal resources sector is unconducive for drawing private investment, and that there is the need for "reliable data, tools and mechanisms to develop quality investment plans" [44]. There needs to be coordination between local and regional level governments and the encouragement and incentivising of private sector participation.

9. **Involvement in Surveys and integrated schemes**. Countries should consider the use of AGRIS (Integrated Survey) methodology for livestock data collection, whereby core modules can be integrated into wider census programmes. Integrated sample surveys are the only schemes through which considerable data is being generated for livestock policy formation [155].
   The household survey is an appropriate data collection approach for the inclusion of working animal data, due to the small numbers of these working animals usually kept, i.e., household level data rather than agricultural/commercial. Whilst gold-standard approaches in data collection should be strived for, they are often not appropriate where capacity and budgets are constrained; the LSMS-ISA appears to have achieved a "second-best" approach that is scalable and sustainable, with improved data quality compared to established practices [65]. The LSMS-ISA initiative is working well in some countries with regards to equid data inclusion. Ideally data collection should be an on-going process, carried out and reviewed all the time, rather than a huge one-off event.

It is important to note the distinction between *rural* and *agricultural* – a rural survey may include equids/donkeys better than an agriculture survey [415].
Ministerial ad hoc surveys can be useful when there is requirement for critical information with regards to policy and investment [37].

10. **Expansion of data initiatives to include equids.** Existing data initiatives such as the LSMS-ISA, SEBI-Livestock and 50x2030 should expand to include equids, and other working animals. If further engagement between these initiatives allows, SEBI-Livestock will suggest the inclusion of a Brooke representative to join such conversations.
    Funders should support these initiatives to include equid data within the wider livestock sector, particularly official population data to help accurately monitor trends globally, as well as data on their purpose, to demonstrate how their roles contribute to livelihoods, especially working equids in LMICs.

11. **Livestock Identification and Traceability Systems** (LITS). Livestock 247 and SEBI are conducting a LITS pilot study in Nigeria. It is essential to sensitize farmers via community leaders in order to encourage uptake. Care must be taken with regards to associations to identification, for example the use of ear-tags is not well regarded in Nigeria and as such, microchips are used instead. Depending on their level of technology involved, LITS can help with enumeration, and traceability with regards to cross-border movement and its associations with disease surveillance, as well as movement in the donkey skin trade. The feasibility of these systems should be explored by countries attempting to improve data collection. Additionally, there is the requirement to establish the quantity of cross-border trade and governments should be looking to improve border controls, both for reducing the illegal movement of donkeys and for reducing the disease threat of unrestricted livestock movement. A One Health approach could be used to promote the uptake.

12. **Extend participatory research** to establish what working equid owners feel is required to elevate their status. This could be tied in with the Sustainable Development Goals, for example making links with gender equality and highlighting the roles that women have with livestock; as donkeys are often favoured by women there must be gender-disaggregated participation and evidence of contributions that working animals make to different members of communities. By highlighting the roles of women, the use of donkeys can also be highlighted.
    It has been recognised that data collection in LMICs is often ineffective and alternative participatory epidemiological approaches have been developed [416,417] - these methods are being used more commonly in working equid studies [418].
    Community engagement, knowledge exchange and community level data are required to advocate at local levels – local knowledge and leadership are important.

13. **Consider telecoupling research.** A 'telecoupling framework' examines the interconnectedness and impacts of socio-economic and environmental interactions that are linked over distances. Distant interactions such as international trade, knowledge transfer, foreign investment and species dispersal can be considered as telecoupling processes and research can be conducted to study the interrelationships, feedbacks, drivers and effects, as well as mapping routes towards objectives [419–422]**.** Trade is a 'flow' of production and consumption activities that have socio-economic and environmental effects [423]; as mentioned in Botswana's case study, telecoupling has been used to explore the trade of donkey skins from Botswana to China, to examine the demand, exportation, impacts on human-natural systems in Botswana, responses by policy-makers and the problems and advantages of this trade flow [80].

14. **Quantitative economic studies**. Further studies to demonstrate the unequivocal contributions that working animals make, providing quantitative data. This could be tied in with improving welfare and associations to improved productivity. More attention is required to establish these contributions (whether highlighting existing studies and data, or the requirement for more research and data generation) and to inform national and international governments. Quantitative data, such as income earned, are impactful and can elevate the status of working equids in legislation [424] and more of this influential evidence is needed. It has been recognised that there is the vital requirement for assessment of the socio-economic value of donkeys in different places within areas and countries, due to the disparate views and practices in rural and urban communities [127].
    - **Livestock Master Plans** (LMP). These detailed analyses and investment plans assist in advocating for sustainable investments in livestock, by demonstrating returns on investment (often lacking at Ministry level). The plans involve aims and objectives, action plans and budgets and are being carried out in Odisha and Bihar States of India, Ethiopia, Rwanda, Tanzania and Uzbekistan [425]. Preliminary economic data for working equid contributions could be used to demonstrate sustainable investment opportunities.
    - **Livestock in LSMS.** Further inclusion of livestock – including working equids – in LSMS allows for demonstration of how livestock support livelihoods [37].

15. **Collaboration**. There must be communication between data stakeholders (users, providers, sellers and buyers) to ensure sufficient data collection [47] and there needs to be coordination between statisticians, planning and decision-making. There needs to be cross-organisational support and wider institutional support for working equids. Member states are urged to "enhance capacity for timely collection, analysis and sharing of quality data to guide policy, strategy and investment programs" and it is recommended that the African Union Commission (AUC) holds a 'Livestock Summit' whereby governments and heads of state can plan animal resources sector policies and investments [44].
    In 2017, the Livestock Data for Decisions (LD4D) Community of Practice was established, to connect the producers and users of livestock data, including those from academia, industry, funders and livestock advocacy, and to provide a collaborative platform for discussion and innovation and to advance livestock decision-making [410].
    It is essential to share resources and expertise, as exemplified by the International Coalition for Working Equids, working together to drive issues of shared concern. During communications with others involved in this field, it became apparent that similar population data work is ongoing at another working equid NGO [426]; whilst the remits are somewhat differing, it does highlight the necessity for effective channels of communication and collaboration, so as to avoid any duplication of efforts and unnecessary allocation of funds, and the benefit of collaborative working groups, which allow for the sharing of efforts as well as in-country connections. Collaborative exchange programmes between HIC and LMIC university veterinary programmes would be mutually beneficial to students from both settings and should be encouraged to increase working animal awareness and capacity.

16. **Review of veterinary curricula** in LMICs to establish the level of equid prioritisation within training programmes. As so many qualified veterinarians go on to work for ministries of agriculture and livestock, it is essential that they regard equids as part of the livestock species in order to encourage equid data inclusion. Perhaps more importantly than the veterinary professional curriculums, are the para-veterinary programmes, as it is the community animal workers who are

the frontline workers within communities and aware of the levels of attention given to working equids.

Although not explored in this review, but in the same theme of education, working with primary level children, to teach empathy and compassion towards working equids, especially donkeys who are regarded with so many negative perceptions. Instilling improved attitudes towards these animals from a young age could help redress the negative perceptions towards them, over time. In an even more grassroots approach, teaching empathy and compassion towards working animals to primary school children may reduce the negative perceptions traditionally acquired [427,428]. The Dutch Committee for Afghanistan (DCA) is involved in outreach programmes with children, through schools and families [73].
With HIC veterinary programmes having highly international student cohorts, it makes sense to include some level of working equid teaching, whereby those students returning to countries with these species have knowledge and capacity to treat them, as well as promoting positive attitudes towards them. A Global Module, including working equid teaching, has been introduced to the veterinary curriculum at the University of Glasgow (personal communication, Patrick Pollock).

17. **Perception of other working animals**. It could be useful to explore how other working animals are perceived, for example camels, in comparison to equid draught animals – do attitudes to risk perception, and/or values and beliefs differ? It would be of use to survey the value of animal power, including all forms of animal traction – cattle, equids and camels – in rural and urban locales. Animal power, as a renewable source, needs to be recognised and should have policy to support and develop its use [26].

Conclusion

This top-down review approach provides an overview of the equid data available globally, and problems associated with its collection. The case studies describe the data and literature identified in the scoping review, and demonstrate the livestock data collection taking place in individual countries, problems with its collection, whether or not equid data is included and, specifically, problematic attitudes that could be resulting in the exclusion of equid data.

In order to implement drivers for change, it is essential to capture the attention of policy-makers. To do this, the problems must be recognised, which this review has attempted to highlight. The problems are a complex mix, including socio-cultural conventions and attitudes, knowledge, resources, capacity and economics. There is the requirement for government commitment, leadership and investment in sufficient budgets, staff and resources. Additionally, there is the need to break the cycle of inadequate data, leading to poor advocacy, lack of investment from governments and funding resulting in insufficient budgets for development programmes, which ultimately returns inadequate data. Advocacy requires data.

Equid data is on the radar, but there is the need for the classification of equids to be clarified and harmonised, and for data on their *purpose* to be captured. In the case of working equids, they can only be acknowledged as such if their purpose is known, rather than simply their species being enumerated. Similarly, in high-income countries, the multi-purpose nature of equids means that populations can be omitted from enumeration. Where equids have more than one purpose, all purposes must be captured. Working animals, including equids, should be assigned full and consistent recognition as livestock, whereby they are contributing to livelihoods. Where the vast majority of equids in LMICs are in work, they should be included as livestock, as the default, in order to consistently include them. Disaggregated data must be collected for each equid species to allow further analyses; they are susceptible to different diseases and social plights, and they contribute in different ways, so disaggregated data is essential.

There cannot be completely standardised enumeration methodology as individual countries have their own situations and challenges, however, there should be international protocols for enumeration in order to improve the accuracy and timeliness of data collection and to allow for global comparisons. While there are imputation techniques to allow for inferences to be made, and estimated figures may be better than nothing, there remains a need for empirical data, in order to allow models to generate accurate data. Regular ground truth data still remains a requirement. Data should be publicly accessible, located in intuitive, easily accessible locations, and timely so as to be representative of the period from which they were collated. Data collection should also be consistent to allow for comparisons and trends.

In order to implement change at national and international level, there is the requirement for political will. As is already being done, linking working equids with the SDGs and poverty reduction is vital for recognition of how these working animals contribute to household livelihoods. Further quantitative economic analyses are required, to unequivocally demonstrate their contributions, in particular to smallholders and women. With quantitative data, policy-makers can see the figures, where things are being done well and where things are lacking, and attribute funds accordingly. Impactful data are required in order to influence those who can really make change. A holistic approach, from grass-roots, such as educating primary school children about compassion and empathy to help address negative perceptions towards donkeys especially, up to strengthening of government capacity and collaboration between international bodies and national governments, is required in order to address

societal and ministerial attitudes towards working equids and ensure they are included in livestock data and the wider livestock agenda.

There is much room for improvement in livestock data, of which working equids should be implicitly included. There is a real need for connecting those involved in the livestock data environment, and collaboration on approaching critical issues of shared concern. Solutions require working discussions, advocacy and influence of policy-makers, education at all levels, community participation, and investment from public and private sectors. Ultimately, it is improved data that will inform research, decisions and investment, and allow for the perpetuation of a positive cycle of 'good data'.

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Appendix

Table 7. Global populations of donkeys, horses and mules, from 1961 until 2019.Sum of donkey, horse and mule populations totals 117,562,275.
Source: FAOSTAT World +Total

Year	Donkey Population	Horse Population	Mule Population
1961	36,953,785	62,160,403	10,476,686
1962	35,594,948	60,001,313	11,028,433
1963	35,366,873	58,649,668	10,576,824
1964	36,113,888	57,784,013	10,760,604
1965	36,762,123	58,672,660	10,591,048
1966	37,287,227	59,229,981	10,602,635
1967	37,915,209	59,655,942	10,755,427
1968	38,311,983	60,256,116	11,765,114
1969	38,342,749	60,100,684	11,871,724
1970	38,851,988	60,995,938	12,406,658
1971	39,632,996	61,458,101	12,460,532
1972	39,699,182	61,109,410	12,635,878
1973	39,319,061	61,052,649	12,895,363
1974	39,673,418	61,537,450	13,210,024
1975	39,728,705	61,982,100	13,454,318
1976	39,511,391	61,680,141	13,510,559
1977	39,302,707	60,640,616	13,577,857
1978	39,214,678	60,040,430	13,638,470
1979	39,043,743	59,773,400	13,882,508
1980	38,898,054	59,624,911	12,928,509
1981	39,361,071	59,544,698	13,184,856
1982	40,259,828	59,489,750	13,426,066
1983	40,753,260	59,565,349	13,597,832
1984	40,604,521	59,453,304	13,790,437
1985	40,860,698	60,018,546	13,959,362
1986	41,790,624	60,150,420	14,132,603
1987	42,286,844	60,176,373	14,385,277
1988	42,864,949	59,981,887	14,555,369
1989	43,480,548	60,224,196	14,737,837
1990	43,755,945	61,004,289	14,830,213
1991	43,858,571	61,201,649	14,888,184
1992	44,227,638	61,114,736	15,011,346
1993	42,035,610	59,241,829	14,963,425
1994	42,312,422	59,291,293	14,839,434
1995	42,753,155	59,782,479	14,478,247
1996	41,864,717	59,294,720	13,705,572
1997	40,980,246	58,025,028	13,052,602
1998	41,203,688	57,762,466	13,018,048
1999	41,698,878	57,817,135	13,019,428
2000	41,501,382	57,735,289	12,877,572
2001	41,904,464	57,919,620	12,754,832

Year	Donkey Population	Horse Population	Mule Population
2002	42,490,260	57,012,814	12,638,041
2003	42,304,459	57,862,436	12,389,178
2004	42,222,818	58,554,173	12,169,815
2005	42,196,349	59,421,508	11,933,673
2006	42,507,577	59,589,597	11,784,846
2007	42,620,837	59,799,759	11,640,656
2008	41,699,754	59,695,863	11,105,588
2009	40,490,861	58,959,897	10,282,768
2010	40,124,250	58,171,130	9,547,073
2011	40,273,830	58,065,581	9,478,818
2012	47,351,567	56,806,663	9,332,087
2013	47,356,506	56,598,683	9,110,642
2014	47,771,973	57,139,281	9,166,205
2015	50,402,905	57,199,350	8,866,801
2016	50,860,113	58,086,790	8,701,321
2017	50,484,968	58,015,927	8,335,063
2018	49,918,522	58,029,927	7,991,667
2019	50,583,572	59,041,725	7,936,978

Table 8. Global total equid populations (donkeys, horses and mules) in 2019.Total excludes China Hong Kong SAR, China mainland and China Taiwan Province, i.e., only China included in total count. The total count, 115,939,027. Source: FAOSTAT World >List

Country	**Total equids**
Afghanistan	1,699,463
Albania	86,649
Algeria	151,516
Angola	5,446
Antigua and Barbuda	2,227
Argentina	2,652,042
Armenia	12,348
Australia	223,918
Azerbaijan	88,559
Bahamas	
Bahrain	
Barbados	5,556
Belarus	47,149
Belize	10,738
Benin	1,447
Bhutan	39,725
Bolivia (Plurinational State of)	1,227,024
Bosnia and Herzegovina	14,292
Botswana	165,947
Brazil	7,891,952
Burkina Faso	1,296,197
Cabo Verde	18,510
Cambodia	30,864
Cameroon	59,853
Canada	402,701
Central African Republic	
Chad	4,889,900
Chile	324,127
China	6,988,595
China, Hong Kong SAR	1,535
China, mainland	6,986,200
China, Taiwan Province of	860
Colombia	1,437,929
Comoros	5,543
Congo	81
Cook Islands	302
Costa Rica	142,494
Cuba	984,432
Czechia	31,964
Democratic People's Republic of Korea	48,264
Democratic Republic of the Congo	

Country	Total equids
Denmark	41,860
Djibouti	8,372
Dominican Republic	663,158
Ecuador	341,049
Egypt	958,190
El Salvador	125,451
Eswatini	18,263
Ethiopia	11,367,650
Fiji	47,618
French Polynesia	2,200
Gambia	78,239
Georgia	49,420
Ghana	17,839
Grenada	740
Guatemala	182,437
Guinea	5,897
Guinea-Bissau	7,807
Guyana	3,602
Haiti	788,533
Honduras	274,786
Iceland	67,000
India	620,831
Indonesia	393,454
Iran (Islamic Republic of)	1,846,215
Iraq	440,704
Ireland	82,010
Israel	10,600
Jamaica	37,008
Japan	13,832
Jordan	9,063
Kazakhstan	2,881,248
Kenya	2,137
Kuwait	1,159
Kyrgyzstan	551,551
Lao People's Democratic Republic	23,720
Latvia	8,400
Lebanon	22,038
Lesotho	173,967
Libya	75,703
Lithuania	12,934
Luxembourg	4,669
Madagascar	658
Malawi	6,448
Malaysia	4,258
Mali	1,728,520

Country	Total equids
Mauritania	397,459
Mauritius	230
Mexico	12,955,040
Mongolia	4,214,858
Montenegro	3,965
Morocco	1,503,000
Mozambique	49,831
Myanmar	94,767
Namibia	204,417
New Caledonia	11,276
New Zealand	38,445
Nicaragua	325,173
Niger	2,167,382
Nigeria	1,445,093
North Macedonia	8,952
Norway	34,787
Oman	22,623
Pakistan	5,984,000
Panama	96,607
Papua New Guinea	2,047
Paraguay	264,792
Peru	1,718,595
Philippines	252,218
Poland	185,494
Puerto Rico	10,518
Qatar	7,524
Republic of Korea	24,918
Republic of Moldova	33,738
Romania	447,791
Russian Federation	1,290,873
Saint Lucia	2,906
Saint Vincent and the Grenadines	1,316
Samoa	8,953
Sao Tome and Principe	385
Saudi Arabia	130,490
Senegal	1,054,560
Serbia	13,721
Sierra Leone	443,328
Slovakia	6,960
Slovenia	19,000
Solomon Islands	152
Somalia	45,822
South Africa	491,534
South Sudan	397,787
Sri Lanka	1,366

Country	Total equids
Sudan	8,413,365
Suriname	283
Switzerland	81,461
Syrian Arab Republic	84,424
Tajikistan	217,322
Thailand	6,426
Timor-Leste	50,777
Togo	5,305
Tonga	11,842
Trinidad and Tobago	5,844
Tunisia	382,387
Turkey	272,866
Turkmenistan	50,836
Uganda	19,587
Ukraine	255,889
United Arab Emirates	446
United Kingdom of Great Britain and Northern Ireland	418,856
United Republic of Tanzania	187,885
United States of America	10,754,770
Uruguay	415,133
Uzbekistan	433,762
Vanuatu	7,600
Venezuela (Bolivarian Republic of)	1,037,515
Viet Nam	50,692
Yemen	738,558
Zambia	2,200
Zimbabwe	629,311
Total	**115,939,027**

Table 9. Global donkey (ass) population for 2019 and 1999 for comparison.Source: FAOSTAT

Country	Donkey Population 1999	Donkey Population 2019
Afghanistan	919,940	1,562,239
Albania	120,000	55,000
Algeria	171,150	86,987
Angola	4,500	4,428
Antigua and Barbuda	1,400	1,730
Argentina	95,000	61,541
Armenia	6,585	1,562
Australia	2,000	1,924
Azerbaijan	32,800	25,780
Bahrain		
Barbados	2,000	2,290
Belarus	8,500	9,049
Belgium		
Benin	500	634
Bermuda		
Bhutan	18,168	17,952
Bolivia (Plurinational State of)	631,000	634,991
Botswana	325,000	139,524
Brazil	1,236,401	788,595
British Virgin Islands		
Bulgaria	220,525	
Burkina Faso	723,634	1,253,587
Cabo Verde	13,500	16,030
Cameroon	37,000	40,056
Central African Republic		
Chad	349,982	3,621,240
Chile	28,000	15,339
China	9,558,000	2,600,700
Colombia	405,000	90,978
Comoros	5,000	5,543
Costa Rica	7,600	8,324
Croatia	4,000	17,926
Cuba	6,400	
Cyprus	5,200	
Democratic Republic of the Congo		
Djibouti	8,600	8,372
Dominican Republic	145,000	156,596
Ecuador	269,000	61,155
Egypt	3,000,000	871,447
El Salvador	3,000	3,245
Eswatini	14,700	16,427
Ethiopia	3,098,850	8,740,174
France	27,489	
Gambia	32,981	75,213

Country	Donkey Population 1999	Donkey Population 2019
Georgia	11,396	10,164
Ghana	14,300	14,914
Greece	68,093	
Grenada	660	660
Guadeloupe	150	10,030
Guatemala	9,700	2,359
Guinea	1,950	5,251
Guinea-Bissau	4,900	1,021
Guyana	1,000	199,028
Haiti	210,000	23,329
Honduras	22,900	
Hungary	3,500	
India	797,000	194,344
Iran (Islamic Republic of)	1,554,000	1,533,730
Iraq	375,000	379,242
Ireland	6,500	5,000
Israel	5,000	
Italy	23,000	
Jamaica	23,000	23,000
Jordan	12,400	5,998
Kazakhstan	29,000	28,992
Kyrgyzstan	65,000	28,441
Lebanon	16,000	14,109
Lesotho	203,368	116,553
Libya	29,000	30,000
Liechtenstein		
Madagascar	150	158
Malawi	2,150	6,376
Mali	847,810	1,144,336
Malta	500	
Mauritania	200,900	330,578
Mauritius	60	60
Mexico	3,250,000	3,284,347
Mongolia	1,491	40
Montserrat		
Morocco	1,000,500	927,000
Mozambique	23,000	49,831
Namibia	174,584	154,007
Netherlands Antilles (former)		
Nicaragua	8,500	9,081
Niger	1,311,600	1,911,661
Nigeria	1,000,000	1,342,609
Oman	28,000	22,623
Pakistan	3,750,000	5,417,000
Paraguay	32,000	35,117

Country	Donkey Population 1999	Donkey Population 2019
Peru	535,000	650,008
Portugal	37,758	
Puerto Rico	2,000	2,000
Republic of Korea	-	-
Republic of Moldova	3,000	3,772
Réunion	10	
Romania	31,000	
Russian Federation	25,000	7,750
Saint Helena, Ascension and Tristan da Cunha	500	
Saint Lucia	1,260	637
Saint Vincent and the Grenadines	7,000	1,316
Samoa	35	7,000
Sao Tome and Principe	98,060	47
Saudi Arabia	377,000	98,803
Senegal	19,000	482,594
Somalia	210,000	22,717
South Africa		146,136
South Sudan		397,787
Spain	140,000	
Sudan (former)	730,000	7,620,268
Suriname	20	5
Switzerland	10,852	33,614
Syrian Arab Republic	219,044	69,373
Tajikistan	105,700	136,015
Thailand	30	30
Togo	3,300	3,421
Trinidad and Tobago	2,000	2,354
Tunisia	230,000	242,342
Turkey	603,000	133,953
Turkmenistan	24,500	24,881
Uganda	17,800	19,587
Ukraine	12,000	11,889
United Republic of Tanzania	179,000	187,885
United States of America	52,000	51,971
United States Virgin Islands		
Uruguay	1,350	1,671
Uzbekistan	196,700	186,691
Venezuela (Bolivarian Republic of)	440,000	440,000
Western Sahara		
Yemen	500,000	736,624
Zambia	1,700	2,200
Zimbabwe	226,000	599,780
Total	**41,698,086**	**50,582,688**

Table 10. Global horse population for 2018 and 1998 for comparison.Note that totals exclude China Honk Kong, China mainland and China Province of Taiwan i.e., China count includes these
Source: FAOSTAT

Country	Horse Population 1999	Horse Population 2019
Afghanistan	104,000	113,046
Albania	63,000	31,649
Algeria	45,980	48,632
Angola	900	1,018
Antigua and Barbuda	460	497
Argentina	3,600,000	2,543,908
Armenia	11,959	10,748
Aruba		
Australia	220,000	221,994
Austria	75,347	
Azerbaijan	55,800	62,726
Bahamas		
Barbados	1,000	1,266
Belarus	228,700	38,100
Belgium-Luxembourg	60,000	
Belize	5,000	6,087
Benin	389	813
Bermuda		
Bhutan	31,255	16,792
Bolivia (Plurinational State of)	340,000	509,316
Bosnia and Herzegovina	43,000	14,292
Botswana	32,500	22,930
Brazil	5,831,341	5,850,154
British Virgin Islands		
Bulgaria	133,370	
Burkina Faso	31,316	42,610
Cabo Verde	490	570
Cambodia	25,000	30,864
Cameroon	16,500	19,797
Canada	380,000	398,701
Chad	198,101	1,268,660
Chile	435,000	301,918
China	8,983,124	3,673,395
China, Hong Kong SAR	1,500	1,535
China, mainland	8,981,000	3,671,000
China, Taiwan Province of	624	860
Colombia	2,500,000	1,144,651
Congo	65	81
Cook Islands	307	302
Costa Rica	114,500	128,778
Croatia	13,000	
Cuba	430,400	944,701
Cyprus	650	

Country	Horse Population 1999	Horse Population 2019
Czechia	22,675	31,964
Democratic People's Republic of Korea	45,000	48,264
Democratic Republic of the Congo		
Denmark	40,485	41,860
Dominican Republic	330,000	360,876
Ecuador	521,000	196,886
Egypt	48,000	83,675
El Salvador	95,800	98,096
Estonia	3,900	
Eswatini	1,350	1,725
Ethiopia	1,206,730	2,319,656
Falkland Islands (Malvinas)		47,618
Fiji	43,700	
Finland	56,200	
France	393,186	
French Guyana	250	
French Polynesia	2,200	2,200
Gambia	21,915	3,026
Georgia	34,100	39,163
Germany	524,000	
Ghana	3,000	2,925
Greece	30,573	
Greenland		
Grenada	30	30
Guadeloupe	950	
Guam		
Guatemala	119,000	133,448
Guinea	2,700	3,538
Guinea-Bissau	1,850	2,556
Guyana	2,400	2,421
Haiti	490,000	504,238
Honduras	178,000	181,267
Hungary	69,700	
Iceland	77,330	67,000
India	801,000	342,226
Indonesia	484,285	393,454
Iran (Islamic Republic of)	120,000	133,818
Iraq	46,000	51,059
Ireland	75,500	82,010
Israel	4,000	4,000
Italy	288,000	
Jamaica	4,000	4,008
Japan	25,000	13,832
Jordan	3,300	2,259
Kazakhstan	986,300	2,852,256

Country	Horse Population 1999	Horse Population 2019
Kenya	2,100	2,137
Kuwait	1,150	1,159
Kyrgyzstan	335,200	522,611
Lao People's Democratic Republic	28,000	23,720
Latvia	22,000	8,400
Lebanon	4,000	3,267
Lesotho	98,933	56,847
Libya	40,000	45,703
Liechtenstein		
Lithuania	74,300	12,934
Luxembourg		4,669
Madagascar	460	500
Malawi	42	72
Malaysia	3,337	4,258
Mali	164,774	584,184
Malta	1,000	
Martinique	2,000	
Mauritania	35,860	66,881
Mauritius	150	150
Mexico	6,250,000	6,382,699
Mongolia	3,059,100	4,214,818
Montenegro		3,965
Morocco	149,200	191,000
Myanmar	120,000	93,768
Namibia	66,072	43,631
Netherlands	115,166	
New Caledonia	11,500	11,276
New Zealand	70,000	38,445
Nicaragua	245,000	268,076
Niger	216,706	255,721
Nigeria	204,000	102,484
North Macedonia	59,847	8,952
Norway	26,959	34,787
Pakistan	325,000	371,000
Panama	166,000	95,505
Papua New Guinea	2,000	2,047
Paraguay	361,500	219,108
Peru	675,000	751,076
Philippines	230,000	252,218
Poland	551,000	185,494
Portugal	58,000	
Puerto Rico	6	5,884
Qatar	3,680	7,524
Republic of Korea	8,163	24,918
Republic of Moldova	64,000	29,966

Country	Horse Population 1999	Horse Population 2019
Réunion	440	
Romania	839,000	447,791
Russian Federation	1,800,200	1,282,964
Saint Helena, Ascension and Tristan da Cunha		
Saint Lucia	1,000	1,136
Saint Pierre and Miquelon		
Samoa	1,799	1,953
Sao Tome and Principe	240	306
Saudi Arabia	3,000	31,687
Senegal	446,000	571,966
Serbia and Montenegro	76,000	13,721
Sierra Leone	380,000	443,328
Slovakia	9,550	6,960
Slovenia	12,100	19,000
Solomon Islands	120	152
Somalia	750	899
South Africa	258,000	329,992
South Sudan		
Spain	248,000	
Sri Lanka	1,500	1,366
Sudan (former)	550,000	792,459
Suriname	360	278
Sweden	79,710	
Switzerland	48,509	47,076
Syrian Arab Republic	26,576	12,757
Tajikistan	67,100	81,307
Thailand	7,350	6,348
Timor-Leste	38,000	50,777
Togo	1,600	1,884
Tonga	11,400	11,842
Trinidad and Tobago	1,000	1,442
Tunisia	57,040	57,290
Turkey	330,000	108,076
Turkmenistan	25,000	25,955
Ukraine	721,300	244,000
United Arab Emirates	330	446
United Kingdom of Great Britain and Northern Ireland	180,000	418,856
United States of America	5,170,000	10,702,799
United States Virgin Islands		
Uruguay	500,000	409,365
Uzbekistan	148,500	247,071
Vanuatu	3,100	7,600
Venezuela (Bolivarian Republic of)	500,000	525,515
Viet Nam	149,600	50,692
Wallis and Futuna Islands		

Country	Horse Population 1999	Horse Population 2019
Yemen	3,000	1,934
Zimbabwe	25,500	28,276
Total	**57,789,742**	**57,419,470**

Table 11. Global mule population for 2019 and 1999 for comparison.Source: FAOSTAT

Country	Mule Population 1999	Mule Population 2019
Afghanistan	30,000	24,178
Albania	22,000	
Algeria	48,900	15,897
Argentina	180,000	46,593
Armenia	200	38
Azerbaijan	100	53
Barbados	2,000	2,000
Belgium-Luxembourg		
Belize	4,400	4,651
Bermuda		
Bhutan	10,251	4,981
Bolivia (Plurinational State of)	81,000	82,717
Botswana	2,500	3,493
Brazil	1,335,771	1,253,203
British Virgin Islands		
Bulgaria	16,478	
Cabo Verde	1,750	1,910
Canada	4,000	4,000
Chile	9,000	6,870
China	4,739,000	714,500
Colombia	505,000	202,300
Costa Rica	5,000	5,392
Cuba	24,200	21,805
Cyprus	1,500	
Dominican Republic	138,000	145,686
Ecuador	157,000	83,008
Egypt	1,700	3,068
El Salvador	23,800	24,110
Eswatini	85	111
Ethiopia	236,980	307,820
France	14,456	
Georgia	140	93
Greece	32,732	
Grenada	50	50
Guadeloupe	100	
Guatemala	38,500	38,959
Guyana	150	160
Haiti	80,000	85,267
Honduras	69,500	70,190
Hungary	200	
India	205,000	84,261
Iran (Islamic Republic of)	173,100	178,667
Iraq	11,000	10,403
Ireland	800	

Country	Mule Population 1999	Mule Population 2019
Israel	1,600	1,600
Italy	10,000	
Jamaica	10,000	10,000
Jordan	1,900	806
Kyrgyzstan	520	499
Lebanon	5,800	4,662
Lesotho	900	567
Libya		
Liechtenstein		
Malta	300	
Mauritius	20	20
Mexico	3,280,000	3,287,994
Morocco	526,600	385,000
Myanmar	1,300	999
Namibia	6,600	6,779
Nicaragua	45,700	48,016
Pakistan	163,000	196,000
Panama	4,000	1,102
Paraguay	14,300	10,567
Peru	235,000	317,511
Portugal	17,244	
Puerto Rico	2,500	2,634
Republic of Korea		
Réunion	5	
Russian Federation	90	159
Saint Lucia	1,000	1,133
Sao Tome and Principe	25	32
Somalia	18,000	22,206
South Africa	14,000	15,406
South Sudan		
Spain	117,000	
Sudan (former)	620	638
Switzerland	439	771
Syrian Arab Republic	13,989	2,294
Thailand	25	48
Trinidad and Tobago	1,700	2,048
Tunisia	81,000	82,755
Turkey	133,000	30,837
United States of America	28,000	
United States Virgin Islands		
Uruguay	3,700	4,097
Venezuela (Bolivarian Republic of)	72,000	72,000
Zimbabwe	1,100	1,255
Total	**13,019,320**	**7,936,869**

Table 12. Overview of methodological details from all country agricultural censuses.
All are agricultural censuses with the exception of Afghanistan, which has a livestock census, and Kenya, which has a Housing and Population census, with agricultural module; India and Zambia both have more recent livestock censuses, as well as agricultural censuses – both are detailed for completeness. China is reported to have conducted a 2016 agricultural census but this has not been identified; the accessible 2006 agricultural census is described. Where there is no information, this is due to older census reports being unavailable. This table provides an overview, please refer to full census methodology within individual reports

Country	Agricultural census year	Census scope/ Statistical unit	Geographical coverage	Methodology	Use of tech	Inclusion of equids (aggregated/ disaggregated)
Afghanistan	2002/03 (livestock census)	Livestock producing households	Complete enumeration for agroecological region, provincial, district level. Rural and urban	Complete and sample enumeration	GPS was intended	Horses. Donkeys.
	2016-17 Living Conditions Survey	Household	Whole country, excluding insecure districts	Sampling at community level. CAPI	Mobile and wireless tech. and GPS	Horses. Donkeys.
Botswana	2015	Agricultural holding with at least one of land for crop production, or raising a cow, goat, sheep, donkey/mule, horse or pig	Whole country, excluding urban areas	Household sector enumerated with sampling. Non-household sector compete enumeration	GPS. Results disseminated online	Horses. Donkeys & Mules.
Brazil	2017	Agricultural holding, no cut-off thresholds although more details from holdings above a threshold	Whole country, including urban areas	Classical. No sampling	Electronic questionnaires into PDAs integrated with GPS. Data disseminated online	Horses. Donkeys. Mules.
Burkina Faso	2006-10	Agricultural holding, regardless of size.	Whole country. Supplementary modules did not cover large urban areas	Modular approach followed Population and Housing census 2006	Results disseminated online	Horses. Donkeys.
Chad	-	-	-	-	-	-
China	2006	Agricultural holding – household agricultural holding or non-household agricultural holding.	Whole country, urban and rural. Excluding	Classical. Complete enumeration. PAPI	Scanning for data capture. Results	No. But disaggregated

Country	Agricultural census year	Census scope/ Statistical unit	Geographical coverage	Methodology	Use of tech	Inclusion of equids (aggregated/ disaggregated)
	(2016 census conducted but no results identified)	Minimum 67 m^2 of arable or permanent crop land; 67 m^2 woodland and pasture; >1 medium or large livestock (cattle, horse, pig, sheep); >20 small animals (rabbits, poultry); income of agricultural products >RMB 500; income from providing agricultural services >RMB 500.	Taiwan Province, Hong Kong and Macau.		disseminated online	equid population data are collected in the annual agricultural statistical yearbook. Horses. Donkeys. Mules.
Colombia	2014	Agricultural production unit and non-agricultural production unit	Rural areas of the country. Urban excluded	Classical approach. Complete enumeration, no sampling	Digital aerial photography and satellite images. CAPI with smartphones. GPS. Online results dissemination	Equids
Egypt	2009/10	Agricultural holding > 87.5 m^2 or >1 cow, buffalo or camel, or 5 sheep, goats or combination, or 100 poultry or ten beehives, or one fishery cage, or with an agricultural machine. Those with pigs or draught animals not considered agricultural holdings	Whole country, both rural and urban	Classical. Complete enumeration, no sampling. PAPI.	No info available	Horses. Donkeys. Mules.
Ethiopia	2001/02	Agricultural household, >1 member of household engaged in crops or livestock	All country districts, rural and urban, excluding Afar and Somali Regional States	House to house interview	Unknown	Horses. Donkeys. Mules.

Country	Agricultural census year	Census scope/ Statistical unit	Geographical coverage	Methodology	Use of tech	Inclusion of equids (aggregated/ disaggregated)
Ghana	2017/18	Agricultural household and those involved in any agricultural activities	Whole country, excluding embassies and consulates	PAPI and focus groups for a community module. CAPI Complete enumeration and sampling of supplementary modules	CAPI (tablets)	Horses. Donkeys. Mules.
Guatemala	2003	Agricultural holdings	Whole country, excluding insecure areas (Andrés Sajcabajá)	Classical approach. Complete enumeration	Unknown	Horses. Donkeys. Mules.
Honduras	1993	Agricultural holdings (all land >0.2 Ha used for agriculture or livestock	Whole country.	Classical approach with complete enumeration	Unknown	Horses. Donkeys. Mules.
India	2010/11	Operational holding, comprising land for agricultural production and operated as one technical unit, defined as same means of production e.g., labour, machinery, animals, credit. No exclusions	Whole country.	Modular approach. Compete and sample enumeration	Results disseminated online	No
	2019 (livestock census)	Households, household enterprises and non-household enterprises (farm houses and institutions, cooperatives, trusts). Both rural and urban	Country-wide, with exception of some parts of Assam and Arunachal Pradesh, for admin reasons	Complete enumeration and detailed sampling. (methodology defined by Indian Agricultural Statistics Research Institute)	Tablets for data collection and web-based data validation	Horses & ponies. Donkeys. Mules.
Kenya	Module in 2019 PHC	Household	Whole country	Canvasser method, complete enumeration	Mobile devices (tablets) for data collection and mapping	Donkeys only
Kyrgyzstan	2002	Farms and subsidiary holdings (agriculture as secondary activity)	Whole country	PAPI	Unknown	Horses. Donkeys & Mules.

Country	Agricultural census year	Census scope/ Statistical unit	Geographical coverage	Methodology	Use of tech	Inclusion of equids (aggregated/ disaggregated)
Malawi	2006/07	Agricultural household, excluding those in non-household sector	All rural and peri-urban areas	Sample enumeration. PAPI	GPS. Scanning for data capture. Online results dissemination	Donkeys only.
Mali	2005	Agricultural holdings (traditional and modern)	Whole country	Complete enumeration of modern holdings and sample of traditional holdings	Unknown	Horses. Donkeys.
Mexico	2006/07	Production unit with i) land with or without agriculture/forestry in rural areas or with agriculture activity in urban, ii) animals for agricultural purposes. No thresholds/exclusions	Whole country	Classical. Complete enumeration. CAPI	Satellite images supported fieldwork during enumeration CAPI method Results disseminated online	Horses. Donkeys. Mules
Mongolia	2011	Households and Enterprises with agricultural production. No thresholds	Whole country, both rural and urban	Classical. Livestock households were sample enumerated, other agricultural holdings enumerated completely	Satellite images for census mapping and GIS for data dissemination. Results disseminated online	Horses only.
Namibia	2013/14	Agricultural holdings, defined as economic units of agricultural production. No thresholds	Whole country	Household sector sampled, non-household sector complete enumeration. CAPI for household sector, mail-out/mail-back for non-household sector	CAPI for data collection. Bluetooth data transmission between enumerators and supervisors.	Horses. Donkeys & mules.

Country	Agricultural census year	Census scope/ Statistical unit	Geographical coverage	Methodology	Use of tech	Inclusion of equids (aggregated/ disaggregated)
					Online results dissemination	
Nicaragua	2011	Agricultural holdings. No thresholds.	Whole country	Classical approach. Complete enumeration. Post-enumeration survey also carried out.	Results disseminated online (INIDE website)	(Horses) (Donkeys) (Mules) But no data presented in results
Niger	2004-08	Agricultural (farm) household, defined as "household where any member practices agriculture without being only an employee in agriculture"	Whole country, excluding urban	Modular (core and supplementary/thematic). Compete for core and sampling for supplementary/thematic modules. PAPI	GPS Results disseminated online	Horses. Donkeys.
Nigeria	1984/85	-	-	-	-	-
Pakistan	2010	Holding (farm) normally used for crops. Minimum 0.05 ha and >1 cattle and/or buffalo, 5 sheep and/or goats for livestock	Whole country	Sample-based, classical approach	Results disseminated online	No
Peru	2012	Agricultural unit of land used for agricultural production, including livestock, regardless of size	Whole country, including urban	Classical. Complete enumeration	Scanning for data capture. Results disseminated online	No
Senegal	2013	Household with >1 member practicing agricultural activities	Whole country	Integrated with PHC (population household census??). Complete enumeration. CAPI	Digitized mapping of EAs. CAPI, with use of PDAs. Results disseminated	Horses. Donkeys.

Country	Agricultural census year	Census scope/ Statistical unit	Geographical coverage	Methodology	Use of tech	Inclusion of equids (aggregated/ disaggregated)
					through ANSD website	
South Africa	2017	Farming enterprise, farming units involved in growing crops/market gardens/horticulture; farming animals; mixed farming; agricultural and animal husbandry services; game propagation	Whole country	Classical. Complete enumeration. CAPI	CAPI (tablet & desktop) Results disseminated online.	Horses.
Sudan	1980 (Population and Housing census 2008 included livestock - but no report found)	-	-	-	-	-
South Sudan	1980 (Population and Housing census 2008 included livestock - but no report found)	-	-	-	-	-
Tanzania	2007/08	Agricultural holding, economic unit of agricultural production, consisting of livestock and land used for agricultural production. Minimum 25 m^2 arable land and >1 cattle, five goats/sheep/pigs, or 50 chicken/ducks/turkeys	All large-scale farms and rural smallholders only. Excluded urban and peri-urban	Classical approach. Included a community survey. Complete large-scale farm enumeration, sampled small-holders to provide district-level estimates. PAPI method and mail-out/mail-back	Intelligent Recognition (ICR) scanning. ArcGIS	Horses. Donkeys.
Uganda	2008/09	Agricultural holding (farm) defined as an economic unit of	All 80 districts	Modular approach. Complete enumeration of	GPS	Horses. Donkeys.

Country	Agricultural census year	Census scope/ Statistical unit	Geographical coverage	Methodology	Use of tech	Inclusion of equids (aggregated/ disaggregated)
		agriculture production, no thresholds		private large-scale and institutional farms, small and medium farms household-based holding sampled	Results disseminated online	(but no figures)
UK	2010	Agricultural holding which produces agricultural products. >5 ha of UAA; 1 ha orchards/permanent crops; 0.5 ha vegetables; 0.1 ha glasshouse for flowers/veg/fruit; ten cattle, 50 pigs or ten breeding sows; 20 sheep; 20 goats; 1000 poultry; mushrooms	Whole country.	Classical approach, and administrative registers as a source of data. Complete enumeration of all holdings above threshold, and sampling of 31,000 holdings	CATI. Online completion optional in England. Results disseminated online	Equines (Equidae)
USA	2012	Farms, >1000 USD of agricultural produce	National, state and county or county-equivalent level	Classical. Complete enumeration, no sampling. Mail-out/mail-back and Electronic Data Reporting (EDR) online, CATI and CAPI	CAWI CAPI CATI Scanning for data capture. Online database	Horses. Mules, burros & donkeys.
Venezuela	2008	Agricultural production units (UPAs) of minimum 0.5 ha; vegetables/flowers for commercial; 5 ha grassland; 20 same-species fruit trees; five cattle; 15 pigs, 15 goats or 15 sheep; 100 same species birds; five beehives; 25 m^2 water for aquaculture; any production unit with organic crops, nurseries or crops with special techniques; or > 100 other animals of	Whole country	Classical approach and complete enumeration. CAPI method with PDAs	CAPI and PDAs. Results disseminated online.	Horses.

Country	Agricultural census year	Census scope/ Statistical unit	Geographical coverage	Methodology	Use of tech	Inclusion of equids (aggregated/ disaggregated)
		agricultural production. Household producers, and Communal Micro Areas (MACs).				
Zambia	2000	Agricultural households	Whole country	Complete enumeration and post-enumeration survey	unknown	Donkeys.
	2017/18 (livestock census)	Agricultural households	Sampled areas of Zambia, rural and urban	Interviews (unknown if PAPI or CAPI). Sampling enumeration	unknown	Horses. Donkeys.
Zimbabwe	-	-	-	-	-	-