National Livestock
Data Standard

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MINISTRY OF AGRICULTURE

DEVELOPMENT GATEWAY
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TABLE OF CONTENTS

LIST OF TABLES

ACRONYMS

ADE	Animal Data Exchange
ADGG	African Dairy Genetic Gain
ADNIS	Animal Disease Notification and Investigation System
ADR	Animal Data Recording
AGID	Agar Gel Immunodiffusion
AIR	Animal Identification and Registration
BcofS	Body Conformation Score
BCS	Body Condition Score
BHB	Beta Hydroxybutyrate
BMGF	Bill and Melinda Gates Foundation
CBC	Complete Blood Count
CIAT	International Center for Tropical Agriculture
CRT	Capillary Refill Time
DEFRA	Department for Environment, Food, and Rural Affairs
DNA	Deoxynucleic Acid
DOVA	Disease Outbreak and Vaccination Report
ELISA-AG	Enzyme-Linked Immunosorbent Assay for Antigens
ELISA-AB	Enzyme-Linked Immunosorbent Assay for Antibodies
ELSAME	Ethiopian Livestock Sector Analysis, Management Entity
ESGPIP	Ethiopia Sheep and Goat Productivity Improvement Program
ET	Ethiopia
ET-LITS	Ethiopian Livestock Identification and Traceability System
FAO	Food and Agriculture Organization of the United Nations
IBC	Institute of Biodiversity Conservation
IFA	Indirect Fluorescent Antibody
GPS	Global Positioning System
GC	Gregorian Calendar
GDP	Gross Domestic Product
IGAD	Intergovernmental Authority for Development
ICPALD	IGAD Center for Pastoral Areas and Livestock Development
ICAR	International Committee for Animal Recording
ICT	Information and Communications Technology
ID	Identification number
ILRI	International Livestock Research Institute
IM	Intramuscular
IMMI	Intramammary Infusion
ISO	International Organization for Standardization
IU	International Unit

IVacc	Imported Vaccines
IV	Intravenous
KOH	Potassium Hydroxide
LDH	Lactate Dehydrogenase
LIC	Livestock Improvement Corporation
LIS	Livestock Information System
LITS	Livestock Identification and Traceability System
LMIS	Livestock Marketing Information System
LMP	Livestock Master Plan
LVacc	Locally Produced Livestock Vaccines
MoA	Ministry of Agriculture, Ethiopia
mRNA	Messenger RNA
PAG	Pregnancy Associated Glycoprotein
PO	*Per os*
PCR	Polymerase Chain Reaction
RNA	Ribonucleic Acid
SC	Subcutaneous
SCC	Somatic Cell Count
SGP	Sheep and Goat Production
SILAB	Sistema for Laboratoria (laboratory information management system)
TADs	Transboundary Animal Diseases
UID	Unique Identification
UTC	Universal Time Coordinated
VN/SN	Virus (Serum) Neutralization
UN/CEFACT	United Nations Centre for Trade Facilitation and Electronic Business
WHO	World Health Organization
WTO	World Trade Organization

FOREWORD

Agriculture is the foundation of the Ethiopian economy, and the overall economic growth of the country is highly dependent on its success. Livestock is an integral part of the agricultural sector, accounting for about 46% of the country's agricultural gross domestic product (GDP). Ethiopia has the largest livestock population in Africa, and over 80% of its population depends on the sub-sector for income, employment, nutrition, and other benefits.

Despite the potential and importance of the livestock sub-sector, its productivity has remained relatively low. One key impediment to the development of this sub-sector is the current state of the livestock information system (LIS) in Ethiopia. The system is significantly impacted by input data of variable quality and limited analytical capacity resulting in a lack of timely and accurate information from flowing to stakeholders such as the government agencies, livestock keepers, health professionals, researchers, and traders. Thus, to inform policy making for resource allocation, improve service delivery, and enhance the productivity of the sub-sector and the livelihoods of the actors across the value chain, reliable, comprehensive, and timely data on population, health, genetics, markets, and other segments is needed.

Without access to regular, reliable, timely, and useful information, the Ethiopian Ministry of Agriculture (MoA) will encounter challenges in ensuring agricultural prosperity. Indeed, poor-quality data, fragmented systems, and limited analytical capacities have already limited the government's ability to plan, implement, and monitor livestock growth strategies. In this context, a fit-for-purpose LIS that is interoperable with new and old information platforms should be developed. Backed by data integrity guidelines, this LIS should fill data gaps, provide analytics, and disseminate appropriate information to stakeholders. This LIS will be critical for monitoring the achievement of strategic goals, enabling evidence-based decision-making for governmental policy, increasing production and productivity, streamlining supply chains, reducing operational costs, and improving smallholders' access to information, inputs, and markets. The system may also enable the government to mitigate the effects of drought and animal disease outbreaks in Ethiopia.

This document focuses on the standardization of livestock data across Ethiopia. Such standardization will not only improve the quality and availability of livestock data but also allow multiple information systems to communicate with each other. Data standardization will also facilitate the integration and interoperability of different information systems that collect and manage livestock data at different levels and sectors. Moreover, standardization will boost the MoA's capacity to analyze and use livestock data in its planning, policymaking, programming, and resource allocation discussions. It will further support the creation of a revamped LIS and strengthen data governance and capacity building activities.

The MoA would like to thank the Development Gateway (DG) for technical support, the Bill & Melinda Gates Foundation (BMGF) for financial support, and all the livestock professionals and ICT teams that helped bring this document to fruition.

(Message from the state minister for Livestock & Fisheries Resources Development)

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The visionary leadership of FDRE Ministry of Agriculture's Minister Dr. Girma Amente and Livestock and Fisheries Resources Development State Minister, Dr. Fikru Regassa, played a monumental role in steering this endeavor toward success.

Thank you for your dedication and support.

EXECUTIVE SUMMARY

***Background*:** Livestock dominates the Ethiopian agricultural economy, accounting for about 46% of agricultural GDP. Despite the importance of the livestock sub-sector, its productivity has remained relatively low. The current state of the information system is a key impediment to the development of the sub-sector. This system is significantly impacted by the variable quality of data inputs and the limited analytical capacity at present. To meet specific user needs, data needs to be integrated for analytics and visualization purposes; existing information systems also need to be made interoperable. Standardizing data across all systems will thus improve information exchange and allow for uniformity in data reporting.

As part of the data standardization process, international best practices were modeled. All relevant stakeholders were also engaged in the process, with the MoA playing a key ownership role in planning discussions. This document contains standardized data sets for national animal data recording, animal disease, diagnosis, treatment, and vaccination recording, animal events recording, location, and other additional attributes. The standard preparation follows the recommendation made in the LIS-roadmap (2021) which is in line with ICAR (2022).

Animal Data Recording (ADR): ADR refers to the collection of information that will help the national animal identification and registration (AIR) scheme at the household level. It includes information related to livestock (such as animal ID, species, sex, birth date, breed, lactation and health status, animal ownership, etc.). These records are used to improve information flow and lay the foundation for animal and animal product traceability, disease control, genetic improvement of animals, annual planning, and the acquisition of bank loans and insurance.

A unique identifier (tag number or ear tag) is used for animal identification purposes. This identifier is a 10-digit number that is preceded by the ISO country code for Ethiopia (ET) (i.e. record about 10 billion animals). Different numbers are used for different kinds of animals. For example, tag numbers that start with 0, 1, 2, 3, and 4 are used to identify cattle (i.e., their range is from ET 0000000000 and ET 4999999999). The tags numbers used to identity other types of animals are listed below:

- Sheep (ET 5000000000 to ET 5999999999)
- Goats (ET 6000000000 to ET 7499999999)
- Camel (ET 7500000000 to ET 75999999999)
- Chicken (ET 8000000000 to ET 9999999999)

The ADR domain also contains records about animal species (namely cattle, sheep, goats, and camels). The species are prioritized according to the LIS-Roadmap (2021). Any other related animal information such as sex, birth date, breeds (indigenous, cross, and exotic) and reproduction information (progeny, lactation category) are also covered in ADR.

Species and breed types/names have been standardized to allow for uniformity in reporting/recording. The [*SpeciesTypeCode.BreedTypeCode.BreedNameCode*] format has been used for standardization. The numbers "1", "2", "3", and "4" are the respective codes for cattle, sheep, goats, and camels, whereas "01", "02" and "03" represent indigenous, exotic, and cross breeds, respectively. The numbers of indigenous, exotic, and crossbreeds vary and are mainly based on the Ethiopia livestock master plan, ICAR, and Institute of Biodiversity Conservation (IBC) documents. Accordingly, 25 indigenous cattle breeds are given a code from 01 to 25, based on their alphabetical order. The same logic is applied for coding exotic (from 01 to 04) and cross (01 to 05) cattle breeds. Similarly, goats, sheep, and camels are given codes based on their breed/species. For example, there are 19 indigenous, 3 cross, and 2 exotic goat breeds, while there are 13 indigenous, 5 cross, and 7 exotic sheep breeds. Each of these breeds has a particular coding. The seven types or breeds of camels have codes ranging from 01 to 07.

Recording of Animal Events: Animal events are any of the numerous events that take place throughout an animal's life cycle. There are five major categories of events, namely:

- Registration and movement (i.e., arrival, birth, tagging/registration, retagging/replacement, and death and departure)
- Milking (i.e., test day result and dry off)
- Reproduction (i.e., insemination, abortion, parturition, pregnancy diagnosis, synchronization, and heat/estrus)
- Performance (i.e., conformation score, weight)
- Health (i.e., diagnosis, treatment, and vaccination)

For recording purposes, the event category, name of a specific event, and the detailed description of the event involving an animal are noted down.

Livestock rearers can comply with relevant regulations and standards by recording events related to the traceability, health and welfare of animals under the registration and movement category. For this reason, events such as arrival, birth, tagging/registration, retagging/replacement, and death and departure are filed under this category. Similarly, the milking category is used to record and evaluate how well dairy cows produce milk. The reproduction category is likewise used to measure and improve the genetics of animals across Ethiopia. The remaining performance and health categories are respectively used to track animal growth or rearing (from birth to slaughter) and manage the health statuses of individual livestock or entire herds (e.g., by recording vaccinations).

***Animal Disease, Diagnosis, Treatments, and Vaccinations Recording*:** Vast numbers of animal diseases affect different species of animals and humans. Exhausting all the diseases that affect animal species is neither easy nor in the scope of this document. Rather, the most common diseases within tropical environments, including Ethiopia, are listed in this document. As indicated above, ICAR is used as a main source of disease listing and categorizations for standardization.

The standardization of animal diseases is critically important, particularly as diseases can have multiple names. Additionally, different systems may have various methods of abbreviating the name of a single disease. These variations in names and abbreviations can create misunderstandings among data users. They can also create errors and hinder system interoperability. Taking these problems into consideration, this document suggests a method of standardizing the reporting of common animal diseases, diagnostic methods, treatments, and vaccinations. This standardization will allow different users to access organized information about livestock diseases. Indeed, existing systems such as ET-LITS, ADGG, DOVAR2, ADNIS, and NLMIS have no standardized pattern of reporting various livestock-related data, and this limitation makes the systems largely incompatible.

In this document, animal diseases are categorized based on etiology/causative agents, including infectious (i.e., bacterial, viral, fungal, and prion), parasitic, and the affected systems. Some 127 infectious, 47 parasitic, and 215 system-based diseases have been cataloged. Of the 127 infectious diseases, 55 are bacterial, 54 are viral, 3 are prion, 14 are fungal, and 1 is unknown. The 215 system-based diseases/disorders affect the integumentary, lymphoid, cardiovascular, respiratory tract, digestive tract, urinary, locomotors, and central nervous (CNS) systems and the sensory organs. They also include reproductive disorders, metabolic diseases and deficiencies, poisonings, and behavioral disorders. The list of the diseases affecting cattle, sheep, goats, and camels is exhaustive to the extent that some have a probably low risk of occurring in Ethiopia. Though the scope of this work is limited to these four species of animals, some diseases affecting other species of animals are included in the list as well (as they are already being reported by systems such as DOVAR2).

A specific naming convention has been used for all diseases listed throughout this document. For example, only one name is used for a disease with multiple common names. This single name is to be used for various communications and system reporting. The abbreviations of all diseases and disorders are similarly given in a uniform pattern. The internationally agreed-upon abbreviations for certain diseases are directly used as they are in this document. For others, a uniform abbreviation method has been created (e.g., using the first three-to-five letters of the disease. In case of similarities, additional letters are used). To standardize recording of diseases with multiple names and to create uniformity across all the livestock stakeholders, only the first name is to be reported and all the other names indicated in parentheses will not be used.

In the veterinary medicine field, common protocols are used to categorize information on diagnostic techniques, treatments, and vaccinations. Accordingly, the most common diagnostic techniques fall under the clinical examination and laboratory examination category. Clinical examinations take place before laboratory examinations, and they cover health histories, observations, and physical examinations of an animal. For laboratory examinations, different tests are conducted, including microbiological (bacteriology, virology, and mycology), parasitology, molecular biology, clinical chemistry, cytology, fluid analysis, haematology, histopathology,

serology, and toxicology tests. Additionally, diagnostic procedures may be carried out as part of laboratory exams. These include radiography, ultrasonography, computerized tomography (CT) scan, magnetic resonance imaging (MRI), cystoscopy, colonoscopy, endoscopy, rhinoscopy, bronchoscopy, endocrine testing, fluoroscopy, and biopsy.

Following a diagnosis, different treatment approaches may be taken, including palliative, preventive, curative, antimicrobial (includes antibacterial, antiviral, and antifungal protocols), anthelmintic, ectoparasiticide, antidote, anti-pain, and surgical interventions (minor and major surgeries or operative procedures). With respect to treatments, common routes of administration can include intravenous (IV), intramuscular (IM), subcutaneous (SC), *per os* (PO), intramammary infusion (IMMI), intrauterine (IU) bolus, intranasal droplet (IN), intraperitoneal (IP), and topical interventions.

The animal disease management approach in Ethiopia follows the principle of 'prevention is better than treatment.' Given this priority on disease prevention, Ethiopia established the National Veterinary Institute to solely produce vaccines in the country. This institute produces and distributes about 19 vaccines designed for livestock disease prevention and control. Additionally, 15 vaccines are imported and registered by the Ethiopian Agricultural Authority's veterinary drug standard setting and information preparation and dissemination team. The 'LVacc' abbreviation is used for locally produced livestock vaccines while the 'IVacc' abbreviation is used for important vaccines. Both these abbreviations are followed by abbreviations of the animal diseases they prevent. In general, vaccine names and administration routes are abbreviated and coded for use by all livestock disease databases.

Additional Attributes: Additional attributes refer to data that does not fall into any of the above-listed animal data/event recording and health -related categories. The key additional attributes to be standardized relate to:

- Livestock production (i.e., farming) system
- Age categorization
- Animal grading

There are several sub-attributes under the livestock production system, including production system (urban, per-urban, mixed, pastoral, and agro-pastoral), land, labor, and capital investment (intensive, extensive, and semi-intensive) and farm size (small, medium, and large scale).

Similarly, the age categorization attribute has several parameters, including life expectancy and age at puberty/maturity. The age parameters for four different animals are listed below:

Species	Immature	Young	Adult	Old
Cattle		≤1 year	1-3 years	≥ 10 years
Camel	≤3 years	3-7 years	7-15 years	>15 years
Sheep and Goats		<1 year	1-4 years	>4 years

There are also several parameters under the animal grading attribute, namely body condition, conformation, weight, age, and sex of animals. Animals have four possible grades (1, 2, 3, 4) which depend on their body condition and conformation scores (with some consideration also given to their age, sex, and weight). However, the procedures used to determine body condition and conformation scores vary depending on the species of animal (cattle, sheep, goats, and camels) and production purposes (e.g., for beef or dairy).

1. BACKGROUND

Agriculture is the foundation of the Ethiopian economy and has a huge impact on the country's overall economic growth rate. Agriculture accounts for one third of GDP and nearly two thirds of exports; it also employs over two thirds (about 65%) of the labor force. In this context, agricultural production must significantly increase to support the country's growing population, which is expected to exceed 200 million by 2050.

Livestock is an integral part of the agricultural sector, accounting for about 46% of Ethiopia's agricultural GDP. Livestock produce several economic benefits - for example, the trade of live animals and their products generates foreign currency and thereby supports Ethiopia's future prospects. Ethiopia has the largest livestock population in Africa, and over 80% of its population depends on the sub-sector for income, employment, and nutrition.

Regardless of the huge potential of livestock production and productivity, the benefits from the sub-sector remain relatively low. One key impediment to the development of this sub-sector is the current state of the LIS, which is impacted significantly by variable quality data inputs and limited analytical capacity. This problem prevents timely and accurate information from flowing to stakeholders such as government agencies, livestock keepers, health professionals, researchers and traders. Furthermore, existing information systems struggle to deliver necessary data and analytics due to lack of interoperability - this leads to gaps in available data, poor timeliness, and incomparability of data inputs. This problem is further compounded by a lack of data sharing, governance, and integrity regulations and guidelines. Individual directorates thus maintain data that cannot be easily combined and analyzed to create clear information about the status of the livestock sector. Such clarity would inform policy making for resource allocation, improve service delivery, and enhance productivity of the sub-sector and the livelihoods of the actors across the value chain. Reliable, comprehensive, and timely data about livestock population dynamics, health, genetics, markets, and other segments must consequently be made available for use by any concerned stakeholder.

Data and system interoperability will be a cornerstone for the future scaling and sustained use of a LIS. A high level of interoperability between databases and information systems will allow data to be integrated for analytics and visualizations that meet specific user needs. However, data will first have to be standardized if different livestock systems are to consistently change data and become interoperable. It would be challenging for the systems to communicate with each other and exchange data without standardization.

The data standardization made in this project lay ground for interoperability in the process of data integration not only for the five prioritized databases (ET-LITS, ADGG, DOVAR2, ADNIS and NLMIS), but also for the remaining and upcoming databases. In future phases, the databases will be made interoperable, and all relevant data will be incorporated into a central LIS platform. Hence, the creation of strong data standard policies and guidelines will ensure a supportive environment

for sustainable data flows along different government channels. Data standardization must be relevant and appropriate for a range of current and future systems. As part of the data standardization process described in this document, international best practices were modeled. All relevant stakeholders were also engaged in the process, with the MoA playing a key role in planning discussions.

The livestock data standardization process described in this document is in line with recommendations made by the LIS-roadmap, which in turn are based on the livestock data exchange standards and specifications published by the International Committee for Animal Recording (ICAR). Several leading international livestock organizations collaboratively developed the ICAR specifications to standardize common data concepts and facilitate interoperability between different systems within the wider livestock value chain. Hence, by leveraging and adopting the ICAR specifications, the datasets in the future LIS will be interoperable and aligned with local and international standards.

2. RATIONALE

The current livestock data collection and management systems in Ethiopia are fragmented, inconsistent, and incomplete. Standardization is one way of improving the quality and availability of livestock data across multiple information systems in Ethiopia. This means developing and implementing common definitions, formats, indicators, and protocols for collecting, processing, storing, and sharing livestock data among different stakeholders. Standardizing data can help to reduce duplication, inconsistency, and the incomparability of data sources and enhance the efficiency, accuracy, and usability of data for decision making. Standardizing data also facilitates the integration and interoperability of different information systems that collect and manage livestock data at different levels and sectors.

One key advantage of data standardization is the enhanced interoperability of information systems. Interoperability of systems means enabling different information systems to communicate and exchange data with each other seamlessly and securely. Interoperability can help create a comprehensive and coherent picture of the livestock sector by aggregating data from multiple sources and platforms. Interoperability can also support the analysis and dissemination of livestock data for planning, monitoring, evaluation, and learning purposes. Interoperability can be achieved by using common standards, protocols, formats, and interfaces for data exchange and establishing effective coordination mechanisms among different actors involved in livestock data management.

Developing a standardized and interoperable livestock information system in Ethiopia can bring many benefits to the livestock sector. For example:

- Registration of animals can help establish the identity, ownership, traceability, and health status of individual animals or groups of animals. This can improve animal health management, disease control, breeding programs, and market access.

- Market data can provide information about the supply, demand, prices, quality, and trends of livestock products and services. This can improve market efficiency, competitiveness, transparency, and profitability of producers and traders.
- Health data can provide information about the prevalence, incidence, distribution, impact, and control of livestock diseases. This can improve animal health surveillance, diagnosis, treatment, prevention, and response. In addition, livestock health data can help prevent and control zoonotic diseases that can move from animals to humans and pose public health risks.

This livestock data standard document, which focuses on four species (cattle, sheep, goats, and camels), will help standardize data across the multiple fragmented systems. Standardization is important to ensure interoperability and integration of data for improved planning and decision-making purposes.

3. PURPOSE AND OBJECTIVE

The purpose and objective of this document is to provide a common framework for the collection and exchange of data related to livestock production, health, genetics and market information. The document defines the key concepts, terms, approaches, and formats that are relevant for the livestock sector to ensure consistency as well as interoperability between different data sources and stakeholders. Furthermore, the document facilitates the integration of livestock data with other domains such as environment, food security, trade, and public health that support evidence-based decision making and policy formulation.

The document has four core components, namely recording of animal data (registration), recording of events that occur throughout an animal's life cycle, health-related information, and other attributes related to animals (including animal grading, farming systems, and more).

4. SCOPE

The scope of this document pertaining to the standardization of data is described to ensure clarity and precision for readers.

Species covered: Cattle, goats, sheep, and camels.

Data Components Standardized: Across these species, the collected data to be standardized include:

- **Animal recording (registration):** This covers the data elements for animal recording (unique animal identifiers, species, sex, birth dates, breed, parentage, etc.) with standard definitions and data types.

- **Animal event recording:** This includes major events that happen across an animal's lifetime, such as birth, movement, diagnosis, treatment, birthing, performance (weight), milking, and death.
- **Animal health, diagnosis, treatment, and vaccination recording:** This covers a standardized and coded list of diseases and vaccines as well as standard definitions of health-related terms.
- **Recording of key additional attributes:** Animal grading, farming systems, and farmer recording are included in this section.

The document's scope is limited to the standardization of key data elements across the four species previously described. It does not, however, include data governance aspects. These aspects are covered in another separate data governance reference document. Five prioritized database systems, namely LITS, ADNIS, DOVAR, Genetic Database, and LMIS, will directly adopt the data standards per an implementation guideline that will be produced. Other currently functional information systems within the livestock data will adopt the data standards in due time. To ensure further interoperability across the livestock ecosystem, future database systems to be developed should also adhere to the outlined data standards.

5. LIVESTOCK DATA: STANDARDS AND DICTIONARY

5.1. Guiding Principle

This section describes the guiding principles for ensuring interoperability, re-use of data, ease of finding/searching data, making updates to existing systems and historical data, and making data accessible and compliant with national and international standards for improved data exchange and consumption.

- **Interoperability:** The principle of interoperability is central to the development of data standard guidelines. Different data systems, platforms, and software applications must be able to seamlessly exchange and interpret shared data. This interconnectivity ensures that data from one source can be fully understood and utilized by another, promoting more effective communication and collaboration across different sectors of the livestock industry.
- **Reuse of Data:** A hallmark of a well-constructed data standard is the ability to reuse data efficiently. Instead of re-collecting or re-entering information, the guidelines are developed in a way that allows data, once captured, to be repurposed for multiple needs. This approach not only economizes resources but also ensures consistency and accuracy in data's representation across different platforms or use cases.
- **Ease of Finding/Searching Data:** For data to be truly useful, it must be easily retrievable. This guideline places a significant emphasis on structuring data in a manner that is intuitive and user friendly. With organized hierarchies and clear labeling, users can quickly locate, retrieve, and utilize the information they need without unnecessary complications.

- **Feasibility of Updates:** As the livestock sector evolves, so too must the systems that manage its data. This guideline has been designed with adaptability in mind, ensuring that updates to existing systems and historical data can be executed without undue burden. Whether integrating new findings, incorporating additional species, or adjusting to new technologies, the standard anticipates and accommodates the need for change.
- **Accessibility and Compliance:** Making data readily available to relevant stakeholders is a cornerstone of this guiding principle. Accessibility does not compromise security or privacy; rather, it operates within the bounds of national and international standards. Compliance with these standards not only ensures the broad availability of data but also guarantees the safe, ethical, and legal exchange and consumption of data. By aligning with recognized standards, the guideline also facilitates improved data exchange on a global scale, fostering collaborative efforts and insights that transcend borders.

In essence, these guiding principles form the backbone of the livestock data standard. They seek to create a harmonized, efficient, and robust framework that caters to the current and future needs of the livestock sector, always with the focus on clarity, consistency, and collaboration.

5.2. Animal Data Recording

5.2.1. Background

Continuous and sustainable animal data recording (ADR) is needed to improve the flow of information related to livestock and its production. ADR is used for animal and animal product traceability, disease control, genetic improvement of farmers' animals, annual planning, and acquisition of bank loans and insurance. As such, the section covers the standard definitions and data types of various ADR elements (e.g., unique animal identifies, species, sex, birth dates, breed, and parentage). It also offers guidance on how to collect information and highlights the implications of incomplete/inaccurate data.

The Ethiopian Livestock Identification and Traceability System (ET-LITS), which is used to identify and register animals, was started in 2017. The ET-LITS is managed by the Livestock Identification and Traceability (LIT) Directorate (now structurally under Ethiopian Agricultural Authority), which is accountable to the Ministry of Agriculture (MoA). The LIT Directorate manages ET-LITS in collaboration with the ICT Directorate, which houses the system in its datacenter. The LIT Directorate tags and records animals, allowing ET-LITS to track their lifespans.

Currently, animal identification and registration is only carried out on cattle for export. There is a plan to cover more animals, track the production, processing, distribution, and transport of livestock into the broader retail market, and ensure animal health and food safety. As such, the main users of the information in ET-LITS are involved in the health and trade sectors. Tagging and recording of animals also acts as a deterrent to cattle theft and can lead to improvements in management and productivity.

5.2.2. Animal Identification

Animal identification is the use of unique identifiers and registration systems to identify animals individually or collectively by their epidemiological units. The unique identity number given to an animal a is used throughout its lifespan, both in the country of birth and all other countries, and this number is never subsequently shared by any other animal of the same or different species (ICAR, 2014).[1] However, lost identifiers (such as ear tags) can be replaced according to the guidelines outlined in the Animal Health, Welfare, and Veterinary Public Health Proclamation No. 00/2016 Article 26, No. 1-4.

The LIT Directorate at the Ethiopian Agricultural Authority (which is accountable to MoA) is responsible for the overall management of national animal identification. This responsibility includes tagging animals and arranging the tags. A unique animal identifier (tag number or ear tag)

[1] ICAR (2014). International Conference on "Key Principles of Creation of National Systems of Identification and Traceability of Farm Livestock." https://www.icar.org/index.php/icar-meetings-news/moscow-2014/. Accessed date July 20, 2023.

is a 10-digit number preceded by the alphabetic ISO country code (ET). With this 10-digit format, about 10 billion animals can be assigned a unique identification number. The cattle tag numbers start with 0-4, while numbers for sheep, goats, camels, and chickens/others start with 5-6, 6–8, 8, and 8–9, respectively (Table 1).

Table 1: The Country Code (ET) and the Range of Code Numbers Categorized by Species

Species	Country Code	Range of Code Numbers by Species	Total Numbers to be Tagged	Final Tag Displayed on the Animals
Cattle	ET	0,000,000,001 to 4,999,999,999	4, 999,999,999	ET 0000000001 to ET 4999999999
Sheep	ET	5,000,000,000 to 6,499,999,999	1,500,000,000	ET 5000000000 to ET 6499999999
Goats	ET	6,500,000,000 to 8,499,999,999	2,000,000,000	ET 6500000000 to ET 8499999999
Camels	ET	8,500,000,000 to 8,599,999,999	100,000,000	ET 8500000000 to ET 8599999999
Chickens & others	ET	8,600,000,000 to 9,999,999,999	1,400,000,000	ET 8600000000 to ET 9999999999
Total			**9,999,999,999**	

Ear Tags: Ear tags with the unique 10-digit identifier can be different in terms of size and/or coloring, based on the species of the animal. For example, a device with a unique national identification code is used to distinguish individual cattle. This identification device consists of twin tags attached to both ears of the animal. It is a yellow, plastic ear tag marked with the Ethiopian country code (ET) and 10 digits printed on both sides (six digits are printed using small fonts while four digits are printed with large fonts to ease identification from a distance). The device is properly and securely attached on both ears of the animal to prevent easy detachment and loss.

Figure 1: Sample of the national identification device with unique animal identification code, the tag fixer, and the animal with the tag (picture to be edited for final version)

Table 2: Identification Scheme and ID

Item	Description	Example
Identification Scheme	The identifier (in reverse domain format) of an official scheme that manages unique identifiers.	et.gov.etlits
ID	A unique identification of the animal according to the defined scheme (10 digits as per the description above), preceded by the alphabetic ISO country code (ET)	ET 0000000013

Table 3: Identification Data Fields

Field Name	Identifier	
Description	A unique identifier of an animal	
Required?	Required	
Display Name	Type	Acceptable Values / Example
Identifier	Object Identifier scheme and ID	e.g., "identifier": { "id": "string", "scheme": "string" },
Implications if field is not completed / accurate		

5.2.3. Animal Species

A class of individuals grouped by their common attributes and assigned a common name; a division subordinate to a genus. It is a group of actual or potentially interbreeding populations that are reproductively isolated from other such groups. The common animal species in Ethiopia include cattle, sheep, goats, camels, horses, donkeys, mules, and pigs. Species is one of the most specific classifications used to describe animals.

The system of binomial nomenclature is currently used to describe animals. This system uses the genus as the first name, which is always capitalized, and the species name as the second name, which is always lowercase. However, there are some discrepancies in the naming of species of animals in most cases. For example, the terms 'bovine' and 'cattle' are often used interchangeably for various purposes, such as data collection for disease occurrence, market price determination, traceability, and genetic classification. However, it is important to note that 'bovine' does not have a specific scientific name; instead, it refers to domestic animals of the species *Bos indicus* and *Bos taurus* (cattle) or *Bubalus bubalis* (water buffalo). Therefore, it is more accurate to use the colloquial name of a given species. In this particular case, cattle is recommended as the standard term for these species, rather than bovine.

By the same token, it is more sensible to use the terms sheep, goat, camel, pig, cat, dog, horse, donkey, and mule rather than ovine, caprine, camelidae, swine, feline, canine, and equine, respectively.

Bovine: Animals of the species *Bos indicus and Bos taurus* (cattle), *Bubalus bubalis* (water buffalo), *Bison* spp (bison), or hybrids such as Beefalo (*Bos Taurus* x *Bison bison*). General characteristics include cloven hooves and usually at least one sex of a species having horns, unless the line is from "polled" (hornless) genetics. The only bovine species currently found in Ethiopia is cattle (*Bos taurus* and *Bos indicus*).

Ovine: The scientific species name given to sheep (*Ovis aries*), or animals resembling sheep.

Caprine: A term relating to goats, including the domestic goat (*Capra hircus*) and the wild goat (*Capra aegagrus*).

Feline: Under the feline family (family Felidae), there are 36 species, including the domestic cat, Chinese desert cat, fishing cat, cheetah, puma, jaguar, leopard, lion, lynx, tiger, caracal, jaguarundi, ocelot, serval, and Eurasian lynx. Among these, house/domestic cats are found in Ethiopia.

Equine: Members of the horse family, including horse, donkey, mule, hinny, and zebra. They have single hoofed feet.

Canine: Includes dog (*Canis lupus familiaris*), the domestic mammal of the family Canidae (order Carnivora). It is a sub-species of the gray wolf (*Canis lupus*) and is related to foxes and jackals.

Table 4: Scientific Names of Different Domestic Animal Species

S.N.	Species	Scientific name	Subfamily
1	Cattle	*Bos taurus & Bos indicus*	Bovine
2	Camel	*Camelus*	Camelidae
3	Sheep	*Ovis aries*	Ovine
4	Goat	*Capra hircus*	Caprine
5	Horse	*Equus caballus*	Equine
6	Donkey	*Equus asinus*	Equine
7	Mule	*Equus mulus*	Equine
8	Cat	*Felis catus*	Feline
9	Dog	*Canis lupus familiaris*	Canine
10	Pig	*Sus scrofa domesticus*	Swine
11	Chicken	*Gallus gallus domesticus*	Avian
12	Bee	*Anthophila*	Apinae

Table 5: Species Data Field

Field Name	Species	
Description	Species of the animal **Note:** See the list of species names in the above table	
Required?	Required	
Display Name	Type	Acceptable Values / Example
Species	Enumeration Text	**e.g.,** "specie": "Cattle"
Implications if field is not completed / accurate		

5.2.4. Sex

Sex refers to male or female animals, including fully or partly neutered male or female animals.

Table 6: Gender Data Field

Field Name	Gender	
Description	The sex of the animal **Note:** see details on how to specify sex of animal above	
Required?	Required	
Display Name	Type	Acceptable Values / Example
Sex	Enumeration String	**e.g.,** "gender": "Female",
Implications if field is not completed / accurate		

Sex Enumerator Values	Sex Description
Female	An individual of the sex that has ovaries and produces ova. It may or may not conceive and bring forth young.
Male	An individual gamete-producing sex that fertilizes the female.
FemaleNeuter	Female animals from which certain parts of the reproductive organs (like ovaries, fallopian tubes, and uterus) are removed so that they are unable to reproduce.
MaleNeuter	Male animals whose testicles have been rendered dysfunctional through an approved procedure.

Note:
An infertile male still has testes and will be recorded as a male. For some exceptional anomalies, such as cryptorchidism (uni or bilateral; a condition where either or both testes fail to descend into the scrotal sac), checking for other reproductive organs such as the penis can be used to identify male animals.

5.2.5. Birth Rate

Refers to the date on which an animal was born. This date may be actual or estimated (via different tools such as owners' record/information and animal dentition). The date should be recorded using ISO-8061 standard (YYYY-MM-DD:T[hh][mm][ss])based on the Gregorian calendar.

Note: The difference between animal date of birth and parents' date of birth must be greater than or equal to 720 days for cross and exotic breeds of cattle, 1,200 days for zebu breeds of cattle, 270 days for goats/sheep, and 1,700 days for camels.

Table 7: Birthdate Data Field

Field Name	**birthDate**	
Description	The birth date of the animal in ISO-8061 format	
Required?	Required	
Display Name	**Type**	**Acceptable Values / Example**
Birth Date	date	**e.g.,** "birthDate": "2023-04-19T06:52:32.353Z",
Implications if field is not completed / accurate		

5.2.6. Breed

Animal breed is a specific group of domestic animals that have similar appearance (phenotypic), behavior, and other characteristics (genetic) that distinguish them from animals of the same species. When two animals of the same breed are bred together, their offspring consistently exhibit recognizable characteristics of that breed, both in terms of physical appearance and abilities. Animal breeds arise from genetic isolation, driven by natural adaptation to the environment, selective breeding, or a combination of both factors.

It is important to emphasize that relying on morphological factors like coat color, ear set, and horn shape is not a dependable method for identifying a breed. Frequently, different breeds share similar morphological features, making it challenging to accurately differentiate between them. However, the advent of gene mapping and DNA analysis has revolutionized breed identification. This advanced technology allows for a much more precise and reliable determination of breeds and their relationships with others, marking a significant improvement in accuracy compared to traditional morphological assessments (Porter, 2002).[2] Breeds can be broadly categorized as indigenous, exotic, and crossbred. Below is a detailed description of each and how to record them in the database.

5.2.6.1. Breed Categories

Indigenous Breeds

An indigenous breed is one that has originated in and adapted to a specific geographic region and cultural context. Indigenous breeds are often rich in genetic diversity and have unique traits that make them suitable for their environments and human needs. In this document, indigenous breeds

[2] PorterV. (2002). Mason's World Dictionary of Livestock Breeds, Types and Varieties. Fifth Edition. Wallingford: CABI Publishing.

in Ethiopia are referred to as local breeds. Indigenous breeds are important for maintaining biodiversity, food security, and cultural heritage. However, many indigenous breeds are threatened by genetic erosion, crossbreeding, loss of habitat, and market competition. Therefore, conservation efforts - including in situ and ex situ methods - are needed to protect and promote these valuable genetic resources.

Exotic Breeds

Exotic breeds are a group of animals that have been brought to a country or region or ecosystem from abroad. In Ethiopia, at least four exotic cattle breeds have been imported to improve dairy production. These imported cattle breeds are Holstein Friesian, Jersey, Simmental, and Ayrishire.

Crossbred Breeds

A crossbred breed is developed by crossing indigenous breeds with exotic breeds. For example, an exotic male breed mates with a local female breed to produce a crossbred breed that inherits genetic traits from both parents. t Crossbred breeds are identified by combining the names of the parent breeds with the multiplication sign (x), with the name of the male parental breed put first (Porter, 2002). In some cases, crossbred breeds can exist among exotic breeds such as Holstein Friesian and Jersey. In Ethiopia, five exotic cattle breeds can be crossed with 25 indigenous breeds. However, there have only been a few successful crossings, as highlighted below (Table 8).

- Holstein Friesian x Fogera: This indicates Holstein Friesian is the male while Fogera is the dam.
- Fogera x Holstein Friesian: In this case, Fogera is the male parent while Holstein-Friesian is the dam.
- Holstein-Friesian x Fogera x Abergele: When F1 from Holstein Friesian and Fogera re-crossed with other local breed (e.g. Abergele), the offspring (F2) will be Holstein Friesian x Fogera x Abergele; this continues likewise with F3, F4, etc., with different breed combinations.
- When F1 from Holstein Friesian and Fogera re-crossed with other local breed (e.g. Abergele), the offspring (F2) will be Holstein Friesian x Fogera x Abergele; this continues likewise with F3, F4, etc., with different breed combinations.

5.2.6.2 Breed Fraction / Proportion (Blood Level)

Ethiopia aims to crossbreed local cattle with highly productive exotic breeds to produce offspring with greater milk production and larger mass (for meat). The overall goal of the country's crossbreeding program is to increase the exotic blood level in offspring via livestock management. In the below table, E represents Exotic and L represents local animals (Table 8).

The fraction under the 'Exotic blood level' column describes the proportion of different breeds in a crossbred animal. For example, a cattle breed fraction of ½ Holstein-Friesian and ½ Fogera has one parent of each breed, with 50% blood level from each parent. Breed fractions should be recorded as an array of breed identifiers and proportions (for instance, an animal might be 3⁄4

Jersey and ¼ Holstein Friesian, which might be represented in percentages or some other fraction in various systems). For the purpose of recording breed fractions, different percentages can be used as indicated in Table 8. For example, if a 100% Holstein Friesian breed is crossed with a 100% Horro breed, the F1 generation (the offspring of the two) would be 50% of the two breeds; if the F1 is then crossed with a Horro breed, the F2 generation of this second cross would be 25% Holstein Friesian and 75% Horro. This is based on the principle that each animal inherits half of its genes from its sire and half from its dam. By tracing the ancestry of each animal, the breed fraction of each breed in its pedigree can be calculated.

Table 8: Possible Blood Level Percentage of Crosses Between Exotic and Indigenous Animals

Crossbreeding	Filial (F)	Exotic blood level
E1 X L	F1	50.00% (1/2)
E2 X F1	F2	75.00% (3/4)
E3 X F2	F3	87.50% (7/8)
E4 X F3	F4	93.75% (15/16)
E5 X F4	F5	96.88% (31/32)
E6 X F5	F6	98.44% (63/64)

E-exotic, L-indigenous local breed

Species and Breed Codes

To standardize the species and breed codes to be used across multiple systems, the following approach should be used [*SpeciesTypeCode.BreedTypeCode.BreedNameCode*] where 1 stands for cattle, 2 stands for goat, 3 stands for sheep, 4 stands for camels, and so on. For the three breeds, the codes given are: 01 for indigenous, 02 for exotic, and 03 for crossbred breeds (Table 9).

Table 9: Codes of Various Animal Species and Breeds

Species	Code	Breed	Code
Cattle	1	Indigenous	01
Goat	2	Exotic	02
Sheep	3	Crossbred	03
Camel	4		
Donkey	5		
Horse	6		
Mule	7		
Poultry	8		

Breed Name Code: The breed name code for each species and breed type will start with 01 and continue sequentially. For example, the first breed “Abergele” under the species “Cattle” is an

indigenous breed, so it will have the code 1.01.01, as described below: The codes in the tables below follow the same approach.

Table 10: Breeds Name Codes

1.01.01	1	01	01
	Cattle (species type)	Indigenous breed	The first breed name under the list of Cattle breeds. In this case, "Abergele."

Limitations of Breed Descriptions

In this document, different cattle breeds (indigenous, exotic, and crossbred) are mentioned with their phenotypic descriptions (Table 11). Although there are numerous reports on the breed phenotypic descriptions in Ethiopia, most have fragmented information. Thus, recorded information cannot fully describe the specific phenotypic character of these animals. To have a holistic national picture of a breed's phenotypic descriptions, a structured national assessment needs to be conducted.

5.2.7. Species and their Respective Breeds

5.2.7.1. Cattle

The number of indigenous cattle breeds in Ethiopia varies across different literatures/ documents (Shapiro, *et al*., 2015[3]; IBC, 2014[4]; IBC, 2012[5]; IBC, 2004[6]). In this document, 25 indigenous cattle breeds are listed (Table 11) based on the Ethiopia livestock master plan document (Shapiro *et al.,* 2015). Apart from indigenous breeds, four exotic cattle breeds (Holstein Friesian, Jersey, Simmental, and Ayrshire), which have been used to improve milk production, are listed. Holstein Friesians and their crosses dominate the list (IBC, 2004).

[3] Shapiro, B.I., Gebru, G., Desta, S., Negassa, A., Nigussie, K., Aboset, G. and Mechal, H. 2015. Ethiopia livestock master plan. ILRI Project Report. Nairobi, Kenya: International Livestock Research Institute (ILRI).

[4] IBC (Institute of Biodiversity Conservation). (2014). Ethiopia's Fifth National Report to the Convention on Biological Diversity. https://www.cbd.int/doc/world/et/et-nr-05-en.pdf

[5] IBC (2012). Ethiopian National strategy and plan of action for conservation, sustainable use and development of animal genetic resources, Draft. Ethiopian-National-Strategy-and-Plan-of-Action-for-Conservation-Sustainable-Use-and-Development-of-Animal-Genetic-Resources-.pdf (ebi.gov.et)

[6] IBC (Institute of Biodiversity Conservation). 2004. The State of Ethiopia's Farm Animal Genetic Resources: Country Report. A Contribution to the First Report on the State of the World's Animal Genetic Resources. Addis Ababa, Ethiopia: IBC.

Table 11: Ethiopian Indigenous Cattle Breeds

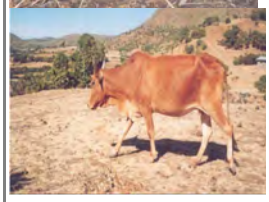
Indigenous Cattle Breeds				
Code	**Name**	**Abbreviation**	**Description**	**Pictorial description**
1.01.01	Abergele[7]	ABE	♦ *Coat color*: Fine skin, coat color varies considerably with black, spotted, and black and white spotted; black and white animals are abundant color types; other colors include chestnut, gray, and light red ♦ *Horns:* Females have thin and medium-sized horns, mostly upward with pointed ends; males have thicker and shorter horns; polled animals are not common ♦ *Hump:* Small and not very well developed; small dewlap and naval flap are typical features of the breed ♦ *Location*: Southern Tigray and North Wollo	 
1.01.02	Abigar8	ABI	♦ *Coat color:* Red or black pied ♦ *Horns:* Vary in length and shape, but in general, are very long and crescent-shaped, project outward and upward, or are oval; in some cases, horns are loose, unattached, and short ♦ *Hump*: Small ♦ *Location:* Border area between Ethiopia (Akobo area of Gambella), Sudan, Illubabor, Kefa ♦ *Synonym:* Neolithic, Nuer	 
1.01.03	Adwa[9, 10]	ADW	♦ *Coat color*: Mainly red, chestnut, black, roan, and white ♦ *Horns*: Upward curving horns ♦ *Hump:* Upward curving horns ♦ *Location*: Found around Adwa, in the central zone of the Tigray Region	

[7] Zerabruk M. and Vangen O. The Abergele and Irob cattle breeds of North Ethiopia: description and on-farm characterisation. https://www.fao.org/3/a0070t/a0070t06.htm

[8] Minuye N., Abebe G., and Dessie T. (2018). On-farm description and status of Nuer (Abigar) cattle breed in Gambella Regional State, Ethiopia. 10(6): 292-302. https://academicjournals.org/journal/IJBC/article-full-text-pdf/946968357169

[9] Tefera M. 2013. Atlas of indigenous domestic and wild mammals of Ethiopia. Haramaya University Press, Ethiopia. 68p. ISBN 978-99944-981-3-0.

[10] DAGRIS. https://dagris.info/node/2335.

Indigenous Cattle Breeds				
Code	**Name**	**Abbreviation**	**Description**	**Pictorial description**
1.01.04	Afar[11]	AFA	♦ *Coat color*: Usually ash gray, cream, or light chestnut ♦ *Horns*: Extremely long—up to 1 meter or more in length—and lyre- or crescent-shaped, sometimes forming a complete circle ♦ *Hump*: Small cervico-thoracic hump and small dewlap ♦ *Location*: Afar region, Western Hararghe, Eastern Shewa zones, Tigray and Welo, Ethiopia, and Northeastern Djibouti, South Eritrea ♦ *Synonym*: Danakil	
1.01.05	Ambo	AMB	♦ Located in west Shewa around Ambo, Dandi, Addis Alem and Holeta areas ♦ No information on phenotypic descriptions	
1.01.06	Arado[12]	ARA	♦ *Coat color*: Mostly red with shades ranging from light to dark pattern; many animals are red-pied or black-pied, and a few of them are black, brown, gray, or white ♦ *Horns*: Vary in size and may be large, crescent-shaped, or even absent ♦ *Hump*: Smaller in females, larger in males, and the dewlap is relatively large ♦ *Location*: Northern Ethiopia (northern Shire, Adwa and parts of Agame) and in the highlands of Eritrea ♦ *Synonym*: Ethiopian Highland Zebu, Akele-Guzai, Asaorta, Bileri (Keren)	 
1.01.07	Arsi[13]	ARS	♦ *Coat color*: Red, with a black muzzle, is predominant, although many animals are black, light gray, or white with black spots) ♦ *Horns*: Small and short ♦ *Hump:* Small ♦ *Location*: Highlands of Central Ethiopia especially Arsi, Bale, and Shoa	

11 AGTR. http://agtr.ilri.cgiar.org/danakil

12 Genzebu D, Hailemariam M and Belihu K. (2012): Morphometric characteristics and livestock keeper perceptions of "Arado" cattle breed in Northern Tigray, Ethiopia. Livestock Research for Rural Development. 24 (1). http://www.lrrd.org/lrrd24/1/hail24006.htm. Accessed date: August 2, 2023.

13. Assefa A and Hailu A. (2018). Ethiopian indigenous cattle breed's diversity, distribution, purpose of keeping, and their potential threats. J. Bio.Innov. 7 (5): 770 -789. https://www.jbino.com/docs/Issue05_10_2018.pdf

Indigenous Cattle Breeds				
Code	**Name**	**Abbreviation**	**Description**	**Pictorial description**
1.01.08	Bale	BAL	♦ *Coat color*: Black, chestnut, white, or roan ♦ *Hump*: Prominent hump ♦ *Origin/location*: High plateau of Bale zone, in areas adjacent to the habitat of the Jem-Jem ♦ *Synonym*: Highland Zebu	
1.01.09	Begait[14]	BEGc	♦ *Coat color*: Mostly brown, black and white, or beige ♦ *Horns*: Small and stumpy, loose hanging down ♦ *Hump*: Mostly no hump (a few with a small hump) ♦ *Location*: Tigray and Gondor ♦ *Synonym*: Barka	 
1.01.10	Boran[15]	BOR	♦ *Coat color*: Usually white or gray fawn, but light brown and black/dark brown shading on the head, neck, shoulder, and hindquarter also occur ♦ *Horns*: Short, erect, and thick at the base ♦ *Hump*: Straight above and in line with front legs, rounded, well developed ♦ *Location*: Borana zone, Southern Ethiopia, Smoli, and border areas (Northern Kenya, Somalia, and other African countries) ♦ *Synonym*: Borana, Ethiopian Boran, Somalia Boran, or Awai	 
1.01.11	Fogera[16]	FOG	♦ *Coat color*: White, white with black spots, or black and gray. ♦ *Horns*: Short, stumpy, pointed ♦ *Hump*: Ranges from thoracic to cervical-thoracic ♦ *Location*: Northwest Ethiopia, mainly in Gojam (around Lake Tana) and Gindor ♦ Synonym: Wagera	

14. Mekonnen T. and Meseret S. (20202). Characterization of Begait cattle using morphometric and qualitative traits in Western Zone of Tigray, Ethiopia. 11(1):21-33.https://www.researchgate.net/publication/339540184_Characterization_of_Begait_cattle_using_morphometric_and_qualitative_traits_in_Western_Zone_of_Tigray_Ethiopia. Accessed date: August 2, 2023.

15. AGTR. http://agtr.ilri.cgiar.org/boran Accessed date: August 28, 2023.

16 Tesfa, A. Kumar, D. Abegaz, S. Mekuriaw, G. Bimerew, T. Kebede, A. Bitew, A. Ferede, Y. Mazengia, H. and Tilahun, M. (2016).Growth and reproductive performance of Fogera cattle breed at Andassa Livestock Research Center. Livestock Research for Rural Development. 28. http://lrrd.cipav.org.co/lrrd28/1/tesf28004.htm. Accessed date: July 28, 2023.

Indigenous Cattle Breeds				
Code	**Name**	**Abbreviation**	**Description**	**Pictorial description**
1.01.12	Goffa	GOF	♦ *Coat color*: Plain black or reddish brown. ♦ *Horns*: Small to medium, wedge-like ♦ *Location*: Goffa area, principally around Sawla in South Omo. ♦ *Synonym*: Konso (Knosso)	
1.01.13	Guraghe	GUR	♦ *Coat color*: Usually red, chestnut, or roan ♦ *Horns*: Small and short ♦ *Location*: Guraghe and Hadiya areas ♦ *Synonym*: Ethiopian Highland Zebu	
1.01.14	Hammer	HAM	♦ *Coat color*: White, gray, chestnut, or roanusually ♦ *Hump*: Prominent ♦ *Horns*: Short to medium ♦ *Location*: Found in Hammer area, in Southern Omo	
1.01.15	Harar[17]	HAR	♦ *Coat color:* White gray, white, red, and black ♦ *Horns*: Short and thick ♦ *Hump:* Smaller ♦ *Location*: Highlands of Eastern and Western Hararghe Zone	
1.01.16	Horro[18]	HORc	♦ *Coat color*: Uniform brown color, slightly lighter around the muzzle and on the flank ♦ *Horns*: Medium to large ♦ *Hump*: Straight and small to medium ♦ *Location*: Wellega, Ilubabor, Keffa, Shoa ♦ *Synonym*: Wallega	
1.01.17	Jem-Jem Zebu	JEM	♦ *Coat color*: Black, usually with white face or patches on a mainly black background ♦ *Horns*: Short ♦ *Hump*: Small to medium ♦ *Location*: Bale, Sidama ♦ Synonym: Black Zebu, Black Highland Cattle	

[17] Dessalegn D, Mummed Y Y, Leta U M (2021) On Farm Phenotypic Characterization Breeding, Husbandry and Fattening Practices of Harar Cattle in Hararghe Highland. *J Anim Sci Livest Prod.* 5 (5). https://www.primescholars.com/articles/on--farm--phenotypic--characterization---breeding---husbandry--and--fattening--practices--of--harar--cattle--in--hararghe-highland.pdf

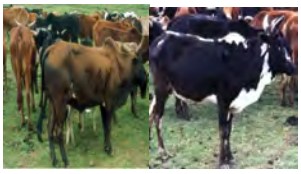
[18] https://breeds.okstate.edu/cattle/horro-cattle.html?Forwarded=afs.okstate.edu/breeds/cattle/horro/index-2.html

Indigenous Cattle Breeds				
Code	**Name**	**Abbreviation**	**Description**	**Pictorial description**
1.01.18	Jiddu[19]	JID	♦ *Coat color*: Ranges from all shades of white and light fawn to dark mahogany or red; in almost all cases, Jiddu cattle have white muzzles, white eyelashes, white hairs ♦ *Horns*: Project form pedestal-like ♦ *Hump*: Smaller in females than the male; thoracic or cervico-thoracic hump position; the dewlap is moderately well developed and free from folds and fleshiness ♦ *Location*: Southeastern Ethiopia and Southern Somalia, also Zanzibar, Tanzania	
1.01.19	Jijjiga	JIJ	♦ *Coat color*: Chestnut, black, white, dark gray, or red ♦ *Horn*: Short, mostly polled ♦ *Hump*: Erect ♦ *Location*: Ogaden area of the Somali region and border area Eastern Hararghe ♦ *Synonym*: Ogaden	
1.01.20	Medenes[20]	MED	♦ *Coat color:* Black and white in varying patterns, other colors are rare ♦ *Location*: Distributed in the hot to warm semi-arid lowlands of Welqayit ♦ No information on descriptions of horn and hump	
1.01.21	Mursi[21]	MUR	♦ *Coat color*: Various combinations (solid rare) of gray, white, black, chestnut, and roan, or pied or striped ♦ *Horns*: Mainly large, usually curved inwards ♦ *Hump*: Prominent and well-developed hump ♦ *Location*: Mursi and Bodi pastoral communities, South Omo zone	

[19] DAGRIS. https://dagris.info/breed/2421/trait_type/all?page=1

[20] Zerabruk, et al. (2007). Characterization of six cattle breeds in North Ethiopia. Animal Genetic Resources Information, No. 40. https://www.fao.org/3/a1128t/a1128t02.pdf Accessed date: July 28, 2023.

[21] FAO (2015). Animal Genetic Resources. Pp. 15-24. https://www.fao.org/3/i5198t/i5198t.pdf Accessed date: August 2, 2023.

Indigenous Cattle Breeds				
Code	**Name**	**Abbreviation**	**Description**	**Pictorial description**
1.01.22	Ogaden[22]	OGA	♦ *Coat color*: Uniform plain white, black shade around face ♦ *Hump*: Thoracic in location, large and prominent in both sexes, but larger in males ♦ *Horns*: In most cases polled, but when present, it is short and thick ♦ *Location*: Ogaden area of Somali Region and bordering East Hararghe	
1.01.23	Raya-Azebo[23]	RAY-A	♦ *Coat color*: Chestnut, ash gray, and black spots ♦ *Horns:* Lyre-shaped, upward orientation ♦ *Hump*: Long, erect, small, and found at cervical thoracic position ♦ *Location*: Tigray, Wollo, Afar ♦ *Synonym*: Raya, Harmo	
1.01.24	Sheko[24]	SHE	♦ *Coat color*: Most often brown multi-colored with black and white, however, brown predominates in a plain, patchy, or spotted pattern ♦ *Horns*: Short, many are polled ♦ *Hump*: Absent or small ♦ *Location*: Southwest Kefa ♦ *Synonym*: Mitzan, Goda	
1.01.25	Smada[25]	SMA	♦ *Coat color*: Black, also red, roan, or black-and-white ♦ *Horns*: Short to moderate ♦ *Hump*: Small to medium ♦ *Location*: North Western Ethiopia ♦ *Synonym*: Worie, Agew	

[22] Ermias, E. (2001). Field report on the Ogaden breed of cattle maintained at Alemaya University. DAGRIS collection. https://cgspace.cgiar.org/handle/10568/70883#:~:text=The%20coat%20colour%20of%20this,sexes%2C%20but%20larger%20in%20males Accessed date: August 2, 2023.

[23] Mustefa A., Belayhun T., Melak A., Hayelom M, Hailu A., and Assefa A. (2020). Body morphometric measurements in Harmo cattle (Raya-Azebo cattle) in Southern Tigray of Ethiopia. Online J. Anim. Feed Res., 10 (6): 259-267. https://www.ebi.gov.et/wp-content/uploads/2021/10/Body-morphometric-measurements-in-Harmo-cattle-Raya-Azebo-cattle-in-Southern-Tigray-of-Ethiopia.pdf Accessed date; August 2, 2023.

[24] AGTAR. http://agtr.ilri.cgiar.org/sheko Accessed date: August 2, 2023.

[25] Getie A., Hile Melekot M., Taye M., Wuletaw Z., and Tesfa A. 2015. A Survey on Breeding Practice, and Productive Performance of Simada Cattle in Tach Gayint District, Ethiopia. J. Life Sci. Biomed., 5 (6): 171-180. https://jlsb.science-line.com/attachments/article/15/J.%20Life%20Sci.%20Biomed.%205%286%29%20171-180,%202015.pdf Accessed date: August 2, 2023.

Table 12: Exotic Cattle Breeds Found in Ethiopia

*Exotic Cattle Breeds				
Code	**Name**	**Abbreviation**	**Description**	**Pictorial description**
1.02.01	Holstein Friesian[26]	HOL	♦ *Coat color:* Patterns of black and white or red and white ♦ *Horns*: Horned, and in some cases polled ♦ *Origin*: Dutch provinces of North Holland and Friesland and in Schleswig-Holstein in northern Germany	 
1.02.02	Jersey[27]	JER	♦ *Coat color*: Cream-colored, yellow-brown, light red, and almost black, whereby the head is almost always dark. They often can have a dark eel stripe, black nose, and black tail ♦ *Horns:* Curved, often with black tips; there are also genetically polled animals ♦ *Origin:* British breed of small dairy cattle from Jersey, in the British Channel Islands	 
1.02.03	Simmental[28]	SIM	♦ *Coat color*: Muted, pied, speckled from dark red-brown to light yellow on white base color; lower belly, feet, tail switch and head are mainly white ♦ *Horns*: Light with yellow tips; slightly bowed out and up; they can be genetically polled. ♦ *Origin*: The Simmental is a Swiss breed of dual-purpose cattle, named after the Simmental—the valley of the Simme river—in the Bernese Oberland, in the canton of Bern in Switzerland	 

[26] The Cattle Site. https://www.thecattlesite.com/breeds/dairy/22/holstein Accessed date: July 27, 2023.

[27] GGI-SPERMEX. https://www.ggi-spermex.de/en/further-breeds/jersey-503.html Accessed date: August 3, 2023.

[28] https://www.thecattlesite.com/breeds/beef/17/simmental/ Accessed date: July 27, 2023.

*Exotic Cattle Breeds				
Code	**Name**	**Abbreviation**	**Description**	**Pictorial description**
1.02.04	Ayrshire[29]	AYR	♦ *Coat color*: Red and white color pattern; red may range from a very dark, almost black mahogany to a very light brownish-red ♦ *Horns*: Lyre-shaped ♦ *Origin:* The Ayrshire is a Scottish breed of dairy cattle; it originates in, and is named for, the county of Ayrshire in south-western Scotland	

* Exotic breeds do not have hump; called "humpless"

Table 13: Crossbreeds of Cattle in Ethiopia

Crossbreeds of Cattle			
Code	**Name**	**Abbreviation**	**Description**
1.03.02.01-01.16	Holstein- Friesian x Horro	HOL-HOR	No phenotypic descriptions are available for crossbred breeds.
1.03.02.02-01.07	Jersey x Arsi	JER-ARS	
1.03.02.02-01.16	Jersey x Horro	JER-HOR	
1.03.02.03-01.10	Simmental x Boran	SIM-BOR	
1.03.02.03-01.16	Simmental x Horro	SIM-	

Example of Coding for crossbreed:

Holstein Friesian =1.02.01
Horro =1.01.16
Holstein Friesian x Horro = 01.03.02.01X01.16

- 01 = Cattle
- 03 = Cross
- 02 = Exotic
- 01 = Holstein Friesian
- 01 = Local
- 16 = Horro

[29] Livestock Conservacy. AYRSHIRE CATTLE. https://livestockconservancy.org/heritage-breeds/heritage-breeds-list/ayrshire-cattle/ Accessed date: August 3, 2023.

5.2.7.2. Goat

Table 14: Indigenous Breeds of Goats in Ethiopia

Indigenous Goat Breeds				
Code	**Name**	**Abbreviation**	**Description**	**Pictorial description**
2.01.01	Abergele[30]	ABEg	♦ *Coat color*: Mostly reddish brown; plain coat ♦ color, patchy, and rarely spotted ♦ *Horns*: Males have spiral horns directed backwards ♦ *Wattle:* Wattles are almost entirely absent ♦ *Location*: South Tigray and North Wollo, Ethiopia/Eritrea	
2.01.02	Afar[31]	AFAg	♦ *Coat color*: Coat is very fine and short with variable colors (white, light brown, black, black, and flecks), and patches are also common ♦ *Wattle*: A beard (common in males) and wattle are relatively common ♦ *Horns*: Long, thin, upward-pointing horns ♦ *Location*: Afar, northern and western Hararghe ♦ *Synonym*: Widar, Danakil	
2.01.03	Agew	AGE	♦ *Coat color*: White and/or fawn color ♦ *Location:* Highlands of South Gonder, Gojam, Wellega and western Shoa; also found in Gojam, Wolega, Ilu Aba Bora	
2.01.04	Arab[32]	ARA	♦ *Coat color*: Patchy pattern or smooth white or black ♦ *Horns*: Straight, curved, or spiral with upward or backward orientation ♦ *Wattle:* Wattle and beard present ♦ *Location*: Benishangul ♦ *Synonym*: Worre, Tseada, Milege	

[30] ESGPIP (2009). Goat breeds of Ethiopia: A guide for identification and utilization. Technical Bulletin No. 27.

[31] FARM-Africa. 1996. Goat Types of Ethiopia and Eritrea. Physical description and management systems. Published jointly by FARM-Africa, London, UK, and ILRI (International Livestock Research Institute), Nairobi, Kenya. P. 76. https://cgspace.cgiar.org/bitstream/handle/10568/5372/Goat_types_ethiopia.pdf?isAllowed=y&sequence=4 Accessed date: July 28, 2023.

[32] Sheriff O., Alemayehu K., Haile, A. (2020). Morphological characterization of Arab and Oromo goats in northwestern Ethiopia: implications for community-based breeding programs. https://assets.researchsquare.com/files/rs-49628/v1/8b66d09c-26b5-4c96-ae15-2e3586039728.pdf?c=1631851226 Accessed date: August 2, 2023.

Indigenous Goat Breeds				
Code	**Name**	**Abbreviation**	**Description**	**Pictorial description**
2.01.05	Arsi-Bale	ARS-BAL	♦ *Coat color*: White (male) or brown (female), also black-and-gray, roan, red ♦ *Horns:* Males have curved or straight horns mainly pointing backwards, but in some, pointed straight upwards; there are few polled goats in both sexes ♦ *Location*: Highlands of Arsi, Bale and South Shewa, Ethiopia ♦ *Synonym*: Gishe, Sidama	
2.01.06	Begayit	BEGg	♦ *Coat color*: Mainly white with brown patches; their hair is particularly long around the thighs ♦ *Horns*: Both sexes have horns that are straight or curved and oriented backwards; males have beards and ruffs ♦ *Location*: Found mainly in western Tigray ♦ *Synonym*: Barka	
2.01.07	Central Highland[33]	CEN-HIG	♦ *Coat color*: Predominant color is reddish-brown, followed by plain, patchy, and rarely spotted ♦ *Horns*: Males have horns that are thick, mostly straight and pointed backwards; horns are sometimes curved and rarely spiral ♦ *Wattles*: Rarely present; commonly have beard and ruff ♦ *Location*: Highlands of North Ethiopia and South Eritrea) ♦ *Synonym***:** Brown goat	
2.01.08	Felata	FEL	♦ *Coat color*: Most are patchy pattern ♦ *Horns*: Straight or curved backward or upward ♦ *Location*: Northwestern lowlands (Bambasi and Mandura)	
2.01.09	Gumuz[34]	GUM	♦ *Color coat*: The dominant color is white followed by fawn, black, and gray; white patchy colors are also commonly observed ♦ *Horns*: Both males and females have straight and backward-oriented horns; most males also have beards and ruffs ♦ *Location*: Found in areas bordering the Sudan (Metekel, Assosa, and Gambela) ♦ *Synonym*: Western Lowland goats	 

[33] ESGPIP (2009). Technical bulletin No.28 Sheep breeds of Ethiopia. https://www.yumpu.com/en/document/read/11539604/technical-bulletin-no28-sheep-breeds-of-ethiopia-esgpip Accessed date: August 3, 2023.

[34] Allpedia. http://allpedia.dkart.in/livestock/breeds/goat-breeds/9332-western-lowland-goat-gumuz.html

Indigenous Goat Breeds				
Code	**Name**	**Abbreviation**	**Description**	**Pictorial description**
2.01.10	Hararghe Highland	HAR-HIG	♦ *Coat color*: The coat color is white, brown, or black and the hair is short and shiny ♦ *Horns*: Commonly polled; horned goats have straight or curved horns ♦ *Location*: Found in the East and West Hararghe highlands	
2.01.11	Keffa	KEF	♦ *Coat color*: Coarse, hairy coat, dominant colors are black or brown ♦ *Horns*: Most males have straight and backward-oriented horns ♦ *Wattles*: Present in some; males have beards and ruffs ♦ *Location*: Widely distributed in the highlands and lowlands of Keffa	
2.01.12	Ille	ILLg	♦ Although the name "Ille" is indicated in the breed list of the livestock master plan, no information on its phenotypic description can be found	
2.01.13	Long-eared Somali	LON-EAR-SOM	♦ *Coat color*: Short, smooth coat that is mainly white, with occasional brown, black, and gray ♦ *Horns*: Mainly curved or pointed backwards; some of the horns in both sexes have a lateral orientation; high incidence of polledness ♦ *Location*: Found in all parts of the Ogaden, lowlands of Bale and Borana zones of Oromia, and some parts of Sidama Region ♦ *Synonym***:** Large white Somali, *Degheir,* Digodi, Melebo	
2.01.14	Maefur[35]	MAE	♦ *Coat color*: Spotty, pied, and uniform and shaded (light brown, black, and gray). ♦ *Horns*: Long and thick ♦ *Location*: Mountainous topographical features of the hillside of Erob district eastern Tigray	
2.01.15	Short-eared Somali	SHO-EAR_SOM	♦ *Coat color*: Mainly white; short, smooth hair ♦ *Horns*: Upward pointing horns; very few polled with a low incidence of spiral horns in both sexes ♦ *Location*: Northern and eastern Ogaden, Dire Dawa ♦ *Synonym***:** *Denghier, Deghiyer*	

[35] Gebreyowhens W. and Kumar,R. (2017). Phenotypic characterization of indigenous Maefur goat population in Tigray, Northern Ethiopia. . 9(5). 130-145. https://academicjournals.org/journal/IJBC/article-full-text-pdf/53CF2E963837

Indigenous Goat Breeds				
Code	**Name**	**Abbreviation**	**Description**	**Pictorial description**
2.01.16	Western Highland	WES-HIG	♦ *Coat color*: Mostly covered with coarse hair, forming a long coat; most observed color is plain followed by patchy and spotted color patterns ♦ *Horns*: Both males and females have horns but some animals are polled; mostly straight and backward-oriented ♦ *Wattles*: Present in some; males also have beards and ruffs ♦ *Location*: Highlands of South Gonder, Gojam, Wellega and Western Shoa	
2.01.17	Western Lowlands	WES-LOW	♦ *Color coat*: Fawn (often with white patches), occasionally black or gray ♦ *Horns*: Most male goats have straight horns, oriented backwards; few polled males in the population ♦ *Location*: Western lowlands bordering Sudan around Metekel, Assosa, and Ilu Aba Bora ♦ *Synonym*: Gumez	
2.01.18	Widar	WID	♦ *Coat color*: Coat is very fine and short with variable colors and color patterns—white, light, patchy brown, black, and flecks ♦ *Horns*: Long, thin, upward-pointing horns ♦ *Location*: Afar, northern and western Hararghe, Eritrean rift valley strip ♦ *Synonym*: Afar	
2.01.19	Woyito-Guji[36]	WOY-GUJ	♦ *Coat color*: The body is covered with shiny and smooth hair of various colors; predominant coat colors are reddish-brown in a patchy pattern with black or brown stripes running along the back, on the underside, or on the front of the legs ♦ *Horns*: Most males and females are horned; some animals are polled; horns are mostly oriented backward or upward, sometimes laterally ♦ *Wattles:* Present in some; males have beards and ruffs ♦ *Location*: North and South Omo, southern Sidama and parts of Wolayta ♦ *Synonyms*: Woyto, Guji, Konso	

[36] Allpedia. http://allpedia.dkart.in/livestock/breeds/goat-breeds/9333-woyto-guji-goat.html

Table 15: Exotic Goat Breeds in Ethiopia

Exotic Goat Breeds				
Code	**Name**	**Abbreviation**	**Description**	**Pictorial description**
2.02.01	Anglo-Nubian	ANG-N	♦ *Color*: Can be any color or combination of colors; the large number of color variations and the short silky coat adds to the breed's appeal ♦ *Horns*: May or may not have horns at birth. ♦ *Origin*: UK	
2.02.02	Toggenburg	TOG	♦ *Coat color:* Solid, varying from light fawn to dark chocolate with distinct white markings on the ears, face, hind legs, forelegs, each side of tail, and wattle; white markings are distinctive on this breed ♦ *Horns:* May or may not be present. ♦ *Wattle*: A white spot may be present at the root of wattles or in that area if no wattle is present ♦ *Origin*: Toggenburg Valley of Switzerland	

Table 16: Crossbreeds of Goats in Ethiopia

Crossbreeds of Goats			
Code	**Name**	**Abbreviations**	**Description**
2.03.02.01-01.10	Anglo-Nubian x Hararghe Highland	ANG-N-HAR-HIG	No phenotypic descriptions are available for crossbred breeds.
2.03.02.01-01.13	Anglo-Nubian x Long-eared Somali	ANG-N-LON-EAR-SOM	
2.03.02.02-01.10	Toggenberg x Hararghe Highland	TOG-HARHIG	

5.2.7.3. Sheep

Table 17: Indigenous Breeds of Sheep in Ethiopia

Indigenous Sheep Breeds				
Code	**Name**	**Abbreviation**	**Description**	**Pictorial description**
3.01.01	Abergele	ABEs	♦ *Coat color*: Hair coat (white animals have fine hair or wooly udder-coat); predominantly plain brown or white coat, few blacks with brown belly ♦ *Horns*: Curved ♦ *Location*: Agew, Tigray, and Amhara communities. ♦ *Tail:* Short, fat, turned up at end, and fused with main part ♦ *Synonym*: Sekota, Tigray highland	
3.01.02	Afar[37]	AFAs	♦ *Coat color*: Uniform creamy white/ beige coat ♦ *Horns*: Polled ♦ *Location*: Afar, Amhara, Tigray ♦ *Tail:* Rump, wide, fat tail; some have large, fat tails ♦ reaching below the hock ♦ *Synonym*: Danakil	
3.01.03	Arsi	ARSs	♦ *Coat color*: Brown, brown with white patches, black, white, and combinations of above colors ♦ *Horns*: Males and most females are horned ♦ *Tail*: Long, fat, sometimes twisted on the end ♦ *Synonym*: Arsi-Bale	
3.01.04	Begayit[38]	BEGs	♦ *Coat color*: Dominated by white, white and black, gray, slightly red, and creamy white ♦ *Horns*: Both male and female sexes are polled ♦ *Location*: North-Western of Tigray Regional State ♦ *Tail:* Long and thin (up to 50-cm long)	

[37] Gizaw S., Komen H., Hanote O., Arendonk J.A.M. van, Kemp S., Haile A., Okeyo A.M., and Dessie T. 2011. Characterization and conservation of indigenous sheep genetic resources: A practical framework for developing countries. ILRI Research Report 27. Nairobi, Kenya: ILRI.https://cgspace.cgiar.org/handle/10568/5371

[38] Amare B., Kefyalew A., and Zeleke M. (2012). Typical features, characterization and breeding objectives of Begait sheep in Ethiopia. *Animal Genetic Resources/Resources génétiques animales/Recursos genéticos animales*, *51*, 117-123. DOI:10.1017/S2078633612000379

Indigenous Sheep Breeds				
Code	**Name**	**Abbreviation**	**Description**	**Pictorial description**
3.01.05	Begi-Degu[39]	BEG-DEG	♦ *Location*: Atsbi-wonberta, Wukro-Kilte Awlaelo, Ofla and Degua-Tembien districts, Tigray	
3.01.06	Black Head Somali	BLA-HEA-SOM	♦ *Coat color*: Distinguished by the black color of the head; the body is predominantly white but other colors may be observed ♦ *Horns*: Both rams and ewes are hornless, though males can sometimes have rudimentary horns ♦ *Location*: Ogaden area of the Somali Region ♦ *Tail:* Long and fat with straight, tapering end ♦ *Synonym*: Wanke, Ogaden, Berbera, black	
3.01.07	Bonga	BON	♦ *Coat color*: Predominantly plain brown or with black or white shade, plain white or with brown patches, and black ♦ *Horns*: Both sexes are polled ♦ *Location*: Keffa, Sheka and Bench communities ♦ *Tail:* Long and fat with straight, tapering end ♦ *Synonym*: Gesha, Menit	
3.01.08	Dangila	DAN	♦ *Coat color*: Predominantly brown ♦ *Horns*: Both males and females are polled ♦ *Location*: Highlands of northwest, south of Lake Tana ♦ *Tail:* Short, fat ♦ *Synonym*: Washera, Agew	
3.01.09	Farta	FAR	♦ *Coat color*: Commonly white, brown and black with brown belly, white/brown with brown/white patches; ♦ *Horns*: Males are horned ♦ *Location*: South Gondar Zone ♦ *Tail*: Short, fat	
3.01.10	Horro	HORs	♦ *Coat color*: Cream, brown, black, or pied ♦ *Horns*: Both sexes are polled ♦ *Location*: East Welega, West Welega, Illubabor, Jimma and West Shoa zones of Oromia, and some bordering Gambella and Benishangul districts ♦ *Tail*: Long and fat, extending below hock, either straight or coiled/twisted at the tapering end; prominent fat tail in males	

[39] Hayelom M., Abegaz S., Mekasha Y. (2014). Within Breed Phenotypic Diversity of Sokota/Tigray Sheep in Three Selected Zones of Tigray, Northern Ethiopia. Journal of Biology, Agriculture and Healthcare. 4 (17): 148-157.

Indigenous Sheep Breeds				
Code	**Name**	**Abbreviation**	**Description**	**Pictorial description**
3.01.11	Ille	ILLs	♦ *Location*: Tigrai highland ♦ No phenotypic descriptions are available for crossbred breeds	
3.01.12	Menz[40],[41]	MEN	♦ *Coat color*: Commonly black with white patches, white, brown, white with brown patches ♦ *Horns*: Curved ♦ *Location*: North Shoa zone of Amhara regional state, Ethiopia ♦ *Tail*: Short and fat, turned up at end ♦ *Synonym*: Legegora, Shoa, Abyssinian, Ethiopian Highland sheep	
3.01.13	Tukur	TUK	♦ *Coat color*: Predominantly black ♦ *Horns*: Curved ♦ *Location*: North Wollo zone of Amhara state ♦ *Tail:* Short, fat	

Table 18: Exotic Breeds of Sheep in Ethiopia

Exotic Sheep Breeds				
Code	**Name**	**Abbreviation**	**Description**	**Pictorial description**
3.02.01	Awassi[42], [43]	AWA	♦ *Coat color*: Brown or black head, ears, legs, and neck ♦ *Horn*: Rams are generally horned and ewes polled with a ”roman” nose and long, pendulous ears ♦ *Origin*: Israel, southwest Iran, southern Iraq, Syria, and northeast Arabia ♦ *Tail:* Fat ♦ *Synonyms*: Ausi, Baladi, Deiri, Ivesi, Gezirieh, Nuami and Syrian	

[40] Solomon G., Azage T., Berhanu G., Dirk H. (2010a). Sheep and goat production and marketing systems in Ethiopia: Characteristics and strategies for improvement. Available @:https://cgspace.cgiar.org

[41] Tesfaye G., Aynalem H., Markos T., Sharmad A.K., Ashebir K., Endashaw T., Wurzingere M.F., Sölkner J.E. (2009). Morphological characters and body weight of Menz and Afar sheep within their production system. Ethiopian Journal of Animal Production 9(1):99.

[42] Geoff D. (2002). New and Introduced Sheep Breeds in Australia. Final Report. https://www.mla.com.au/contentassets/35a2fbe6128e44388697e045805e71d3/shgen.011_final_report.pdf

[43] Ethiopia Sheep and Goat Productivity Improvement Program. Chapter 2 By Awgichew K. and Abegaz S. Breeds of Sheep and Goats.

Exotic Sheep Breeds				
Code	**Name**	**Abbreviation**	**Description**	**Pictorial description**
3.02.02	Bleu du Maine[44]	BLE-DU-MAI	♦ *Coat color*: Dark blue slate-colored head and feet; the breed has no wool on its head or legs ♦ *Horn:* Both sexes are polled ♦ *Origin:* Maine et Loire Mayenne and Sarthe regions of western France ♦ *Tail*: Long and short in improved breed ♦ *Synonyms:* Blauköpfiges Fleischschaf (German), Bazougers, Bluefaced Maine, Blue-headed Maine, Maine-Anjou, Maine à tête bleue, Mayne Blue	 
3.02.03	Corriedale[45]	COR	♦ *Coat color:* Black nose and hooves ♦ *Horn:* Polled ♦ A distinguishing characteristic of the breed is their horizontal ears, which sometimes have blue or black spotting ♦ *Origin:* New Zealand and Australia ♦ *Tail:* Stubbed	
3.02.04	Dorper[46]	DOR	♦ *Color*: Most have a black head and neck with a white body, but some are solid white ♦ *Horn*: Both rams and ewes are polled ♦ *Origin*/*Location*: South Africa ♦ *Tail:* Reduced	
3.02.05	Hampshire [47]	HAMs	♦ *Color*: The face is dark in color and practically free of wool from the eyes down ♦ *Horn*: Polled, hornless ♦ *Origin*: Hampshire in Southern England ♦ *Tail:* Reduced	

[44] Bleu du Maine Sheep. https://breeds.okstate.edu/sheep/bleu-du-maine-sheep.html

[45] Ryan (2022). Corriedale Sheep Breed Information, History & Facts. In Sheep breeds. https://sheepcaretaker.com/corriedale-sheep/

[46] AGTR. http://agtr.ilri.cgiar.org/dorper

[47] Hampshire Sheep. https://breeds.okstate.edu/sheep/hampshire-sheep.html

Exotic Sheep Breeds				
Code	**Name**	**Abbreviation**	**Description**	**Pictorial description**
3.02.06	Merino[48]	MER	♦ *Coat color:* White faces and legs ♦ *Horn:* Some are naturally polled, and some variants have horned rams. ♦ *Origin*: Spain, Italy, South Africa, America, and Australia ♦ *Tail:* Shorter	
3.02.07	Romney[49]	ROM	♦ *Coat color*: Broad white face, sometimes with a small, wooly top knot. ♦ *Horn*: Both sexes are hornless ♦ *Origin*: Originated in the Romney Marshes of Kent, England ♦ *Tail:* tail set almost even with the chine	

Table 19: Crossbreeds of Sheep in Ethiopia

Crossbreeds of Sheep			
Code	**Name**	**Abbreviation**	**Description**
3.03.02.01-01.12	Awassi x Menz	AWA-MEN	No phenotypic descriptions are available for crossbred breeds
3.03.02.02-01.12	Bleu du Maine x Menz	BLE-DU-MAI	
3.03.02.04-01.12	Dorper x Menz	DOR-MEN	
3.03.02.05-01.12	Hampshire x Menz	HAM-MEN	
3.03.02.07-01.12	Romney x Menz	ROM-MEN	

Source: Tesema, et al. (2020)[50]

5.2.7.4. Camel

According to Wilson (1984), the camel breeds in Ethiopia are classified as Afar, Anfi, Borena, Ethiopian Dromedary, and Somali/Ogaden, of which specific phenotypic descriptions are

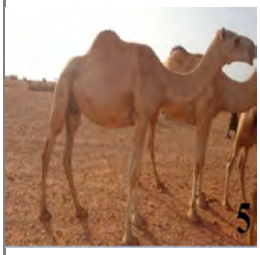
[48] AGTR. http://agtr.ilri.cgiar.org/merino

[49] Global Grange. https://www.livestockoftheworld.com/sheep/

[50] Tesema, et al. (2020). Current status of livestock crossbreeding in Ethiopia: Implications for research and extension. *Journal of Applied Animal Science*; 13(2): 9-26. https://vs.mahidol.ac.th/jaas/Files/Vol13No2/01%20RV%20Zeleke%20FiUP.pdf

unavailable. On the other hand, Taddesse *et al.* (2014[51], 2015a[52], b[53]) classified the breeds (as indicated in Table 20) with detailed descriptions. According to SFAGRA (2014),[54] breed or type classifications in most camel-rearing societies are based mainly on names of the ethnic group, clan, and geographical localities where they are raised, rather than the phenotypic characteristics. Hence, seven types ("breeds") of camels are listed with their phenotypic descriptions (Table 20).

Table 20: Camel Types Found in Ethiopia

Code	Name	Abbreviation	Description	Pictorial description
4.01.01	Amibara	AMI	♦ *Coat color*: Brown to gray, short hair length ♦ *Hump*: Thoracic and cervico-thoracic hump position ♦ *Location*: Awash in Gewane in the north and Bure-Mudaitu and Afambo in the east and west, respectively ♦ *Other characteristics:* Medium-sized udder and teats, smaller body size and weight, and small abdominal and heart girth	
4.01.02	Gelleb	GEL	♦ *Coat color*: Dominant brown and red coat color, pigmented skin, muzzle, and hooves ♦ *Hump*: Prominent, located at thoracic and cervical-thoracic hump position ♦ *Location*: Gode, Afder, and Kebridahar zones of Somali Region ♦ *Other characteristics*: Longer in height, long tail, exceptionally wider hip and chest and long chest depth	
4.01.03	Hoor	HOO	♦ *Coat color*: Varies from brown to red and yellowish white, short hair length ♦ *Hump*: Small, thoracic hump position ♦ *Location*: Gode, Afder, and Kebridahar zones of Somali Region ♦ *Other characteristics*: ° *Body:* Small body size with less beefy conformations, large abdomen, ° *Legs*: Short ° *Udder*: Well-developed with prominent milk veins	

[51] Tadesse Y., Kebede, K., Kurtu, M., Urge, M., Abegaz, S., Dessie, T. and Han, J. 2014. Morphological diversities and eco-geographical structuring of Ethiopian camel (Camelus dromedarius) populations. Emir. J. Food Agriculture 26 (4): 371 –389.

[52] Tadesse, Y. Kurtu, M.Urge ,M., Abegaz,S. Kebede, K. and Dessie, T. 2015a. Distribution, characteristic features of camel populations (Camelus dromedarius) and the unseen treasures of rock-shelters in relation to camel domestication in Ethiopia. Global J. Animal Science, Livestock Production and Animal Breeding 3 (3): 145 –155.

[53] Tadesse, Y., . Urge, M, Kesari, P., Kurtu,Y.M, Kebede, K. and Abegaz. S. 2015b. Socioeconomic profile and gender characteristics in relation to camel management practices in the pastoral communities of Ethiopia. J. Economics and Sustainable Development 6 (1): ISSN 2222 – ISSN 2855 (online).

[54] The State of Farm Animal Genetic Resources in Africa (2014). Pp. 39.
*gi_20191107_state_farm_animal_genetic_resources_africa_full_book_en.pdf (au-ibar.org)

Code	Name	Abbreviation	Description	Pictorial description
4.01.04	Jijiga	JIJc	♦ *Coat color*: Predominantly brown color, medium hair length ♦ *Hump*: Thoracic hump position ♦ *Location*: Jijiga and Fiq zones of Somali Region ♦ *Synonym*: ♦ *Other characteristics*: Medium sized body with short body and barrel shape	
4.01.05	Liben	LIB	♦ *Coat color*: Brown, red, black, and white ♦ *Hump*: Prominent ♦ *Location*: Konso and Gofa districts in SNNPR and Borana zones ♦ *Other characteristics*: ° *Neck*: Long ° *Tail*: Long ° Large ear size, large hoof circumferences with long legs, heavy body weight, large heart and abdominal girth, wide hip and chest	
4.01.06	Mille	MIL	♦ *Coat color*: Red to brown coat color with short hair length ♦ *Hump*: Thoracic hump position ♦ *Location*: Mille to Chifra to the West and Dubti to the North; reach other places through temporary migration to Yalo and Teru districts, Dalifage and Dawe districts of Afar region and up to Bati in Amhara region ♦ *Other characteristics*: ° Medium to long tail, small body size, large ears, short neck, long legs, medium udder and teat sizes	
4.01.07	Shinille	SHI	♦ *Coat color*: Gray and brown ♦ *Hump*: Thoracic hump position ♦ *Location*: Shinille Zone, Chelenko, Daketa and Fafen in Jijiga area and eastern Oromia region ♦ *Other characteristics*: ° Short neck and large/long ears, small body size, large udder, medium teat size, and lightweight, muscled and prominent shoulder and rump	

Source: Allpedia website[55]

[55] Allpedia. http://allpedia.dkart.in/livestock/breeds/camel-breeds/9434-hoor-camel.html

5.2.7.5. Donkeys, Horses, Mules, and Poultry

According to the livestock information system roadmap, the priority species of animals are cattle, sheep, goats, and camels. As such, they are phenotypically described in this document (as indicated in the above tables). In future, additional species of domestic animals will be considered and described; for the moment, the donkey, horse, mule, and poultry breeds found in Ethiopia are listed and coded in Annex 3.

Table 21: Breed Data Field

Field Name	PrimaryBreed	
Description	The primary breed by which an animal is known or described. **Note:** See the list of breeds categorized by species above.	
Required?	Required	
Display Name	**Type**	**Acceptable Values / Example**
Breed	Object Breed scheme and ID	**e.g.,** "primaryBreed": { "id": "1.01.15", "scheme": "et.breed" }, *1.01.15: Code for Horro breed of Cattle species (refer to the table above)*
Implications if field is not completed / accurate		

Table 22: Breed Fractions Data Field

Field Name	**breedFractions**	
Description	An array of breed identifiers and proportions **Note:** See details on how to specify breed fractions above	
Display Name	**Type**	**Acceptable Values / Example**

Breed Fractions	Breed (scheme and ID) and breed fraction (denominators and positive integers totaling 100)
	
	Text (string)
		"breedFractions": {
		"denominator": "number",
		"fractions": [
		{
		"breed": {
		"id": "string",
		"scheme": "string"
		},
		"fraction": "number"
		}
		]
		},
		e.g., with value
		"breedFractions": {
		"denominator": 100,
		"fractions": [

		{
		"breed": {
		"id": "1.02.01",
		"scheme": "et.breed"
		},
		"fraction": 75
		},
		{
		"breed": {
		"id": "1.01.15",
		"scheme": "et.breed"
		},
		"fraction": 25
		}
		]
		},
		1.02.01: Holstein Friesian, 75%
		1.01.15: Horro, 25%

Implications if field is not completed / accurate		

5.2.8. Name

Farmers may give their animals names that are easy to remember. This field (Name) represents the official name of the animal given by the farmer (also known as herd/flock book name). Although difficult to implement, as animals are given names by the farmer, the name of an animal within a herd must be unique. A recommended approach is to combine farmer-assigned animal name + coat color + last three digits of the tag identifier (UID) (e.g., Tuka-RED-013).

Table 23: Name Data Field

Field Name	**name**	
Description	Name given by the farmer for this animal	
Display Name	**Type**	**Example / Acceptable Values / Example**
Name	String	**e.g.,** "name": "tuka-red-013",

5.2.9. Production Purpose

Animal production is the process of raising and managing animals for various purposes, such as meat, milk, skin/hide, or draft power. Production can be classified into different systems based on the level of intensification, feed resources, breed types, and market orientation (see Additional Attributes for more details). In Ethiopia's context, animal production has a multi-purpose role. For example, oxen first serve as draft power for crop production and are then repurposed and moved to feedlots for meat production. This approach has its own impact in terms of meat quality as farmers use oxen for crop production for most of their lives. These oxen then produce poor quality meat when they are moved to feedlots in their old age.

Table 24: Production Purposes of Domestic Animals in Ethiopia

Production Purpose	Species
Meat	Cattle, Goats, Sheep, Camels
Milk	Cattle, Goats, Camel
Draft power	Cattle, Horses, Donkeys, Camels
Wool	Sheep
Hide/Skin	Cattle, Goats, Sheep
Dung	Cattle, Camel, Horses, Donkeys
Other (social status)	Cattle, Goats, Sheep, Camels, Horses, Mules

Table 25: Production Purpose Data Field

Field Name	productionPurpose	
Description	Primary production purpose for which animals are bred Note:See the list of production purposes above	
Display Name	Type	Acceptable Values / Example
Production Purpose	Enumeration String	**e.g.,** "productionPurpose": "Meat",
Implications if field is not completed / accurate		Grading information depends on production purpose and cannot be validated if it is missing.

5.2.10. Reproduction Status

Categories of reproduction status and their respective definitions follow the ones listed in ICAR.

Table 26: Reproduction Status Categories

Enumeration values	Description
Open	The average number of days from calving/kidding/lambing to conception for those animals conceiving, and from calving/kidding/lambing to culling for those failing to do so.
Inseminated	The introduction of semen into the reproductive tract of a female, either through sexual intercourse (natural mating) or the use of an instrument such as a syringe (in the process known as artificial insemination).
Pregnant	In mammals, the period of reproduction during which a female carries one or more live offspring from implantation in the uterus through gestation and birth. It begins when a fertilized zygote implants in the female's uterus (i.e., conception), and ends once it leaves the uterus (i.e., birth).
NotPregnant	The reproductive status of a female animal that carries no offspring (which can be due to the failure or lack of insemination.

Enumeration values	Description
Birthed	The act or process of bearing or bringing forth offspring (also referred to in technical contexts as parturition).
DoesNotBreed	These are animals that do not produce young animals/offspring. This can be due to various infertility reasons (sterile, repeat breeder, anestrus).

Table 27: Reproduction Status Data Field

Field Name	reproductionStatus	
Description	Reproduction status of the animal Note: See the list of reproduction status values above	
Display Name	Type	Acceptable Values / Example
Reproduction Status	Enumeration String	**e.g.,** "reproductionStatus": "Open",
Implications if field is not completed / accurate		

5.2.11. Lactation Status

The lactation period for dairy cattle, sheep, goats, and camels differs as their gestation periods vary. Generally, lactation and gestation periods are directly proportional to one another. Hence, camels have the longest lactation period, followed by cattle, sheep, and goats. A dairy cow can be in a lactating or dry period (state). A lactation period is the time between one calving and the next. The lactation phase is further classified as early, mid, and late.

For a dairy cow, the dry phase can last as long as 65 days. However, the length of lactating or dry phases is different for camels, sheep, and goats. For example, in an ideal world, cows can calve every 12 months, sheep can lamb and goats can kid three times in two years, while camel cows can calve every other year. The following table summarizes the lactation status for dairy cows, camel cows, ewes, and female goats (does or nannies). The descriptions provided are based on ICAR documents.

Table 28: Dairy Cow Lactation Category

Enumeration values	Description
DryPeriod	The period from the date of drying (stop of milk production) to next calving (when the animal is pregnant). Generally, the length of the dry period in cows is 60-90 days. Note, the length of the dry period varies with the species of animal.
Fresh	The first phase of the lactation stage, which is critical because there is a sudden increase in milk output and low feed intake. The cow is in a negative energy balance. The body

Enumeration values	Description
	condition score declines and the cow is susceptible to diseases like mastitis and milk fever. For cows, this is the first 14 days.
EarlyLactation	Usually refers to the first 100 days of lactation, during which the animal will achieve peak milk production (in a cow, during the first 90-100 days of lactation). Feed intake lags and the animal is usually losing weight during this period.
MidLactation	Usually refers to lactation days between 100 to 200, during which milk production declines by about 10% per month.
LateLactation	Usually refers to lactation days between 200 to 300, during which milk production gradually declines.
Lactating	It is the period between one calving and the next during which a mother secretes milk from her mammary glands. The cycle is split into phases; the early lactation, mid lactation, late lactation, and the dry periods.

Table 29: Camel Cow Lactation Category

Enumeration values	Description
DryPeriod	The dry period allows mammary tissue to recover and repair.
Fresh	The time immediately after parturition.
EarlyLactation	Early lactation in camels is the 1–3-month period after postpartum.
MidLactation	Mid lactation in camels is the 4–6-month period after early lactation.
LateLactation	Late lactation in camels is the time before the dry-off period. It is the time after the seventh month since the lactating camel started providing milk.
Lactating	Lactating is the period between one calving and the next during which a camel secretes milk from her mammary glands.

Table 30: Sheep and Goat Lactation Category [56,57]

Enumeration values	Description
DryPeriod	Ewes require a dry (non-lactating) period before they lamb again. Research has shown that goats require a dry period of at least 28 days, otherwise their production of milk during the next lactation period will be much lower. Without this quiet period, mammary cell proliferation is reduced at the next lambing, and as much as 1/3 less milk is produced

56 El-Tarabany M.S., *et al.*., Impact of lactation stage on milk composition and blood biochemical and hematological parameters of dairy Baladi goats. Saudi Journal of Biological Sciences (2016), http://dx.doi.org/10.1016/j.sjbs.2016.08.0

57 Abecia J.A., Garcia A.,Castillo L., Palacios C., 2017. The effects of weather on milk production in dairy sheep vary by month of lambing and lactation phase. J Anim Behav Biometeorol (2017) 5:56-63

Enumeration values	Description
	the following lactation. An ewe should have a dry period not shorter than 28 days and, more appropriately, a minimum of 60 days.
Fresh	The time immediately after parturition
EarlyLactation	For goats, this milk production period lasts up to 80 days, whereas for sheep the period lasts up to three months after lambing. Milk yield peaks six to nine weeks after kidding, and feed intake does not peak until later. Thus, lactating goats are usually in a state of negative energy balance in early to mid-lactation. During early lactation, the doe does not go into heat. This time period is known as lactational anestrous. Even when nursing a kid or being milked, the doe will start cycling again.
MidLactation	For goats, mid-lactation is the 80-140 days of milk production, and for sheep, it is 3–7 months of milk production following the early lactation.
LateLactation	Late lactation is the stage of lactation immediately after mid-lactation, which is after 140 days for goats and the eighth month for sheep.
Lactating	The period between one kidding/lambing and the next during which a doe/ewe secretes milk from her mammary glands.

Table 31: Lactation Status Data Field

Field Name	**lactationStatus**	
Description	Lactation status of the animal Note: See the list of lactation status values above	
Display Name	**Type**	**Acceptable Values / Example**
Lactation Status	Enumeration String	**e.g.,** "lactationStatus": "Dry",

5.2.12. Parentage

Animal parentage recording is the process of documenting the genetic relationship between an offspring (e.g., calf) and its sire (male parent) and dam (female parent). This recording is important for improving breeding decisions, enhancing genetic selection, verifying pedigrees, and ensuring animal health and welfare. Cattle parentage recording is done using the unique identification (UID) of the sire and dam, (provided that unique identifiers of the sire and dam are known or recorded in the database). Generally, the identity of the dam is fairly certain and should be recorded. However, if the identity of the sire is unknown, the sire field can be left blank.

Visual Inspection of the Progeny: Visual inspection cannot be solely used to verify parentage. However, it can be used as a rough indicator of parentage where a sire can be easily identified by the type of calf that is born. Visual inspection is better for exclusion rather than for verification.

Table 32: Sire ID Data Field

Field Name	sireID	
Description	The UID of the sire of the animal	
Display Name	Type	Acceptable Values / Example
Sire ID	Object Identifier scheme and ID	**e.g.,** "identifier": { "id": "string", "scheme": "string" },

Table 33: Dam ID Data Field

Field Name	damID	
Description	The UID of the dam of the animal	
Display Name	Type	Acceptable Values / Example
Dam ID	Object Identifier scheme and ID	**e.g.,** "identifier": { "id": "string", "scheme": "string" },

5.2.13. Health Status

Animal health status categories are listed below in line with ICAR.[58] The respective definitions of animal status are also described below.[59]

Table 34: Animal Health Status Categories

Enumeration values	Description
Healthy	In animals, health may be defined as the absence of clinical signs or disease, or the normal functioning of an organism and normal behavior based on the observation of a certain number of individuals. For the animal to be categorized as "healthy," there needs to be a final confirmation from a competent animal health professional followed by the production of a health certificate.
Suspicious	An animal can be categorized as "suspicious" when either there is a history of complaints from the animal owner/keeper or when an animal health professional observes some clinical signs of disease (but cannot confirm it). The professional may need other confirmatory laboratory assistance for final diagnosis; in some cases, they may even require golden tests for confirmation. The "suspicious" animal can be re-categorized as "healthy" or "ill" based on the final confirmatory diagnosis.
Ill	Illness is any harmful deviation from the normal structural or functional state of an animal, generally associated with certain clinical signs and differing in nature from physical injury. A diseased animal commonly exhibits clinical signs indicative of its abnormal state. An animal can be categorized as "ill" by a competent animal health professional on the basis of the owner's complaint about its health status (history),

[58] ICAR Technical series no. 7. https://www.icar.org/Documents/technical_series/tec_series_17_Aarhus.pdf Accessed date: August 4, 2023.

[59] WOAH. https://www.woah.org/fileadmin/Home/eng/Health_standards/tahc/current/glossaire.pdf

Enumeration values	Description
	symptomatic and clinical examinations, and various tests. It is up to a professional to categorize animals as ill based on his/her judgment.
InTreatment	This means the animal is confirmed to have contracted a (certain) disease(s) and is taking treatment/medication/care, either as an inpatient or outpatient at an animal hospital.
ToBeCulled	This is the condition when the animal is to be removed from the population (herd/flock/production system, etc.). There can be various valid reasons that can result in culling of animals, such as severe disease conditions or performance-related issues.

Table 35: Health Status Data Field

Field Name	healthStatus	
Description	Health status of the animal Note: See the list of health status values above	
Display Name	Type	Acceptable Values / Example
Health Status	Enumeration, String	**e.g.,** "healthStatus": "InTreatment",

5.2.14. Status

Defines the status of the animal either absolutely and/or with reference to the location on which it is recorded Off-farm signifies that the animal is no longer recorded at the location. The following are the enum values for the possible status that can be recorded. Alive, Dead, OffFarm, Unknown.

5.2.15. Ownership

Animal ownership recording is the process of documenting and verifying the legal ownership of animals. This is important for preventing theft, fraud, disease outbreaks, and disputes over inheritance or sale. Detailed ownership recording is described in a later section. However, during animal data recording, owners' information should be recorded.

Table 36: Ownership Data Field

Field Name	owner	
Description	Identifier of the owner of the animal Note: See details on ownership identification in a later section	
Display Name	Type	Acceptable Values / Example
Owner	Object Owner scheme and ID	**e.g.,** "identifier": { "id": "string", "scheme": "string" },

5.3. Recording of Animal Events

Animal events refer to the various events that occur in the life cycle of an animal, including birth, registration, tagging, movement, and death. They also include productivity and performance events (e.g., milk production, weight, reproduction, feed, and market price). This section provides detailed descriptions of events and covers the standards for events recording. Recording involves keeping track of the various events that occur in the life cycle of an animal, such as calving, breeding, health, and production. Recording these events can help monitor the performance and welfare of animal herds and allow rearers to make informed decisions about breeding, culling, and feeding.

Recording of animal events can also improve herd management practices, optimize production efficiency and profitability, and enhance animal welfare standards. Additionally, it can help farmers comply with legal and regulatory requirements, such as those related to traceability and quality assurance. According to the ICAR data standard (ICAR, 2022),[60] there are seven broad categories of animal events that represent observations or actions recorded for an animal. The broad categories, with the list of events under each, are listed in the table below.

The last column in the table below contains the data that will need to be collected for each selected event. Detailed descriptions of each attribute/field listed in this column can be found later in this section.

Table 37: List of Categorized Animal Events

Category	Event Name	Description	Attributes or Fields
Registration and Movements	Arrival	Documents the arrival of an animal into a herd or new location.	♣ id ♣ eventDateTime ♣ animal ♣ location ♣ originLocation ♣ arrivalReason ♣ responsible ♣ remark
	Birth	Documents the birth of an animal.	♣ id ♣ eventDateTime ♣ animal ♣ location ♣ registrationReason ♣ remark
	Tagging/ Registration	Documents the tagging/registration of animals.	♣ id ♣ eventDateTime ♣ animalDetails ♣ location ♣ tagType ♣ registrationReason
	Retagging/ Replacement	Documents the replacement of animals' tags.	♣ id ♣ eventDateTime ♣ location ♣ previousIdentifier ♣ newIdentifier ♣ tagType ♣ retaggingReason
	Death	Documents the death or slaughter of an animal.	♣ id ♣ eventDateTime ♣ explanation ♣ disposalMethod

[60] ICAR (2022). Resource entities. Ed. Andrew C. 9 revisions. https://github.com/adewg/ICAR/wiki/Resource-entities#event-resources

Category	Event Name	Description	Attributes or Fields
			♣ animal ♣ location ♣ deathReason ♣ disposalOperator ♣ deathMethod
	Departure	Documents the departure of an animal from a location.	♣ id ♣ eventDateTime ♣ animal ♣ location ♣ destinationLocation ♣ departureKind ♣ departureReason ♣ responsible ♣ remark
Milking	Test Day Result	Records the test day result of a milking animal.	♣ id ♣ eventDateTime ♣ animal ♣ location ♣ MilkVolume24Hours ♣ unitCode ♣ testDayCode ♣ milkCharacteristics
	Dry Off	Documents an animal being dried off at the end of a lactation.	♣ id ♣ eventDateTime ♣ animal ♣ location ♣ responsible ♣ remark
Reproduction	Insemination	Records the insemination of an animal using natural or artificial methods or embryo transfer.	♣ id ♣ eventDateTime ♣ animal ♣ location ♣ inseminationType ♣ sireIdentifiers ♣ straw ♣ eventEndDateTime ♣ semenFromFarmStocks ♣ farmContainer
	Abortion	Records an abortion (i.e., termination of normal pregnancy before the normal delivery time).	♣ id ♣ eventDateTime ♣ animal ♣ location ♣ responsible ♣ remark
	Parturition	Records the parturition (calving, lambing, kidding, fawning, etc.) of a dam, ewe, or doe.	♣ id ♣ eventDateTime ♣ animal ♣ location ♣ damParity ♣ liveProgeny ♣ totalProgeny ♣ calving/kidding/lambing Ease ♣ progenyDetails ♣ progeny
	Pregnancy Check	Records a pregnancy test result (pregnancy diagnosis).	♣ id ♣ eventDateTime ♣ animal ♣ location ♣ method ♣ result ♣ fetalAge ♣ foetusCount ♣ foetusCountMale ♣ foetusCountFemale ♣ description
	Synchronization	Records the procedure undertaken (i.e., hormonal intervention) to manipulate the estrus cycle to bring the majority of animals into heat/estrus in a short time.	♣ id ♣ eventDateTime ♣ location ♣ number ♣ synchronizationProtocol ♣ synchronizationPeriod ♣ remark

Category	Event Name	Description	Attributes or Fields	
	Heat (Estrus)	Records animals' heat status.	♣ id ♣ eventDateTime ♣ animal ♣ location ♣ heatDetectionMethod	♣ certainty ♣ expirationDateTime ♣ heatSigns ♣ heatIntensity
Performance	Conformation Score	Records numeric conformation scores in one of the recognized categories.	♣ id ♣ eventDateTime ♣ animal ♣ location ♣ traitGroup	♣ score ♣ traitScored ♣ method ♣ device
	Weight	Records the live weight of an animal.	♣ id ♣ eventDateTime ♣ animal ♣ location ♣ measurement	♣ units ♣ method ♣ resolution ♣ device ♣ timeOffFeed
Health	Diagnosis	Records an animal being diagnosed with a disease or issue or anomaly.	♣ id ♣ eventDateTime ♣ animal ♣ location ♣ diagnoses	**Single diagnosis** ♣ id ♣ name ♣ description ♣ diagnosisCode ♣ stage ♣ severity ♣ positions
	Treatment	Records an individual health treatment (medicine and/or procedure) for an animal.	♣ id ♣ eventDateTime ♣ animal ♣ location ♣ medicine ♣ procedure ♣ doseQuantity ♣ doseUnits	♣ site ♣ route ♣ batchNumber ♣ expiryDate ♣ manufacturingDate ♣ manufacturerDetail ♣ comment
	Vaccination	Records an individual application of vaccination for an animal.	♣ id ♣ eventDateTime ♣ animal ♣ location ♣ vaccine ♣ doseQuantity ♣ doseUnits	♣ site ♣ positions ♣ batchNumber ♣ expiryDate ♣ manufacturingDate ♣ manufacturerDetail ♣ releaseDate

5.3.1. Registration and Movement

In this section, the recording of data related to the registration of animals (including birth, tagging, retagging, and fate/death) and the movement of animals (from origin to destination) is covered, with detailed explanations of the data that needs to be recorded for each event - along with definitions and standards - provided.

The purpose of recording these events is to ensure the traceability, health, and welfare of animals and comply with the relevant regulations and standards. Animal movement recording involves checking the identity and origin of the animal, including movement date, the reason for the movement, and other related relevant data.

5.3.1.1. Arrival

Animal arrival recording is a process of documenting and verifying the information of animals that arrive into a herd or new location (including farms, slaughterhouses, quarantine stations, etc.). Arrival events should include the following data items at the minimum:

Table 38: Arrival events data items

Data	Description	DataField	Type	Required
ID	Unique identifier in the source system for this event	id	string	☑
Event Date and Time	UTC date and time	eventDateTime	date	☑
Animal	Core schema for identifier and tag number	animal	object	☑
Animal Detail	Core schema for representing animal (refer to the Animal data recording section for field details)	animalDetail	object	☑
Premise	Location of the event (arrival) Location identifier based on a scheme and ID	location	object	☑
Origin Location	The origin location of the arriving animal Location identifier based on a scheme and ID	consignment. originLocation	object	
Arrival Reason	Arrival reason (see list in the table below)	arrivalReason	enum	
Responsible Person	Person recording the event	responsible	string	
Remark	A comment or remark field for additional user-specified information about the event	remark	string	
Transportation Method	Method of transportation	Transportation Method	string	

Arrival Reasons (Enumeration Values)	
Purchase	Agistment
InternalTransfer	AgistmentReturn
Imported	Show
StudService	ShowReturn
StudServiceReturn	Sale
Slaughter	SaleReturn
	Other

Example: Below is an example for recording an animal arrival event:


```
 "id": "ac9bdd26-0e20-44e7-b311-7d3d988f9717",
"animal": {
  "id": "ET 919713288",
  "scheme": "et.lits"
},
"eventDateTime": "2023-01-06T14:00:00Z",
"location": {
  "id": "231817",
  "scheme": "et.location"
},
"arrivalReason": "Purchase",
 "consignment": {
"originLocation":
        {
   "id": "765410142",
   "scheme": "et.location"
 },
 "transportationMethod": "string"
 }
```


5.3.1.2. Birth

Birth date - the date the animal was born - can have different purposes in animal recording. It is the first information recorded by a farmer or input into a system during registration. Other descriptive information (such as species, sex, breed/type, parentage, etc.) that fit into the "Animal Data Recording" section of this document is also gathered and documented. During birth recording, specific information such as event date and time, animal detail (species, sex, breed, etc.), premises, registration reason, tag type, and any other additional information (as a "Remark") is filled.

Table 39: Animal Birth data field

Item	Description	Data Field	Type	Required
ID	Unique identifier in the source system for this event	id	string	☑
Event Date & Time	UTC date and time	eventDateTime	date	☑
Animal	Core schema for identifier and tag number	animal	object	☑
Animal Detail	Core schema for representing animal Refer to the Animal Data Recording section for field details	animalDetail	object	☑
Premise	Location of the event (the birth location) Location identifier based on a scheme and ID	location	object	☑
Registration reason	Registration reason (see list in the table below)	registrationReason	enum	
Tag Type	The tag type provided	tagType	enum	

Remark	A comment or remark field for additional user-specified information about the event	remark	string	

Registration Reason (Enumeration Values)	Tag Type (Enumeration Values)
Born	Plastic Ear Tag

Example: Below is an example for recording an animal birth event:


```
 "id": "string",
"eventDateTime": "2023-05-03T15:32:58.146Z",
 "animal": {
  "id": "string",
  "scheme": "string"
},
"registrationReason": "Born",
"animalDetail": {
  "location": {
    "id": "string",
    "scheme": "string"
  },
  "identifier": {
    "id": "string",
    "scheme": "string"
  },
  "specie": "Cattle",
  "gender": "Female",
  "birthDate": "2023-05-03T15:32:58.147Z",
  "primaryBreed": {
    "id": "string",
    "scheme": "string"
  },
  "breedFractions": {
    "denominator": 0,
    "fractions": [
      {
        "breed": {
          "id": "string",
          "scheme": "string"
        },
        "fraction": 0
      }
    ]
  },
  "name": "string",
  "officialName": "string",
```

```
"productionPurpose": "Meat",
"reproductionStatus": "Open",
"lactationStatus": "Dry",
"parentage": [
  {
    "parentOf": {
      "id": "string",
      "scheme": "string"
    },
    "gender": "Female",
    "relation": "Genetic",
    "identifier": {
      "id": "string",
      "scheme": "string"
    },
    "officialName": "string"
  }
],
"healthStatus": "Healthy"
```


5.3.1.3. Tagging/Registration

Tagging/registration is the method in which an animal gets a specified identification code placed on their body, preferably on the ear. Specific rules for assigning common codes to animal species should be followed during tagging/registration. The details of the species-specific codes and definitions are outlined in the "Animal Data Recording" section of this document.

Table 40: Animal tagging/registration data field

Item	Description	Data Field	Type	Required
ID	Unique identifier in the source system for this event	id	string	✔
Event Date & Time	UTC date and time of the tagging/registration date	eventDateTime	date	✔
Animal	Core schema for identifier and tag number	animal	object	✔
Animal Detail	Core schema for representing animal Refer to the Animal Data Recording section for field details	animalDetails	object	✔
Premise	Location of the event (the destination location) Location identifier based on a scheme and ID	location	object	✔
Tag Type	The type of tag applied	tagType	enum	
New Tag Identifier	Core schema for identifier and tag number	animal	object	✔
Registration Reason	Registration reason (see list in the table below)	registrationReason	enum	✔

Registration Reason (Enumeration Values)	Tag Type
Registered	Plastic Ear Tag

Example: Below is an example for recording an animal tagging/registration event:


```
 "id": "string",
"eventDateTime": "2023-05-03T15:32:58.146Z",
 "animal": {
  "id": "string",
  "scheme": "string"
},
"registrationReason": "Registered",
"tagType" : "PlasticEarTag",
"animalDetail": {
  "location": {
    "id": "string",
    "scheme": "string"
  },
  "specie": "Cattle",
  "gender": "Female",
  "birthDate": "2023-05-03T15:32:58.147Z",
  "primaryBreed": {
    "id": "string",
    "scheme": "string"
  },
  "breedFractions": {
    "denominator": 0,
    "fractions": [
      {
        "breed": {
          "id": "string",
          "scheme": "string"
        },
        "fraction": 0
      }
    ]
  },
  "name": "string",
  "officialName": "string",
  "productionPurpose": "Meat",
  "reproductionStatus": "Open",
  "lactationStatus": "Dry",
  "parentage": [
    {
      "parentOf": {
        "id": "string",
        "scheme": "string"
```

```
    },
    "gender": "Female",
    "relation": "Genetic",
    "identifier": {
      "id": "string",
      "scheme": "string"
    },
    "officialName": "string"
  }
],
"healthStatus": "Healthy"
```


5.3.1.4. Retagging/Replacement

An initial tag could be lost or damaged due to different unexpected reasons. Therefore, retagging is the method of recording lost codes and allowing animals to retain their identifiers. A retagging request could be made by either animal owner or officials during site observation.

Table 41: Animal Retagging/Replacement data field

Item	Description	Data Field	Type	Required
ID	Unique identifier in the source system for this event	id	string	✔
Event Date and Time	UTC date and time of the tagging/registration date	eventDateTime	date	✔
Premise	Location of the event (the destination location) Location identifier based on a scheme and ID	location	object	✔
Previous Tag Identifier	Core schema for identifier and tag number	animal	object	✔
New Tag Identifier	Core schema for identifier and tag number	newIdentifier	object	✔
Tag Type	The type of tag applied	tagType	enum	
Retagging Reason	The reason for retagging/replacement	retaggingReason	enum	✔

Retagging Reason (Enumeration Values)
Lost
Damaged
Theft
Others

Example: Below is an example for recording an animal retagging/replacement event:


```
 "id": "string",
"eventDateTime": "2023-05-03T15:54:40.691Z",
 "location": {
```

```
    "id": "string",
    "scheme": "string"
  },
  "animal": {
    "id": "ET 0000010231",
    "scheme": "et.lits"
  },
   "newIdentifier" : {
    "id": "ET 0000012987",
    "scheme": "et.lits"
   }
   "retaggingReason": "damaged",
   "remark" : "string"
```

5.3.1.5. Death

The information recorded for death includes death date and time, animal details (i.e., species, breed, sex, age, etc.), premises or locations where the specific death event happened, suspected or possible causes of death (as Death Reason), any additional description of the causes of death (Explanation), and methods used to dispose of the cadaver (i.e., Disposal Method).

Table 42: Death registration data field

Item	Description	Data Field	Type	Required
ID	Unique identifier in the source system for this event	id	string	✔
Event Date and Time	UTC date and time	eventDateTime	date	✔
Animal	Core schema for identifier and tag number	animal	object	✔
Premise	Location of the event (the destination location) Location identifier based on a scheme and ID	location	object	✔
Death Reason	Coded reasons for death, including disease, parturition complications, consumption by humans or animals (see list in the table below)	deathReason	enum	
Explanation	Free text explanation of the reason for death	explanation	string	
Disposal Method	Coded disposal methods including approved service or consumption by humans or animals (see list in the table below)	disposalMethod	enum	

Death Reason (Enumeration Values)	Disposal Method of Dead Animals (Enumeration Values)
Parturition	Burial
Disease	Landfill

Death Reason (Enumeration Values)	Disposal Method of Dead Animals (Enumeration Values)
Accident	Incineration
Slaughtered	Rendering
Culled	Composting
Other	Chemical digestion
Unknown	Others
Age	
Drought	
Poisoning	

Example: Below is an example for recording an animal death event:


```
  "id": "string",
"eventDateTime": "2023-05-03T15:54:40.691Z",
"location": {
  "id": "string",
  "scheme": "string"
},
"remark": "string",
"animal": {
  "id": "string",
  "scheme": "string"
},
"deathReason": "Age",
"explanation": "string",
"disposalMethod": "Burial",
"disposalOperator": "string",
"deathMethod": "Perished"
```


5.3.1.6. Departure

Animal departure recording is the process of documenting and verifying the information of animals that depart from a herd or location (including farms, slaughterhouse, feedlots, etc.). Information related to animal departure includes departure date and time, animal descriptions (i.e., species, breed, age, etc.), the specific premises/location of departure, destination premises/location, reasons for departure, and persons responsible for departing the animal.

Table 43: Animal Departure data field

Item	Description	Data Field	Type	Required
ID	Unique identifier in the source system for this event	id	string	☑
Event Date and Time	UTC date and time	eventDateTime	date	☑
Animal	Core schema for identifier and tag number	animal	object	☑
Departure Premise	Location of the event (departure) Location identifier based on a scheme and ID	location	object	☑
Destination Premise	The destination location of the departing animal Location identifier based on a scheme and ID	consignment.destinationLocation	object	☑
Departure Reason	Coded value for departure cause; not specified in previous Animal Data Exchange (ADE) data dictionary (see list in the table below)	departureReason	enum	
Responsible Person	Person recording the event	responsible	string	
Remark	A comment or remark field for additional user-specified information about the event	remark	string	

Departure Reason (Enumeration Values)
Age
Health
Slaughter
Sale
Mastitis
Fertility
Nutrition
Parturition
Production
MilkingAbility
Behavior
Other
Unknown

Example: Below is an example for recording an animal departure event:

```
{    "id": "0e20-44e7-b311-8f1e09f9717-ac9bdd26",
```

```
        "eventDateTime": "2023-05-02T10:06:23.905Z",
        "responsible": "string",
        "location": {
           "id": "ETH584458",
           "scheme": "et.location"
         },
        "remark": "string",
        "animal": {
         "id": "ET 0000010231",
         "scheme": "et.lits"
        },
        "departureKind": "InternalTransfer",
        "departureReason": "Age",
        "consignment": {
        "originLocation": {
           "id": "ETH091123",
           "scheme": "et.location"
         },
         "destinationLocation": {
            "id": "string",
            "scheme": "string"
         },
}
```


5.3.1.7. Exit/Removal

Animal exit recording is the process of listing animals exiting or being deactivated from database systems for various reasons, including death (i.e., slaughter, euthanasia, sudden death) or theft. Information such as animal identifications (ID), specific date and time, animal description, specific premises/location of existing animals, and the reason for exit/removal must be recorded.

Table 44: Exit/removal data field

Item	Description	Data Field	Type	Required
ID	Unique identifier in the source system for this event	id	string	✔
Event Date and Time	UTC date and time	eventDateTime	date	✔
Animal	Core schema for identifier and tag number	animal	object	✔
Exit Premise	Location of the event (departure) Location identifier based on a scheme and ID	location	object	✔
Exit Reason	Coded value for departure cause; not specified in previous ADE data dictionary (see list in the table below)	exitReason	enum	

Exit Reason (Enumeration Values)
Death
Theft

Exit Reason (Enumeration Values)
Other
Unknown

5.3.2. Milking

5.3.2.1. Test Day Result

Test day result is a method of evaluating the performance and health of dairy cows. It includes information related to body condition scores, milk production, and milk quality assessments (e.g., milk yield, fat and protein content, somatic cell count). The test day result helps identify cows that need special attention, such as those with low production, high mastitis risk, or poor body condition. The test day result also provides information for breeding or culling decisions, feed management, and disease prevention.

Table 45: Animal test day result data field

Item	Description	Data Field	Type	Required
ID	Unique identifier in the source system for this event	id	string	✔
Event Date and Time	UTC date and time	eventDateTime	date	✔
Animal	Core schema for identifier and tag number	animal	object	✔
Premise	Location of the event (the destination location) Location identifier based on a scheme and ID	location	object	✔
Calving Date	Last calving date	dateTime		
Milk Weight	The amount of milk milked in 24 hours	milkWeight24Hours.value	double	✔
Unit Code	UN/CEFACT Common Code for Units of Measurement. For example: LTR to represent liter or KGM for kg	milkWeight24Hours.unitCode	string	✔
Test Day Code	The test day code indicating the status of the cow on the test day (see list in the table below)	testDayCode	enum	
Milk Characteristics	Characteristics of the milk produced ICAR Milk Characteristics Codes and values (see list for characteristics codes and unit in the table below)	milkCharacteristics	array	

Unit code measurement is taken from TRADE/CEFACT (2005)[61]

[61] TRADE/CEFACT (2005). Units of Measure: Code elements listed by common code. https://unece.org/DAM/cefact/recommendations/rec20/rec20_rev3_Annex3e.pdf

Test Day Code (Enumeration Values)
Dry
SamplingImpossible
Sick
Milking

UN/CEFACT Common Code for Units of Measurement

Unit Code (Enumeration Values)
KGM

Milk Characteristics Objects				
Item	Description	Data field	Type	Required
Characteristic	Milk Characteristics Codes and Values	characteristic	string	✔
Value	The value of the characteristic measured	value	string	✔
Unit	The defaults are described below, only use this field when different from the default; use UN/CEFACT codes	unit	string	✔

Milk Characteristics Codes and Units of Measurement	
Characteristic	Unit of Measurement
SCC	SCC|Somatic cell count|x1000 cells/ml|NCL
FAT	FAT|Fat|%|VP
PROTEIN	PROTEIN|Protein|%|VP
LAC	LAC|Lactose|%|VP
UREA	UREA|Urea|mg/l|M1
BLOOD	BLOOD|Blood|true/false|A99
ACETONE	ACETONE|Acetone|mmol/l|M33
BHB	BHB|Beta hydroxybutyrate|mmol/l|M33
LDH	LDH|Lactate dehydrogenase|IU/l|
PRO	PRO|Progesterone|mmol/l|M33
AVGCOND	AVGCOND|Average conductivity value of the milk at 25 ° C|mS/cm|H61

Milk Characteristics Codes and Units of Measurement	
Characteristic	**Unit of Measurement**
MAXCOND	MAXCOND|Maximum conductivity value of the milk at 25 ° C|mS/cm|H61
AVGFLWR	AVGFLWR|Average flow rate|Kg/min|F31
MAXFLWR	MAXFLWR|Max flow rate|Kg/min|F31
WEIGHT	WEIGHT|Weight of animal|Kg|KGM
TEMPERATURE	PAG|Pregnancy associated glycoprotein|mmol/l|M33
Mineral (Ash)	Percentage of ash by weight in GRAMS

Example: Below is an example for recording an animal test day event:


```
 "id": "event.testday",
"animal": {
  "id": "ET 0000010231",
  "scheme": "et.lits"
},
"eventDateTime": "2019-11-01T23:58:31Z",
 "location": {
    "id": "ETH091123",
    "scheme": "et.location"
  },
"milkWeight24Hours": {
  "value": 21.7,
  "unitCode": "KGM"
},
"icarMilkCharacteristics": [
  {
    "characteristic": "FAT",
    "value": "3.74",
    "unit": "VP",
   },
  {
    "characteristic": "PROTEIN",
    "value": "3.54",
    "unit": "VP"
  }
]
```


5.3.2.2. Dry Off

This records that the animal has been dried off from milking. There is no additional field that indicates an animal has been dried off from milking; as such, use the ID of the event (e.g., event/dryoff) with common data fields, including event date, time and location of the event, and details of the animal, to indicate that this particular animal has been dried off from milking.

Table 46: Dray off data filed

Item	Description	Data Field	Type	Required
ID	Unique identifier in the source system for this event	id	string	✔
Event Date and Time	UTC date and time	eventDateTime	date	✔
Animal	Core schema for identifier and tag number	animal	object	✔
Location	Location of the event (the destination location) Location identifier based on a scheme and ID	location	object	✔
Responsible Person	Person object recording the event	responsible	string	
Remark	A comment or remark field for additional user-specified information about the event	remark	string	

Example: Below is an example for recording animal dry off event:

```
  "id": "event.dryoff",
"animal": {
  "id": "ET 0000010231",
  "scheme": "et.lits"
},
"EventDateTime": "2019-11-01T23:58:31Z",
 "location": {
    "id": "ETH091123",
    "scheme": "et.location"
  },
```

5.3.3. Reproduction

5.3.3.1. Insemination

Insemination can be either natural or artificial, depending on breeding goals, farming methods, and availability of bull/semen at a specific time and place. Recording insemination events can help monitor the reproductive performance of animals, identify potential problems, and plan future breeding strategies.

Table 47: Insemination data filed

Item	Description	Data Field	Type	Required
ID	Unique identifier in the source system for this event	id	string	✔
Event Date and Time	UTC date and time	eventDateTime	date	✔
Animal	Core schema for identifier and tag number	animal	object	✔
Premise	Location of the event (the destination location)	location	object	✔

Item	Description	Data Field	Type	Required
	Location identifier based on a scheme and ID			
Insemination Type	The method of insemination (natural service, artificial insemination, implantation)	inseminationType	enum string	
Sire Identifiers	Unique scheme/identifier combinations for the sire	sireIdentifiers	array	
Straw	Details of the straw, which may also include sire details	straw	object	
Semen from Farm Stocks	This only applies if the semen is collected from the farm stock itself and used for local farm animals; however, this will not be applied for semen supplied by the government with artificial insemination technicians	semenFromFarmStocks	boolean	
Farm Container	Number or ID of the container from which the dose was taken	farmContainer	string	
AI /Service Number	The AI service number if insemination type is AI	aiServiceNumber	string	
Body Condition Score	Body condition score of the animal being inseminated	bodyConditionScore	string	

Insemination Type (Enumeration Values)
NaturalService
ArtificialInsemination
Implantation

Example: Below is an example for recording an insemination event:

```
"id": "string",
"animal": {
  "id": "string",
  "scheme": "string"
},
"eventDateTime": "2023-05-02T12:46:44.936Z",
"location": {
  "id": "string",
  "scheme": "string"
},
"inseminationType": "NaturalService",
"sireIdentifiers": [
  {
    "id": "string",
    "scheme": "string"
  }
],
"eventEndDateTime": "2023-05-02T12:46:44.936Z",
"semenFromFarmStocks": true,
```

```
        "farmContainer": "string",
```

Example: Below is an example for straw recording:

```
 "straw": {
          "@self": "string",
          "meta": {
            "source": "string",
            "sourceId": "string",
            "modified": "2023-05-02T12:46:44.936Z",
            "created": "2023-05-02T12:46:44.936Z",
            "creator": "string",
            "validFrom": "2023-05-02T12:46:44.936Z",
            "validTo": "2023-05-02T12:46:44.936Z"
          },
          "id": {
            "id": "string",
            "scheme": "string"
          },
          "batch": "string",
          "collectionCentre": "string",
          "dateCollected": "2023-05-02T12:46:44.936Z",
          "sireIdentifiers": [
            {
              "id": "string",
              "scheme": "string"
            }
          ],
          "sireOfficialName": "string",
          "sireURI": "string",
          "preservationType": "Liquid",
          "isSexedSemen": true,
          "sexedGender": "Female",
          "sexedPercentage": 0
        },
```

5.3.3.2. Abortion

The abortion event records that an abortion has taken place. There are no other parameters. This information can be used for breeding selection and health monitoring.

Table 48: Abortion data field

Item	Description	Data Field	Type	Required
ID	Unique identifier in the source system for this event	id	string	☑
Event Date and Time	UTC date and time	eventDateTime	date	☑
Animal	Core schema for identifier and tag number	animal	object	☑
Premise	Location of the event (the destination location)	location	object	☑

Item	Description	Data Field	Type	Required
	Location identifier based on a scheme and ID			
Abortion reason	Infection, Mechanical, Non-specific, Unknown	abortionReason	enum	

Abortion Reason (Enumeration Values)
Infection
Mechanical
NonSpecific
Unknown

Example: Below is an example for recording an abortion event:

```
 "id": "event.abortion",
"animal": {
   "id": "string",
   "scheme": "string"
 },
 "eventDateTime": "2023-05-02T12:46:44.936Z",
 "location": {
   "id": "string",
   "scheme": "string"
 },
```

5.3.3.3. Parturition

Parturition, also called birthing, is a cross-species term for calving, lambing, kidding, or fawning. Parturition event recording is a process of documenting the details of a birth, such as the date, time, location, mode, ease of calving/lambing/kidding/fawning, and outcome of delivery (live birth, still birth, etc.). It is important for medical, legal, and statistical purposes as well as parentage recording.

Table 49: Parturition data filed

Item	Description	Data Field	Type	Required
ID	Unique identifier in the source system for this event	id	string	✔
Event Date and Time	UTC date and time	eventDateTime	date	✔
Animal	Core schema for identifier and tag number	animal	object	✔

Item	Description	Data Field	Type	Required
Location	Location of the event (the destination location) Location identifier based on a scheme and ID	location	object	✔
Dam Parity	The calving, litter, or other parturition number for the dam, ewe, or doe; the number of times the female has had offspring	damParity	number	
Live Progeny	The number of live offspring from the parturition; important if progeny are not identified (e.g., unregistered or born dead)	liveProgeny	number	
Total Progeny	The total number of offspring from the parturition, including those born dead	totalProgeny	number	
Progeny Details	List of progeny details; may not be fully identified, but recommend that at least gender and status are supplied	progenyDetails	array	
Calving/Kidding/Lambing Ease	Coded values for calving, lambing, or kidding ease (corresponding to traditional 1–5 values) (see list in the table below)	calvingEase	enum	

Calving/Kidding/Lambing Ease (Enumeration Values)	
Normal	
MinorAssistance	e.g., position/presentation and posture adjustment
Dystocia	
UterineProlapse	
RetainedPlacenta	
CaesareanSection	
Others	

5.3.3.3.1. Progeny Details

Progeny recording is a process of documenting whether a newborn animal is a live birth or a stillbirth (i.e., born dead). Details of live progeny also need to be documented, including sex (male or female), health status (normal or with defects), and weight (small, medium, large). The weight of the calf at birth is registered in kilograms. The classification of the birth weight (as small, medium, and large) is inexact because it is impossible to determine a cut-off number (as it requires extensive research of local, cross, and exotic breeds). Therefore, it is better to put the measured weight of a newborn in kilograms. Weight can also be measured using a weighing balance, girth-based calculation, or group average estimates.

Table 50: Progeny details data field

Item	Description	Data Field	Type	Required
ID	Unique identifier in the source system for this event	id	string	☑
Event Date and Time	UTC date and time	eventDateTime	date	☑
Animal Detail	Core schema for representing animal	animal	object	☑
Location	Location of the event (the destination location) Location identifier based on a scheme and ID	location	object	☑

Status Live (Enumeration Value)	Birth Size Type (Enumeration Values)	Weight Method (Enumeration Values)
MaleNormal	Small	WeighingBalance
MaleDefect	Medium	Girth
FemaleNormal	Large	WalkOver
FemaleDefect		Estimated
		Imaged
		GroupAverage

Example: Below is an example for recording a parturition event.

```
 "id": "string",
"eventDateTime": "2023-05-03T16:41:37.512Z",
 "location": {
  "id": "string",
  "scheme": "string"
},
"animal": {
  "id": "string",
  "scheme": "string"
},
"damParity": 0,
"liveProgeny": 0,
"totalProgeny": 0,
"calvingEase": "EasyUnassisted",
"progenyDetails": [
  {
    "location": {
      "id": "string",
      "scheme": "string"
    },
    "identifier": {
      "id": "string",
      "scheme": "string"
    },
    "specie": "Cattle",
    "gender": "Female",
    "managementTag": "string",
    "name": "string",
    "officialName": "string",
```

```
"taggingDate": "2023-05-03T16:41:37.512Z",
"birthStatus": "Alive",
"birthWeight": {
  "measurement": 0,
  "units": "KGM",
  "method": "WeighingBalance",
  "resolution": 0
}
```


5.3.3.4. Pregnancy Diagnosis/Check

This check involves ascertaining animal pregnancy and determining calf/kid/lamb position (to identify if assisted delivery is needed). The age of the unborn calf/kid/lamb can be determined during this diagnosis. It is common to perform the procedure as a part of production, clinical, and abattoir antemortem cases.

Table 51: Pregnancy Diagnosis data filed

Item	Description	Data Field	Type	Required
ID	Unique identifier in the source system for this event	id	string	☑
Event Date and Time	UTC date and time	eventDateTime	date	☑
Animal Detail	Core schema for representing animal	animal	object	☑
Location	Location of the event (the destination location) Location identifier based on a scheme and ID	location	object	☑
Method	Method by which diagnosis was carried out	method	enum	
Result	Result of the pregnancy check (unknown, empty, pregnant)	result	enum	☑
Fetal Age	Assessed age of the fetus or length of the pregnancy (in days)	foetalAge	integer	
Description	Additional local observations	exceptions	string	

Method of Diagnosis (Enumeration Values)	Result of Diagnosis (Enumeration Values)
Echography	Empty
RectalPalpation	Pregnant
Blood	Doubtful
Milk	
Visual	
Other	

Example: Below is an example for recording a pregnancy check event:


```
"id": "string",
```

```
"animal": {
  "id": "string",
  "scheme": "string"
},
"eventDateTime": "2023-05-03T16:49:55.755Z",
"location": {
  "id": "string",
  "scheme": "string"
},
"method": "Echography",
"result": "Empty",
"foetalAge": 0,
"foetusCount": 0,
"foetusCountMale": 0,
"foetusCountFemale": 0,
```


4.3.3.5. Estrus Synchronization

Estrus synchronization is a technique that allows farmers to manage the reproductive cycles of their herds or flocks. Via hormonal treatments, artificial insemination, or natural service, estrus synchronization can help achieve higher pregnancy rates by enabling shorter calving, lambing, or kidding intervals and more uniform calf, lamb, or kid crops. Estrus synchronization can also reduce labor costs and improve genetic selection.

Table 52: Estrus Synchronization data field

Item	Description	Data Field	Type	Required
ID	Unique identifier in the source system for this event	id	string	✔
Event Date and Time	UTC date and time	eventDateTime	date	✔
Location	Location of the event (the destination location) Location identifier based on a scheme and ID	location	object	✔
Protocol	Method of synchronization	synchronizationMethod	enum	
Remark	A comment or remark field for additional user-specified information about the event	remark	string	
Parity	Parentage details of the animal	parity	integer	
Responsible Person	Person object recording the event	responsible	string	
Body Condition Score	Body condition score of the animal being inseminated	bodyConditionScore	string	

Synchronization Method – Protocol (Enumeration Values)	
PG	Prostaglandin F2α (PG) based

Synchronization Method – Protocol (Enumeration Values)	
GnRH	Gonadotropin releasing hormone (GnRH) based
Progestin	Progestin based
Combination	

5.3.3.6. Heat

Also called estrus, this is the period in the reproductive cycle when female animals send sexually receptive signals (stand on mounting, mount on other animals, moist/swollen vulva, clear mucus discharge, restlessness, etc.) and are ready for mating.

Table 53: Heat/estrus data field

Item	Description	Data Field	Type	Required
ID	Unique identifier in the source system for this event	id	string	✔
Event Date and Time	UTC date and time	eventDateTime	date	✔
Animal Detail	Core schema for representing animal	animal	object	✔
Premise	Location of the event (the destination location) Location identifier based on a scheme and ID	location	object	✔
Heat Detection Method	The method of detecting the heat of an animal	heatDetectionMethod	enum	
Certainty	The certainty of a specific heat	certainty	enum	
Expiration Date Time	UTC date/time when the heat will end	expirationDateTime	Date	
Heat Sign	The signs of heat	visualDetection.heatSigns	array of enum	
Heat Intensity	The intensity of the heat (if it can be determined, for example during chemical detection	visualDetection.heatIntensity	enum	

Heat Detection Method (Enumeration Values)	Certainty (Enumeration Values)	Heat Signs (Enumeration Values)	Heat Intensity (Enumeration Values)
Chemical	InHeat	Mucus	VeryWeak
Visual	Suspect	ClearMucus	Weak
Pedometer		InterestedInOtherAnimals	Normal
Other		Bawling	Strong
		Blood	VeryStrong
		StandsUnder	

Example: Below is an example for recording a heat event:


```
  "id": "string",
"eventDateTime": "2023-06-12T09:53:14.975Z",
"traitLabel": {
  "id": "string",
  "scheme": "string"
},
"location": {
      "id": "string",
      "scheme": "string"
    },
"animal": {
  "id": "string",
  "scheme": "string"
},
"heatDetectionMethod": "Chemical",
"certainty": "InHeat",
"expirationDateTime": "2023-06-12T09:53:14.975Z",
"visualDetection": {
  "heatSigns": [
    "Slime"
  ],
  "heatIntensity": "VeryWeak"
},
```


5.3.4. Performance

5.3.4.1. Weight

Recording the weight of animals can be done by directly using a weighing balance on the day of birth. Alternatively, heart girth measurements can be used to estimate animal weight. The weight of an animal before slaughter is determined using an appropriate and acceptable method.

Table 54: Animal Weight data field

Item	Description	Data Field	Type	Required
ID	Unique identifier in the source system for this event	id	string	☑
Event Date and Time	UTC date and time	eventDateTime	date	☑
Animal Detail	Core schema for representing animal	animal	object	☑
Location	Location of the event (the destination location) Location identifier based on a scheme and ID	location	object	☑
Weight	The weight observation in the units specified (usually kilograms)	weight.measurement	number	☑

Item	Description	Data Field	Type	Required
Unit Code	UN/CEFACT Common Code for Units of Measurement. For example: KGM for kg	weight.units	string	✔
Weight Method	The method of observation. Weighing balance is the default if others are not specified (see list in the table below)	weight.method	enum string	✔
Device	Optional information about the device used for the measurement	device	object	
Time Off Feed	Hours of curfew or withholding feed prior to weighing	timeOffFeed	number	

Unit code is adopted from TRADE/CEFACT (2005)

Weight Method (Enumeration Values)
WeighingBalance
WalkOver
Girth
Estimated
Imaged
GroupAverage

Example: Below is an example for recording animal weight event:


```
 "id": "string",
"eventDateTime": "2023-05-03T11:04:24.095Z",
"remark": "string",
"animal": {
  "id": "string",
  "scheme": "string"
},
"weight": {
  "measurement": 0,
  "units": "KGM",
  "method": "WeighingBalance",
  "resolution": 0
},
"timeOffFeed": 0
```

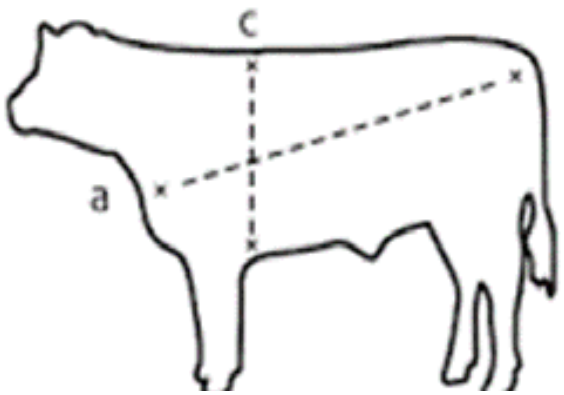

Weight Estimation

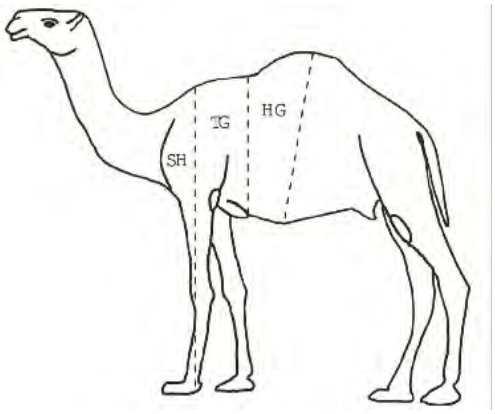
Body weight is often used to prepare diets and determine the insemination date of heifers/cows. Body weight is affected by many different factors, such as frame size, dry matter intake, growth, pregnancy, parity, and lactation. While udder tissue and mass also affects body weight, it is a small factor compared to others. An animal should be weighed after it has fasted for about 12 hours as

this prevents digestive content from skewing measurements. Animal weight for different species can be ascertained using the calculations below:

[62]**For Cattle, Sheep, and Goats:** (Heart girth * heart girth * body length) ÷ 300 = Live weight in pounds. The short form is W = (L * G2)/300, where W is weight, L is body length, and G is heart girth (Length in inches and weight in pounds; 1 inch = 0.0254m; 1 pound = 0.453592kg). The following calculation can be used to convert weight into kilograms and meters.
Weight (kg)= 0.000016387064 (L (in m) x 2 (G (in m))/136.1

For Camel: Live weight [kg] = SH [m] * TG [m] * HG [m] * 50 (SH = shoulder height; TG = thoracic girth; HG = hump girth). Note: Abdominal girth measurement should be taken behind the chest pad.
[63]Body weight (kg) = -200.86 + 105.91 TG(m) + 79.63 HG (m) + 56.22 SH (m)





5.3.5. Health

5.3.5.1. Diagnosis

Diagnosis is the process of determining the nature of a disease or disorder and distinguishing it from other possible conditions based on symptoms, health histories, physical exams, and tests. Single animal or herd can be diagnosed using different approaches. A detailed clinical examination can be carried out on a single animal, while a general assessment can be conducted on an entire herd. The findings from the herd diagnosis can inform a single animal's diagnosis. The detailed diagnostic techniques and tests are addressed under the animal health, diagnosis, treatment, and vaccination section.

[62] Pater S. (2007)., Extension Agent, 4-H Youth Development, University of Arizona Cooperative Extension, Cochise County. https://cales.arizona.edu/backyards/sites/cals.arizona.edu.backyards/files/p11-12.pdf

[63] Kuria S.G., Wahome R.G., Gachuiri C.K., Wanyoike M.M., Mwangi J.N. (2007). Use of linear body measurements in estimating live weight of camel (Camelus dromedarius) calves in Kenya. Journal of Camel Practice and Research. 14:21-25.

Table 55: Herd diagnosis data field

Item	Description	Data Field	Type	Required
ID	Unique identifier in the source system for this event	id	string	✔
Event Date and Time	UTC date and time	eventDateTime	date	✔
Animal Detail	Core schema for representing animal	animal	object	✔
Premise	Location of the event (the destination location) Location identifier based on a scheme and ID	location	object	✔
Diagnoses	Diagnosis of the animal health condition; an array allows for several conditions to be recorded at once (see below for a detailed description of fields for a single diagnosis)	diagnoses	array	✔

Recording of single animal diagnosis: In dealing with individual diseased animals, information about the animal and case must be recorded. This information includes animal description (species, breed, age, sex, etc.), disease condition diagnosed, description of the disease (problem), code given for this diagnosis, clinical stage of the disease progression, clinical severity, and affected body system.

Table 56: Single animal diagnosis data field

Item	Description	Data Field	Type	Required
ID	Unique identifier for this diagnosis	id	string	✔
Condition Diagnosed	Name indicating the health condition diagnosed	name	string	✔
Description	Description of the diagnosis or problem	description	string	
Diagnosis Code	Describes the scheme and the code within that scheme Scheme and code are covered in detail in the Animal Health Recording section of the data standard	diagnosisCode	object	✔
Clinical Stage of Disease Progression	Identifies the clinical stage of disease progression (see the list in the table below)	stage	enum	
Clinical Severity	Identifies the clinical severity of the problem. (See the list in the table below)	severity	enum	
System Affected	The system to be treated (see the list in the table below)	systemAffected	enum	

Clinical Stage of Disease Progression (Enumeration Values)	Clinical Severity (Enumeration Values)	Systems Affected (Enumeration Values)
Peracute	Light	CentralNervous
Acute	Moderate	SensoryOrgans

Clinical Stage of Disease Progression (Enumeration Values)	Clinical Severity (Enumeration Values)	Systems Affected (Enumeration Values)
SubAcute	Severe	Digestive
Chronic		Respiratory
Other		Cardiovascular
		Locomotory
		Urinary
		Reproductive
		Lymphoid
		Integumentary
		Muscular
		Others (like metabolic diseases and deficiencies, poisoning, or behavioral disorders affecting the whole system)

Example: Below is an example for recording an animal diagnoses event


```
 "id": "string",
"eventDateTime": "2023-05-03T12:03:24.893Z",
  "location": {
   "id": "string",
   "scheme": "string"
},
"remark": "string",
"animal": {
  "id": "string",
  "scheme": "string"
},
"diagnoses": [
  {
    "id": "string",
    "name": "string",
    "description": "string",
    "diagnosisCode": {
      "id": "string",
      "scheme": "string"
    },
    "stage": "Early",
    "severity": "Light",
    "systemAffected":"Urinary"
   }
]
```


5.3.5.2. Treatment

Treatment event recording involves listing all the preventative and curative measures used to treat diseased animals, including the medicine or procedure applied, dosage, and application (in case of medicine treatment). Details about treatment are addressed under the animal health, diagnosis, treatment, and vaccination section.

Table 57: Animal treatment data field

Item	Description	Data Field	Type	Required
ID	Unique identifier in the source system for this event	id	string	✔
Event Date and Time	UTC date and time	eventDateTime	date	✔
Animal Detail	Core schema for representing animal	animal	object	✔
Premise	Location of the event (the destination location) Location identifier based on a scheme and ID	location	object	✔
Medicines	Name of the drugs or remedy given for this treatment	medicine.name	string	✔ One of two required
Procedure	Medicine application method or a non-drug procedure	procedure	string	
Dose (quantity)	Quantity of medicine or product administered	dose.doseQuantity	number	
Dose Unit	UN/CEFACT Common Code for Units of Measurement For example: LTR to represent liter or KGM for kg	dose.doseUnits	string	
Body Site	Body site where the treatment was administered	site	string	
Route of Administration	Route of drug administration	route	enum	
Comment	A comment recorded about the treatment or its outcome	comment	string	
Prognosis	To be defined			
Batches		batches	array	
Batch Number	The ID, batch, or lot number of the drug administered	batches.batchNumber	string	
Expiry Date	UTC expiry date of the batch	batches.expiryDate	Date	
Manufacturing Date	UTC manufacturing date of the batch	manufacturingDate	Date	
Manufacturer Detail	Manufacturers detail of the medicine or product	manufacturerDetail	string	

Dose units are adopted from TRADE/CEFACT (2005)[64]

Route of Administration (Enumeration Values)
Intravenous
Intramuscular
Subcutaneous
PerOs
IntramammaryInfusion

[64] TRADE/CEFACT (2005). Recommendation No. 20 - Units of Measure used in International Trade. https://unece.org/DAM/cefact/recommendations/rec20/rec20_rev3_Annex3e.pdf

Route of Administration (Enumeration Values)
Intrauterine
EyeDroplet
Intranasal
Intraperitoneal
Topical
Others

Example: Below is an example for recording a treatment event:


```
      "id": "string",
      "location": {
        "id": "string",
        "scheme": "string"
      },
      "eventDateTime": "2023-05-03T12:43:41.450Z",
      "remark": "string",
      "animal": {
        "id": "string",
        "scheme": "string"
      },
      "medicine": {
        "name": "string",
      },
      "procedure": "string",
      "dose": {
        "doseQuantity": 0,
        "doseUnits": "MLT"
      },
      "site": "string",
      "positions": [
        {
          "position": "LegsFrontLeft"
        }
      ],
      "comment": "string"
    }
  ]
```


5.3.5.3. Vaccination

The vaccination event records the introduction of a vaccine to an animal to protect against a specific disease. The data recorded includes the specific name of disease the vaccine prevents, the type and dosage of the vaccine applied, and the method (route) of vaccine application. More explanation about vaccines and vaccination is given under the animal health, diagnosis, treatment, and vaccination section.

Table 58: Animal vaccination data filed

Item	Description	Data Field	Type	Required
ID	Unique identifier in the source system for this event	id	string	✔
Event Date and Time	UTC date and time	eventDateTime	date	✔
Animal Detail	Core schema for representing animal	animal	object	✔
Location	Location of the event (the destination location) Location identifier based on a scheme and ID	location	object	✔
Vaccine	Name of the vaccine applied	vaccine	string	✔
Purpose of Vaccination	Control, Prophylaxis	vaccinationPurpose	string	
Vaccination Round	The vaccination round: First dose, booster dose	vaccinationRound	string	
Dose (quantity)	Quantity of medicine or product administered	doseQuantity	number	✔
Dose Unit	UN/CEFACT Common Code for Units of Measurement For example: LTR to represent liter or KGM for kg	doseUnits	string	✔
Injection Site	Body site where the vaccine was administered, e.g., under the tail	injectionSite	string	
Route of Administration	Route of vaccine administration	route	enum	
Batch Number	The ID, batch, or lot number	batchNumber	string	
Expiry Date	UTC expiry date of the batch	expiryDate	Date	
Manufacturing Date	UTC manufacturing date of the batch	manufacturingDate	Date	
Manufacturer Detail	Manufacturers detail of the medicine or product	manufacturerDetail	string	
Type of Vaccine	Killed, live attenuated, live			
Release Date	Vaccine released date from store	releaseDate	Date	

Route of Administration (Enumeration Values)
Subcutaneous
Intradermal
PerOs
EyeDroplet
Intranasal
Topical
Others

Example: Below is an example for recording a vaccination event:


```
    "id": "string",
    "location": {
      "id": "string",
      "scheme": "string"
    },
    "eventDateTime": "2023-05-03T12:43:41.450Z",
    "remark": "string",
    "animal": {
      "id": "string",
      "scheme": "string"
    },
    "vaccine": {
      "name": "string",
    },
    "dose": {
      "doseQuantity": 0,
      "doseUnits": "MLT"
    },
    "injectionSite": "UnderTail",
    "comment": "string"
  }
]
```

5.4. Animal Disease, Diagnosis, Treatment, and Vaccination Recording

This section covers how to collect and define the data types relating to animal health, diagnoses, disease types, and vaccinations. The descriptions/definitions of the terminologies used in this document are listed below.

5.4.1. Definitions

Acute Disease

A disease or disorder that occurs suddenly and has immediate or rapidly developing symptoms that are limited in duration. Many acute diseases may go away on their own or can be treated with a simple course of antibiotics or other prescription medications. There are some acute diseases, however, that come on suddenly and produce life-threatening symptoms.

Aetiology/Etiology

The cause of a disease or abnormal condition. Etiologies of disease can be of internal (intrinsic) or external origin (extrinsic) or of unknown origin (idiopathic). Etiologic agents of disease can be infectious (bacteria, viruses, protozoa, fungi, etc.) or noninfectious (toxins, prions, trauma, climatic events).

Antibiotics

A type of antimicrobial substance active against bacteria. Antibiotics are the most important type of antibacterial agent for fighting bacterial infections. Antibiotic medications are widely used in the treatment and prevention of bacterial infections. They may either kill (bactericidal) or inhibit (bacteriostatic) the growth of bacteria.

Antemortem Examination

Literally means before death. Refers to the inspection of live animals before they are slaughtered. This examination helps select adequately rested animals and diagnose diseases before animals are slaughtered. The diagnosis helps identify diseases that may not produce visible lesions and prevent unnecessary contamination of personnel and equipment inside a plant by diseased animals. Antemortem examinations are also necessary for informing postmortem examination and ensuring animals with pain and abnormalities are handled humanely. They are also used to exclude, temporarily or totally, animals with serious cases from slaughter.

Anthelmintics

A group of antiparasitic drugs that expel parasitic worms (helminths) and other internal parasites from the body by stunning or killing them without causing significant damage to the host.

Antidote

A drug, chelating substance, or chemical that counteracts (neutralizes) the effects of another drug, poison, or toxin by changing the poison into a relatively harmless substance through some chemical action, or by setting up an action in the body opposite to that of the poison.

Attack Rate
A measurement of the proportion of animals in a population that experience an acute health event during a limited period (e.g., during an outbreak). The rate is calculated as the number of new cases of a health problem during an outbreak divided by the size of the population, usually expressed as a percentage or per 1,000 or 100,000 population (see below the definition for *Incidence Proportion*).

Case
An individual animal infected by a pathogenic agent, with or without clinical signs.

Case Definition
A set of standard criteria for classifying whether an animal has a particular disease, syndrome, or other health condition. Some case definitions, particularly those used for national surveillance, have been developed and adopted as national standards that ensure comparability. Use of an agreed-upon standard case definition ensures that every case is equivalent, regardless of when or where it occurred or who identified it. Case definitions are often further categorized by the degree of certainty about a diagnosis ("confirmed," "suspected," or "probable"):

- **Confirmed case:** A confirmed case has been identified/confirmed by recognized laboratory techniques (isolation of the causative agent or positive serological test) and may or may not fulfill the clinical criteria described in the case definition.
- **Suspected case**: A suspected case is based on clinical appearance without presumptive or confirmatory laboratory results.
- **Probable case:** A probable case has the typical clinical features of the illness but without laboratory confirmation.

A clear case definition is critical to the effective investigation of an outbreak. A standardized case definition allows a consistent approach to be taken toward ongoing cases of interest and potentially across different outbreak investigations that vary in time or geographic location.

A case definition includes criteria for animal, place, time, and clinical features. These should be specific to the outbreak under investigation.

- ***"Animal"*** describes key characteristics that patients (diseased animals) have in common. This description may include age, sex, and exclusion criteria (e.g., "animals with no history of X disease").
- ***"Place"*** typically describes a specific geographic location (state, county) or facility associated with an outbreak.
- ***"Time"*** is used to delineate the period of time associated with onset of an illness for cases under investigation. Limiting the time period allows unrelated illnesses to be excluded from the outbreak of interest.
- ***"Clinical features"*** should be simple and objective (e.g., sudden onset of fever, cough, diarrhea, etc.). Laboratory findings may be used to characterize the clinical features at a later point in time.

Case Fatality Rate

Also called case fatality risk or case fatality ratio, this is the proportion of animals that die from a specified disease over a certain period of time (e.g., no. of deaths per no. of cases per month X 100). It is the proportion of deaths within a defined population of interest. Case fatality rate measures the severity of the disease that causes death.

Example of Case Fatality Rate:

Consider two populations: One population consists of 1,000 animals; 300 of these animals have the specified disease, and 100 die from the disease. In this case, the mortality rate for the disease is 100 ÷ 1,000 = 0.1 or 10 percent. The case fatality rate is 100 ÷ 300 = 0.33 or 33 percent. The second population also has 1,000 animals; 50 animals have the disease and 40 die from it. Here, the mortality rate is 40 ÷ 1,000 = 0.04 or 4 percent; the case fatality rate, however, is 40 ÷ 50 = 0.8 or 80 percent. The incidence of death from the disease is higher in the first population, but the severity of disease is greater in the second.

Chronic Disease

A disease that persists over a period of time, even a lifetime. Generally, a disease is chronic if it lasts more than a few months. Initially, the symptoms may be very mild. A chronic disease progresses slowly and severely damages the body, sometimes resulting in death. The risk factors of such diseases may be based on the animal (age, gender) and/or environment (e.g., feed shortages, husbandry practices). A chronic disease may or may not be cured by medications and vaccinations.

Clinical Signs

The changes in an animal's normal healthy state, bodily function, or behavior observed by a professional or other onlooker. They are the structure or function abnormalities observed in the patient by the veterinarian or client. They are customarily graded according to severity (severe, moderate, or mild), speed of onset, and progress (peracute, acute, subacute, chronic, or intermittent).

Death

The irreversible loss of brain activity, demonstrated by the loss of brain stem reflexes.

Diagnosis

The process of determining the nature of a disease or disorder and distinguishing it from other possible conditions based on signs, symptoms, patient health history, physical examinations, and laboratory-based tests (like blood tests, imaging tests, and biopsies). It is important to note that not all diagnoses are related to abnormal or disease states. For example, pregnancy diagnosis is the process of recognizing the normal physiological state for breeding.

- **Confirmatory/final diagnosis**: A diagnosis supported with findings of pathognomonic signs of a disease or a test that rules out other differential diagnoses by identifying causative agents or specific case markers.

- **Differential diagnosis**: A diagnosis needed where clinical signs match more than one disease or abnormal disorder affecting a single animal. Additional laboratory tests must be taken to narrow down and specify a single disease condition.
- **Tentative diagnosis**: A preliminary evaluation of animal status usually made by a veterinarian (clinician) during clinical examination. It largely depends on the prior practice and experience of the veterinarian.

Diagnosed Animal

The diseased animal whose disease, disorder, or problem has been identified based on signs, symptoms, health history, physical examinations, and tests (such as blood tests, imaging tests, and biopsies).

Disease

A state in which normal functions are disturbed or altered at the cellular, tissue, organ, or whole-organism level. In other words, the homeostatic mechanisms of the body are upset and malfunctioning.

Emerging Disease

A new infection resulting from the evolution or change of an existing pathogenic agent or a known infection spreading to a new geographic area or population. It may also be a previously unrecognized pathogenic agent or disease diagnosed for the first time which has a significant impact on animal or public health.

Endemic

A disease or infectious agent that is present at an approximately constant level within a given geographic area or population group; it may also refer to the usual prevalence of a given disease within such an area or group.

Epidemiological Unit

A group of animals with a defined epidemiological relationship that share the same likelihood of exposure to a pathogen. This may be because they share a common environment, are subject to common management practices, belong to residents of a village, or access a communal animal handling facility. The epidemiological relationship may differ from disease to disease or even strain to strain of a pathogen. Though practically difficult, an epidemiological unit may also take into consideration the administrative structure that can be clearly defined for a given disease. For example, an epidemiological unit for a disease can be limited to a single kebele or administrative district.

Epizootic/Epidemic

Refers to an often-sudden increase in the number of cases of a disease, above what is normally expected in a population (outbreak carries the same definition of epidemic, but is often used for a more limited geographic area). Epidemics are used to describe a situation where a disease spreads

rapidly to a large number of animals in a given population over a short time period. A sudden rise of cases is usually caused by a new infectious agent or a change in an existing agent, for example:

- An agent moving between host populations, such as moving from animals to humans
- A genetic change (mutation) in the infectious agent (i.e., bacteria, virus, fungi, or parasite)
- Introduction of new pathogens to a host population

False Negative

A false negative refers to a diagnostic test result that incorrectly indicates the absence of a condition or disease in an animal. A diseased individual may erroneously be labeled as healthy during disease screening.

False Positive

A false positive refers to a diagnostic test result that incorrectly indicates the presence of a condition or disease. A healthy individual may erroneously be labeled as diseased during screening.

Immunization (Inoculation)

The process by which an animal becomes protected against a disease through vaccination. It is the process of getting the vaccine and becoming immune to the disease following vaccination.

Immunized Animal

An animal that received a vaccine and became immune to a disease following vaccination.

N.B.

The terms "vaccination," "immunization," and "inoculation" are similar but do not mean exactly the same thing as they have different technical meanings. They are often wrongly used interchangeably. Likewise, the terms "vaccinated," immunized," and inoculated" are often used interchangeably but have different meanings. Using terms correctly can prevent misunderstandings among professionals.

Incidence

Describes the frequency of *new cases* of disease among previously non-diseased animals. It is the number of instances of illness commencing, or of individuals falling ill, during a given period in a specified population. More generally, it is the number of new health-related events in a defined population within a specified period of time. It may be measured as a frequency count, a rate (incidence rate), or a proportion (incidence risk).

Incidence Proportion
The fraction of animals with new cases of illnesses, injuries, or other health conditions during a specified period, calculated as the number of new cases divided by the size of the population at the start of the study period.

N.B.
The terms “attack rate” and “incidence proportion” are sometimes used interchangeably.

Incubation Period

The time interval between invasion by an infectious agent and appearance of the first sign or symptom of the disease in question. In a vector, it is the period between entry of the infectious agent into the vector and the time at which the vector becomes infective (i.e., transmission of the infectious agent from the vector to a fresh final host).

Infection
The entry and development or multiplication of an infectious agent in the body of an individual, where it may or may not cause disease.

Infestation
The external invasion or colonization of animals or their immediate surroundings by arthropods, which may cause clinical signs or be potential vectors of pathogenic agents.

Isolation
The process of separating animals that are already confirmed sick or symptomatic of a disease. They should be isolated from healthy animals in a separate area. For example, a piglet with diarrhea or lamb that is coughing should be isolated to protect the other animals in the herd or flock.

Laboratory
A properly equipped institution staffed by technically competent personnel under the control of a veterinary specialist who is responsible for the validity of results. The Veterinary Authority approves and monitors such laboratories with regard to the diagnostic tests required for international trade.

Morbidity
Morbidity is the state of having a specific illness or condition. It can be any departure, subjective or objective, from a state of physiological or psychological wellbeing. In practice, morbidity encompasses disease, injury, and disability. Morbidity data is presented in two ways: incidence and prevalence (refer to both definitions).

Morbidity Rate

The number of disease cases occurring in the animal population in a specific time (usually a year), divided by the number of animals at risk of being sick during that specified period. Illnesses can range from acute to chronic, long-lasting conditions.

Mortality

The estimated total number of deaths in a population of a given sex and/or age, divided by the total number of this population. Expressed per 100,000 population, for a given year, in a given country, territory, or geographic area.

Mortality Rate

A measure of the frequency of occurrence of death caused by a disease or a condition in a defined population during a specified interval. It is the number of deaths occurring in the animal population in a specific period (usually a year), divided by the number of animals at risk of dying during that specified period.

Necropsy

The examination of a dead animal with the purpose of determining the cause of death or extent of disease. This involves a careful process of dissection, observation, interpretation, and documentation.

N.B.
Traditionally, the term "necropsy" is the examination of an animal after death, while "autopsy" has been reserved exclusively for human patients. However, sometimes both are used interchangeably for animals.

Outbreak

Definition 1: The occurrence of one or more notifiable and economically important disease cases in an epidemiological unit.
Definition 2: The occurrence of cases of disease in excess of what would normally be expected in a defined population of animal, geographical area, or season.
Outbreaks are maintained by infectious agents that spread directly from animal to animal, and can arise from exposure to wild animals or other environmental sources or via an insect or animal vector.

Pandemic

Describes the rapid spread of a transmissible infectious/communicable disease over several continents. Once an epidemic becomes global and affects a large percent of the population, it is called a pandemic. The terms pandemic and epidemic are used to describe the rate and distance of the spread of a disease (and not the severity of the disease). Significant features of a pandemic are listed below:

- Affects a wide geographical area, often global
- Infects a very large number of animals
- Often caused by a new virus or a new strain of a virus that has been dormant for many years
- Spreads quickly in animals as there is little to no existing immunity
- Can cause a high number of deaths
- Because of the need to control the spread of the disease, there is often social disruption, unrest, and economic loss

Pathogen
An organism capable of causing disease (literally, causing a pathological process).

Pathogenicity
The property of an organism that determines the extent to which an overt disease is produced in an infected population, or the power of an organism to produce a disease.

Population
A group of individuals of the same species living and interbreeding within a given area and sharing a common defined characteristic. Members of a population often rely on the same resources, are subject to similar environmental constraints, and depend on the availability of other members to persist over time.

Population at Risk
Refers to the group of individuals susceptible to the event of interest (e.g., infection, disease, death) at or during the time period of interest. The population at risk is used as the denominator in the calculation of measures of disease frequency. It can include the entire population or only a population subset, depending on susceptibility or specific interest in certain subgroups. For example, in describing the frequency of pneumonia caused by *Rhodococcus equi* infections, only foals would likely be included in the population at risk because adult horses are not considered susceptible to this disease.

Postmortem Examination
An examination of the carcass and various organs of the euthanized, slaughtered, or dead (sudden) animal to detect diseases and conditions that could not be identified during antemortem inspection in order to make a complete disease diagnosis of the animal. The examination can identify the cause of sudden death or provide information that enables authorities to condemn or approve meat for human consumption. Hence, it is conducted to supervise and control the hygienic conditions of meat and its byproducts.

Prevalence
The proportion of animals in the population of interest that are "diseased" at any specific point in time. It is calculated by dividing the number of cases of disease by the total size of the population. Unlike incidence, it includes both *new* and *existing* cases.

Prognosis
Refers to predicting the course of the diagnosed disease, disorder, or problem and ascertaining the response to treatment. It comes after the diagnosis (a diagnosis precedes a prognosis).

Quarantine
A strict separation imposed to prevent the introduction and/or spread of disease by (a) new animal(s) brought to the premises/area/country. These animals are not known to be sick. Quarantine measures may be applied to animals that are being moved between countries, animals being introduced to a new area (farm, village, etc.), animals with infectious diseases, or animals that may have been in contact with suspected or infected animals. This prevents disease exposure to other animals. Livestock brought into certain places are quarantined to prevent introduction of diseases.

Risk
The likely occurrence and magnitude of the biological and economic consequences of an adverse event or effect to animal or human health.

Risk Analysis
The process composed of hazard identification, risk assessment, risk management, and risk communication.

Risk Assessment
The evaluation of the likelihood and the biological and economic consequences of the entry, establishment, and spread of a hazard.

Surveillance
The process of gathering, analyzing, and disseminating information for the purpose of proper planning, implementation, and evaluation of animal health services/interventions.

Transboundary Animal Diseases
Diseases with significant economic, trade, and/or food security importance for a considerable number of countries. These diseases can easily spread to other countries and reach epidemic proportions, and control/management, including exclusion, requires cooperation between several countries.

Treatment
All the preventative and curative measures used to treat a sick animal or group of sick animals for a given disease, in accordance with prescriptions, for a limited period.

Treated Animal
An animal that is sick with a given disease and has received veterinary medical treatment, in accordance with prescriptions, for a limited period.

Vaccine
Includes all products designed to stimulate the body's immune response against diseases, without regard to the type of microorganism or microbial toxin from which they may be derived or that they contain. It is a suspension of weakened, killed, or fragmented microorganisms or toxins or other biological preparation, such as those consisting of antibodies, lymphocytes, or messenger RNA (mRNA), that are administered primarily to prevent disease. Vaccines are usually administered through needle injections, but some can be administered orally (via mouth) or sprayed into the nose.

Vaccination
The act of introducing a vaccine into the body to protect against a specific disease. It is the term used for receiving a vaccine by an approved method (e.g., by needle injection, oral, or nasal administration).

Vaccinated Animal
The animal that received (a) vaccine(s) to get protection from a specific disease (i.e., injected or vaccine dose administered by other approved means).

Virulence
The degree of pathogenicity; the disease-evoking power of a microorganism in a given host. Numerically expressed as the ratio of the number of cases of infection to the total number infected as determined by immunoassay. When death is the only criterion of severity, this is the case-fatality rate.

Zero Reporting
Reporting of the absence of cases of a disease under surveillance.

Zoonosis
An infection or infectious disease, which can be enzootic or epizootic, that is transmissible under natural conditions between vertebrate animals and humans.

5.4.2. Diseases Names, Codes and Abbreviations

The existing livestock systems (health, genetic, market, and ET-LITS) collect various animal health information. The health information systems (DOVAR, ADNIS, and SILAB) and others record animal disease occurrences for different purposes; however, there are no uniform/standardized systems for reporting the names of these diseases. Because there are diseases with multiple names, different systems report the same disease with different names. Additionally, there are disparities among systems in abbreviating the names of diseases. These variations in

recording names and their abbreviations can confuse data users. These differences result in errors and, more notably, can prevent system interoperability.

For diseases with multiple names, only one moniker is used for communication and reporting purposes. To standardize animal disease data recording and create uniformity for all livestock stakeholders, only the first name is reported, and all the other names indicated in parentheses are not used. The listed abbreviations for respective diseases will also be used uniformly across all the systems and stakeholders. In addition, internationally agreed-upon abbreviations for diseases are directly used throughout this document. In addition, internationally agreed-upon abbreviations for diseases are directly used throughout this document. For diseases that have no internationally agreed-upon abbreviations, the first three to five letters of their names (with the first letter in upper case and following letters in lower case) are used. For diseases with two words or more, the first letters of all words (in upper case) are used. Additional letters are also used in cases of similarity.

The codes used for diseases, diagnosis, treatment, husbandry, and vaccinations are listed in Table 59. Disease subcategories are also coded with specific numbers, as shown in Table 60.

Table 59: Codes of Diseases, Diagnoses, Treatments, Interventions, Procedures, and Vaccinations

S. No.	Category	Code
1	Disease	01
2	Diagnosis	02
3	Treatment	03
4	Husbandry procedures	04
5	Vaccinations	05

Table 60: Names and Codes of Diseases/Disorders Based on their Etiology and Affected Systems

S. No.	Disease Category	Codes
1	Infectious and other microbe-related diseases • Bacterial infections • Viral infections • Prion • Fungal infections	01.01 01.01.01 01.01.02 01.01.03 01.01.04
2	Parasitic	01.02
3	System base disorders/diseases	01.03
4	Integumentary system disorder • Disorder/disease of skin, subcutis, and coat • Horn diseases (Disorder)	01.03.01 01.03.01.01 01.03.01.02

S. No.	Disease Category	Codes
5	Lymphoid system abnormalities	01.03.02
6	Diseases of cardiovascular system	01.03.03
7	Diseases of the respiratory tract	01.03.04
8	Diseases of the digestive tract	01.03.05
9	Diseases or disorder of the urinary system	01.03.06
10	Diseases of the locomotory system	01.03.07
11	Diseases of the CNS and the sensory organs	01.03.08
12	Reproductive disorders ● Female reproductive disorders or diseases ● Reproductive disorders in males	01.03.09 01.03.09.01 01.03.09.02
13	Metabolic diseases and deficiencies	01.03.10
14	Poisoning	01.03.11
15	Behavioral disorders and general findings	01.03.12
16	Local vaccines ● Vaccines of bacterial diseases ● Vaccine of viral diseases	05.01 05.01.01 05.01.02
17	Imported vaccines ● Avian encephalomyelitis virus + fowl pox +laryngotracheitis virus) ● Avian infectious bronchitis vaccine ● Avian infectious bursal disease (IBD) virus vaccine ● Marek's disease vaccine ● Mycoplasma gallisepticum vaccine ● Newcastle disease virus vaccine ● Rabies vaccine	05.02 05.02.01 05.02.02 05.02.03 05.02.04 05.02.05 05.02.06 05.02.07

5.4.2.1. Diseases category based on etiology

In the tables below, the names of different livestock diseases, specifically diseases affecting four species — namely cattle, sheep, goats, and camels — are listed. The lists include common diseases in tropical regions that might not necessarily present in Ethiopia. Disease names, abbreviations, and codes are listed in alphabetical order according to the specific animal species they affect. This approach prevents separate lists of the diseases that affect different species from being created. While the diseases listed in the table may affect a wide range of hosts, the scope is limited to the four species of interest in this document. For example, the DOVAR2 system tracks 67 animal diseases listed in the table, even though some affect animals other than the species of interest. In a few cases, the names of diseases have been fine tuned. For example, the avian influenza listed in

DOVAR2 is also further classified as 'highly pathogenic avian influenza' and 'low pathogenic avian influenza.'

Table 61: List of diseases affecting cattle, sheep, goats, and camels in Ethiopia categorized by infectious bacterial, viral, fungal, and prion etiological agents

I. INFECTIOUS AND OTHER MICROBE-RELATED DISEASES (01.01)					
No.	**Disease**	**Abbr.**	**Code**	**Species affected**	**Causative agent/s**
A. BACTERIAL INFECTIONS					
1	Actinobacillosis (Wooden tongue)	Actn	01.01.01.01	Cattle, sheep, and goats	*Actinobacillus*
2	Actinomycosis (Lumpy jaw)	Actm	01.01.01.02	Cattle, sheep, and camels	*Actinomyces*
**3	Anaplasmosis	Anap	01.01.01.03	Cattle, sheep, goats, and camels	*Anaplasma marginale, A. centrale*
**4	Anthrax	Ant	01.01.01.04	Cattle, sheep, goat, camels, horses, mules, and donkeys	*Bacillus anthracis*
5	Arcanobacterium pyogenes infection	API	01.01.01.05	Cattle, sheep, and goats	*Arcanobacterium pyogenes*
6	Atrophic rhinitis (Progressive atrophic rhinitis)	AR	01.01.01.06	Swine, cattle, sheep, and goats	*Toxigenic Pasteurella multocida*
*7	Avian Chlamydiosis	AviCh	01.01.01.07	Chicken	*Chlamydia psittaci*
*8	Avian mycoplasmosis	AvMyc	01.01.01.08	Chickens	*Mycoplasma gallisepticum, Mycoplasma synoviae*
**9	Blackleg (Black quarter, quarter evil, quarter ill)	BL	01.01.01.09	Cattle, sheep, and goats	*Clostridium chauvoei*
**10	Botulism	Bot	01.01.01.10	Cattle, sheep, goats and others	*Clostridium botulinum*
**11	Bovine Tuberculosis	BTB	01.01.01.11	Cattle, sheep, goats, camels, and others	*Mycobacterium bovis*
12	Braxy (Hemorrhagic abomasitis, bradsot, Malignant Edema)	Bra	01.01.01.12	Sheep, cattle, and goats	*Clostridium septicum*
**13	Brucellosis	Bru	01.01.01.13	Cattle, sheep, goats, and camels	*Brucella abortus, B. melitensis, B. ovis*
**14	Campylobacter enteritis (Winter dysentery, Winter scours, Vibrionic enteritis)	CE	01.01.01.14	Cattle, sheep, and goat	*Campylobacter bacteria*
15	Caseous lymphadenitis	CL	01.01.01.15	Cattle, sheep, goats, and Camels	*Corynebacterium Pseudotuberculosis and*

I. INFECTIOUS AND OTHER MICROBE-RELATED DISEASES (01.01)					
No.	**Disease**	**Abbr.**	**Code**	**Species affected**	**Causative agent/s**
					Corynebacterium ulcerans
16	Chlamydia bronchopneumonia infection	CBPI	01.01.01.16	Cattle	*Chlamydia pneumoniae*
17	Chlamydia polyarthritis	CPA	01.01.01.17	Cattle, sheep, and goats	*Chlamydophila (Chlamydia) pecorum*
18	Coli diarrhea	ColiD	01.01.01.18	Cattle, sheep, goats, and camels	*Diarrhea due to infection with Escherichia coli*
19	Coli septicemia (Septicemic colibacillosis)	ColiS	01.01.01.19	Cattle, sheep, and goats	*General disease due to infection with Escherichia coli*
20	Contagious agalactia	CA	01.01.01.20	Sheep and goats	*Mycoplasma agalactiae*
**21	Contagious bovine pleuro-pneumonia (Pleuropneumonia contagiosa)	CBPP	01.01.01.21	Cattle	*Mycoplasma mycoides subsp. mycoides*
**22	Contagious bovine pyelonephritis (Bovine cystitis)	CBP	01.01.01.22	Cattle	*Corynebacterium renale*
23	Contagious caprine bleuro-pneumonia	CCPP	01.01.01.23	Sheep and goats	*Mycoplasma capricolum subsp. capripneumoniae*
24	Dermatophilosis (Streptothricosis)	Derma	01.01.01.24	Cattle, sheep, goats, and camels	*Dermatophilus congolensis*
**25	Enterotoxaemia	ET	01.01.01.25	Cattle, sheep, and goats	*Clostridium perfringens*
**26	Enzootic abortion (Ovine enzootic abortion or Ovine chlamydiosis)	OEA	01.01.01.26	Sheep, goats, and cattle	*Chlamydia (Chlamydophila) abortus*
27	Enzootic campylobacter abortion (Venereal campylobacteriosis, Bovine genital campylobacteriosis, Vibriosis genitalis)	ECA	01.01.01.27	Cattle (and others)	*Campylobacter fetus subsp. venerealis*
28	Epizootic bovine abortion or Foothill abortion	EBA	01.01.01.28	Cattle	*Pajaroellobacter abortibovis*
29	Erysipelothrix rhusiopathiae infection	ERI	01.01.01.29	Pigs and sheep	*E. rhusiopathiae*
30	Foot rot (infectious pododermatitis)	FR	01.01.01.30	Cattle, sheep, and goats	*Fusobacterium necrophorum and Dichelobacter nodosus (Bacteroides nodosus)*

I. INFECTIOUS AND OTHER MICROBE-RELATED DISEASES (01.01)					
No.	Disease	Abbr.	Code	Species affected	Causative agent/s
*31	Fowl cholera	FC	01.01.01.31	Chickens	*Pasteurella multocida*
*32	Fowl typhoid	FT	01.01.01.32	Chickens	*Salmonella gallinarum, (serovar Gallinarum biovar Gallinarum)*
*33	Glanders	Glan	01.01.01.33	Horses, mules, and donkeys	*Burkholderia mallei*
**34	Heartwater (Ehrlichiosis, Cowdriosis)	HW	01.01.01.34	Cattle, sheep, goats, and camels	*Ehrlichia ruminantium (formerly Cowdria ruminantium)*
**35	Hemorrhagic septicemia (Bovine pasteurellosis, Ovine Pasteurellosis, Pasteurellosis)	HS	01.01.01.35	Cattle, sheep, goats and camels	*Pasteurella multocida*
**36	Infectious bovine keratoconjunctivitis (Pinkeye)	IBK	01.01.01.36	Cattle	*Moraxella bovis*
37	Infectious keratoconjunctivitis	IKC	01.01.01.37	Sheep and goats	*Mycoplasma conjunctivae*
38	Infectious necrotic hepatitis (Black disease)	INH	01.01.01.38	Cattle, sheep, and goats	*Clostridium novyi type B*
**39	Leptospirosis	Lept	01.01.01.39	Cattle, sheep, and goats	*Leptospira*
40	Listeriosis (Circling disease)	List	01.01.01.40	Cattle, sheep, and goats	*Listeria monocytogenes*
41	Malignant edema disease (Gas edema disease, Gas gangrene)	MED	01.01.01.41	Cattle, sheep, and goats	*Clostridium perfringens type A, C, C, septicum type C*
42	Mastitis	Mast	01.01.01.42	Cattle, sheep, goats, and camels	*Many pathogens*
43	Mycoplasmosis	Myc	01.01.01.43	Cattle, sheep, goats, and camels	*Mycoplasma bovis, Mycoplasma ovipneumoniae*
44	Navel ill (Omphalophlebitis, Joint ill, Polyarthritis)	NI	01.01.01.44	Cattle, sheep, goats, and camels	*E. coli*
45	Necrobacillosis (Necrotic laryngitis, Calf diphtheria)	NB	01.01.01.45	Cattle	*Fusobacterium necrophorum*
46	Nocardiosis	Noca	01.01.01.46	Cattle, sheep, and goats	*Nocardia species*
47	Ovine campylobacteriosis	OCB	01.01.01.47	Sheep and cattle	*Campylobacter fetus subsp. fetus or Campylobacter jejuni*
**48	Ovine epididymitis	OE	01.01.01.48	Sheep and goats	*Brucella ovis*

I. INFECTIOUS AND OTHER MICROBE-RELATED DISEASES (01.01)					
No.	**Disease**	**Abbr.**	**Code**	**Species affected**	**Causative agent/s**
49	Paratuberculosis (Johne's disease)	PTB	01.01.01.49	Cattle, sheep, goats, and camels	*Mycobacterium avium subspecies paratuberculosis*
50	Pneumonic pasteurellosis (Shipping fever)	PnP	01.01.01.50	Cattle, sheep, goats, and camels	*Mannheimia haemolytica (formerly Pasteurella haemolytica)*
51	Posthitis (Pizzle rot or sheath rot)	Posti	01.01.01.51	Sheep and goats	*Corynebacterium pilosum and Corynebacterium cystitis*
*52	Pullorum disease	PD	01.01.01.52	Chickens	*Salmonella enterica subspecies enterica serovar Gallinarum biovar Pullorum (S. pullorum)*
53	Pyobacillosis	Pyob	01.01.01.53	Cattle, sheep, and goats	*Arcanobacterium pyogenes*
54	Query fever infection (Coxiellosis)	QF	01.01.01.54	Cattle, sheep, goats, and camels	*Coxiella burnetii*
**55	Salmonellosis	Salm	01.01.01.55	Cattle, sheep, goats, and camels	*Salmonella species and serovars*
56	Sporadic bovine encephalomyelitis	SBE	01.01.01.56	Cattle	*Chlamydia pecorum*
57	Streptococcus pneumoniae infection	SPI	01.01.01.57	Cattle, sheep, goats, and camels	*Streptococcus pneumoniae*
58	Tetanus (Rust poisoning)	Tet	01.01.01.58	Cattle, sheep, goats, and camels	*Clostridium tetani*
59	Thromboembolic meningoencephalitis	TEME	01.01.01.59	Cattle, sheep and goat	*Histophilus somni*
60	Tuberculosis	TB	01.01.01.60	Cattle, sheep, goats, and camels	*Mycobacterium tuberculosis*
61	Uterine infection with *Trueperella pyogenes*	UIAP	01.01.01.61	Cattle	*Trueperella pyogenes (formerly known as Arcanobacterium pyogenes)*
62	Yersinia enterocolitica infection	YEI	01.01.01.62	Cattle, sheep, goat and camels	*Yersinia enterocolitica*
	B. VIRAL INFECTIONS		**01.01.02**		
*63	African horse sickness	AHS	01.01.02.01	Horses, mules, and donkeys	*African horse sickness virus*
*64	African swine fever	ASF	01.01.02.02	Pigs	*African swine fever virus*

I. INFECTIOUS AND OTHER MICROBE-RELATED DISEASES (01.01)					
No.	**Disease**	**Abbr.**	**Code**	**Species affected**	**Causative agent/s**
65	Aujeszky's disease (Pseudorabies)	AD	01.01.02.03	Cattle, sheep, goats, camels, and others	*Suid herpesvirus 1*
**66	Bluetongue	BT	01.01.02.04	Sheep, cattle, goats, and camels	*Bluetongue virus*
67	Border disease	BorD	01.01.02.05	Sheep and goats	*Pestivirus border disease virus*
68	Bovine Adenovirus infection	BAVI	01.01.02.06	Cattle	*Bovine adenovirus*
69	Bovine papular stomatitis	BPS	01.01.02.07	Cattle	*Bovine papular stomatitis virus*
70	Bovine respiratory syncytial virus disease	BRSV	01.01.02.08	Cattle, sheep, goats, and camels	*Bovine respiratory syncytial virus, Bovine Parainfluenza 3 Virus (BPIV3)*
**71	Bovine viral diarrhea (Mucosal disease)	BVD	01.01.02.09	Cattle, sheep, goats, and camels	*Bovine viral diarrhea virus*
**72	Camel pox	CP	01.01.02.10	Camels	*Camel pox virus*
73	Caprine adenovirus infection	CAVI	01.01.02.11	Goats	*Caprine adenovirus*
74	Caprine arthritis encephalitis	CAE	01.01.02.12	Goats	*Caprine arthritis encephalitis virus*
75	Caprine herpesvirus infection	CHVI	01.01.02.13	Cattle and sheep	*Caprine herpesvirus 1*
*76	Classical swine fever	CSF	01.01.02.14	Pigs	*Classical swine fever virus*
**77	Contagious ecthyma (Orf, Sore mouth or Scabby mouth)	ConE	01.01.02.15	Sheep, goats, and camels	*Orf virus*
78	Coronavirus disease	CoviD	01.01.02.16	Cattle and sheep	*Coronavirus*
79	Cowpox	CowP	01.01.02.17	Rodents, cats, cattle, humans	*Orthopox virus*
80	Enterovirus encephalitis	EVE	01.01.02.18	Sheep and goats	*Enterovirus*
81	Enzootic bovine leukosis (Bovine lymphosarcoma, Bovine lymphadenosis, Leukemia, Malignant lymphoma or lymphosarcomatosis)	EBL	01.01.02.19	Cattle	*Bovine leukemia virus*
*82	Equine herpesvirus (Equine rhinopneumonitis) infection	EHV	01.01.02.20	Horses, mules, and donkeys	*Equine herpes virus*

I. INFECTIOUS AND OTHER MICROBE-RELATED DISEASES (01.01)					
No.	Disease	Abbr.	Code	Species affected	Causative agent/s
**83	Foot and mouth disease	FMD	01.01.02.21	Cattle, sheep, goats, and camels	*Foot and mouth disease virus*
*84	Fowl pox	FP	01.01.02.22	Chickens	*Fowl pox virus*
*85	Highly pathogenic avian influenza	HPAI	01.01.02.23	Chickens	*High pathogenic avian influenza virus (e.g., with subtypes like H5N1, H5N3, H5N8)*
86	Infectious balanoposthitis	IBP	01.01.02.24	Cattle, sheep	*Bovine herpesvirus 1*
87	Infectious bovine rhinotracheitis	IBR	01.01.02.25	Cattle	*Bovine herpesvirus 1*
*88	Infectious bronchitis	IB	01.01.02.26	Chickens	*Avian gamma coronavirus*
*89	Infectious bursal disease (Gumboro disease)	IBD	01.01.02.27	Chickens	*Infectious Bursal Disease virus*
*90	Infectious laryngotracheitis	ILT	01.01.02.28	Chickens	*Gallid alphaherpesvirus 1*
91	Infectious pustular vulvovaginitis	IPV	01.01.02.29	Cattle	*Bovine herpesvirus 1*
*92	Low pathogenic avian influenza	LPAI	01.01.02.30	Chickens	*Low pathogenic avian influenza virus*
**93	Lumpy skin disease	LSD	01.01.02.31	Cattle	*Lumpy skin disease virus*
**94	Maedi visna (Ovine progressive pneumonia)	MV	01.01.02.32	Sheep	*Visna-maedi virus*
**95	Malignant catarrhal fever	MCF	01.01.02.33	Cattle, sheep, and goats	*Macavirus; malignant catarrhal fever virus*
*96	Marek's disease	MarD	01.01.02.34	Chickens	*Alphaherpesvirus or Marek's disease virus or Gallid alphaherpesvirus 2*
97	Middle east respiratory syndrome virus-CoV disease	MERS-CoV	01.01.02.35	Camels, cattle, sheep and goats	*Middle east respiratory syndrome virus-CoV*
**98	Nairobi sheep disease	NSD	01.01.02.36	Sheep and goats	*Nairobi sheep disease virus*
*99	Newcastle disease	NCD	01.01.02.37	Chickens	*Newcastle disease virus*
100	Ovine adenovirus infection	OAVI	01.01.02.38	Sheep	*Ovine adenovirus*
101	Ovine pulmonary adenocarcinoma (Ovine pulmonary adenomatosis)	OPA	01.01.02.39	Sheep and goats	*Jaagsiekte sheep retrovirus*
102	Papillomatosis (Warts)	Papi	01.01.02.40	Cattle, sheep, goats, and camels	*Papilloma virus*

I. INFECTIOUS AND OTHER MICROBE-RELATED DISEASES (01.01)					
No.	**Disease**	**Abbr.**	**Code**	**Species affected**	**Causative agent/s**
103	Parainfluenza (infection with Parainfluenza 3 virus)	PI	01.01.02.41	Cattle, sheep, goats, and camels	*Parainfluenza virus*
104	Parvovirus infection	PVI	01.01.02.42	Cattle and sheep	*Parvovirus (BPV) 1, 2 and 3*
**105	Peste des petits ruminants (Ovine rinderpest or goat plague)	PPR	01.01.02.43	Sheep, goats, and Camels	*Morbillivirus*
**106	Rabies	Rab	01.01.02.44	Cattle, sheep, goats, and camels	*Lyssaviruses, Rabies virus*
**107	Rift valley fever	RVF	01.01.02.45	Cattle, sheep, goats, and camels	*Rift valley fever virus*
**108	Rinderpest (Cattle plague)	RP	01.01.02.46	Cattle, sheep, goats, and camels	*Morbillivirus*
109	Rotavirus infection	RVI	01.01.02.47	Cattle, sheep, goats, and camels	*Rotavirus*
**110	Sheep and goat pox	SGP	01.01.02.48	Sheep and goats	*Sheep pox virus (SPPV) and Goat pox virus (GTPV)*
111	Stomatitis papulosa	SP	01.01.02.49	Cattle	*Stomatitis papulosa virus*
*112	Swine Vesicular Disease	SVD	01.01.02.50	Pigs	*Swine vesicular disease virus*
**113	Vesicular stomatitis	VS	01.01.02.51	Cattle, Sheep, Goats, and Camels	*Vesicular stomatitis virus*
C.	PRION		01.01.03		
**114	Bovine spongiform encephalopathy (Mad cow disease)	BSE	01.01.03.01	Cattle and sheep	*Prion*
115	Camel spongiform encephalopathy (Mad camel disease or camel prion disease)	CSE	01.01.03.02	Camels	*Prion*
**116	Scrapie	Scra	01.01.03.03	Sheep and goats	*Prion*
D.	MYCOSES AND MYCOTOXICOSES (fungal infections and diseases caused by mycotoxins) 01.01.04				
117	Aflatoxicosis (Aflatoxin poisoning)	Afla	01.01.04.01	Cattle, sheep, and goats	*Aspergillus flavus, A. parasiticus*
118	Aspergillosis	Asp	01.01.04.02	Cattle, sheep, goats, and camels	*Aspergillus species (diseases after infection with Aspergillus spp.)*
119	Aspergillotoxicosis (aspergillus poisoning)	AspTi	01.01.04.03	Cattle (more in calves)	*Mycotoxins of Aspergillus (diseases caused by*

I. INFECTIOUS AND OTHER MICROBE-RELATED DISEASES (01.01)					
No.	Disease	Abbr.	Code	Species affected	Causative agent/s
					mycotoxins of Aspergillus)
120	Candidosis (Candidiasis)	Cand	01.01.04.04	Cattle, sheep, goats, and camels	*Candida albicans*
*121	Chalkbrood disease	ChB	01.01.04.05	Bees	*Ascosphaera apis*
*122	Epizootic Lymphangitis	EpiLy	01.01.04.06	Horses, mules, and donkeys	*Histoplasma capsulatum*
123	Ergotism (Ergot poisoning or ergotoxicosis)	Ergt	01.01.04.07	Cattle, sheep, and goats	*Claviceps purpurea*
124	Fusariotoxicosis	FusaT	01.01.04.08	Cattle, sheep, and goats	*Mycotoxins of Fusarium spp.*
125	Ringworm (Dermatophytosis, Dermatomycosis, Dermal mycoses)	RW	01.01.04.09	Cattle, sheep, goats, and camels	*Dermatophytes (Microsporum, Trichophyton and Epidermophyton)*
126	Stachybotryotoxicosis	SBT	01.01.04.10	Cattle, Sheep	*Mycotoxins of Stachybotrys alternans (Stachybotrys chartarum)*
**127	Unknown camel disease	UCD	01.01.04.11	Camel	*Unknown*

Table 62: List of Parasitic Diseases Affecting Cattle, Sheep, Goats, and Camels in Ethiopia

II. PARASITIC DISEASES 01.02					
No	Disease	Abbr.	Code	Animals affected	Causative agent/s
1	Babesiosis (Redwater, Tick fever)	Bab	01.02.01	Cattle, sheep, goats, and camels	*Babesia species (eg. B. divergens, Babesia bovis, B. begemina, B. ovis, etc.)*
2	Bovine trichomoniasis	BTri	01.02.02	Cattle	*Tritrichomonas foetus*
3	Chorioptic scabies	ChorS	01.02.03	Cattle, sheep, goats, and camels	*Chorioptes bovis, C. texanus*
4	Coccidiosis	Coc	01.02.04	Cattle, sheep, goats, and camels	Eimeria species
5	Cooperiosis	Cop	01.02.05	Cattle, sheep, goats, and camels	*Cooperia curticei, C. punctata, C. oncophora*
6	Cryptosporidiosis	Crypto	01.02.06	Cattle, sheep, goats, and camels	*Cryptosporidium parvum*
7	Cysticercosis	Cyst	01.02.07	Cattle, sheep, goats, and camels	*Cysticercus bovis, C. tenecullus, Cysticercus dromedarii*
8	Demodicosis	Demo	01.02.08	Cattle, sheep, goats, and camels	*Demodex bovis, Demodex ovis, D caprae*
9	Dicrocoeliosis (Small liver fluke)	Dicro	01.02.09	Cattle, sheep, goats, and camels	*Dicrocoelium dendriticum*

II. PARASITIC DISEASES			01.02		
No	Disease	Abbr.	Code	Animals affected	Causative agent/s
10	Dictyocaulosis (Bronchopneumonia, verminosa, parasitic bronchitis, Lungworm)	Dicty	01.02.10	Cattle, sheep, goats, and camels	*Dictyocaulus viviparus*, *D. filaria, Protostrongylus rufescens, and Muellerius capillaris*
11	Dourine	Dour	01.02.11	Horses and cattle	*Trypanosoma equiperdum*
12	East coast fever (Theileriosis)	ECF	01.02.12	Cattle, sheep, and goats	*Theileria parva*
*13	Equine piroplasmosis	EPP	01.02.13	Horses	*Babesia caballi and Theileria equi*
14	Fasciolosis (fascioliasis)	Fasc	01.02.14	Cattle, sheep, goats, and camels	*Fasciola gigantica, F. hepatica*
15	Guinea worm disease (Draculnculiasis)	GWD	01.02.15	Dog, cats, and baboons	*Dracunculus medinensis*
16	Haemonchosis	Haemch	01.02.16	Cattle, sheep, goats, and camels	*H. contortus, Haemonchus placei, Haemonchus similis, Haemonchus longistipes*
17	Hookworm infection (Bunostomosis)	HI	01.02.17	Cattle, sheep, and goats	*Bunostomum phlebotomum, B. trigonocephalum*
18	Hydatidosis (Echinococcosis)	Hyd	01.02.18	Cattle, sheep, goats, and camels	Larval stage of *Echinococcus granulosus*
19	Hypodermatosis (bovine) (Warble fly infestation)	HD	01.02.19	Cattle	Larval stage of *Hypoderma lineatum* fly
20	Mange-mites infestation	MMI	01.02.20	Cattle, sheep, goats, and camels	Sarcoptic, Chorioptic, Psoroptic and Demodectic manges
21	Monieziosis (Anoplocephalidosis)	Monie	01.02.21	Cattle, sheep, goats, and camels	*Monezia expansa* and *M. benedeni*
22	Myiasis (Cutaneous)	Mys	01.02.22	Cattle, sheep, goats, and camels	Larvae (maggots) of certain fly species (such as *Lucilia sericata* (greenbottle flies), *Phormia terraenovae* (black bottle flies) and *Calliphora erythrocephala* (bluebottle flies), *Wohlfahrtia* species, etc.)
23	Nasal myiasis	NasM	01.02.23	Sheep and goats	*Oestrus ovis*
24	Nematodirosis	Nemat	01.02.24	Cattle, sheep, goats, and camels	*Nematodirus battus* gastrointestinal (GI) worm
25	Neosporosis	Neos	01.02.25	Cattle, sheep, goats, and camels	*Neospora caninum*
26	New world screwworm (*Cochliomyia hominivorax*)	NWS	01.02.26	Cattle, sheep, goats, and camels	New world screwworm fly (*Cochliomyia hominivorax*)
27	Oesophagostomosis	Oesoph	01.02.27	Cattle, sheep, goats, and camels	*Oesophagostomum bifurcum, esophagostomum columbianum*
28	Old world screwworm (*Chrysomya bezziana)*	OWS	01.02.28	Cattle, sheep, goats, and camels	*Chrysomya bezziana Villeneuve*

II. PARASITIC DISEASES			01.02		
No	Disease	Abbr.	Code	Animals affected	Causative agent/s
29	Ostertagiosis	Ost	01.02.29	Cattle, sheep, goats, and camels	*Ostertagia ostertagi, O. Circumcincta, Teladorsagia (Ostertagia) circumcincta &Ostertagia trifurcata*
30	Paramphistomatosis	Paphi	01.02.30	Cattle, sheep, goats, and camels	*Paramphistomum cervi, P. microbothrium, Paramphistomum epiclitum*
31	Pediculosis or Louse infestation	Pedi	01.02.31	Cattle, sheep, goats, and camels	Lice
32	Psoroptic scabies infestation	PS	01.02.32	Cattle, sheep, goats, and camels	*Psoroptes ovis, P cuniculi*
33	Sarcoptic scabies infestation	SS	01.02.33	Cattle, sheep, goats, and camels	*Sarcoptes scabiei, Sarcoptes scabiei bovis*
34	Sarcosporidiosis (sarcocystosis)	Sarc	01.02.34	Cattle, sheep, goats, and camels	Sarcocystis
35	Simuliosis	Simu	01.02.35	Cattle	Black flies (*Simuliidae*)
*36	Small hive beetle infestation	SHBI	01.02.36	Bees	Small hive beetle *(Aethina tumida)*
37	Strongyloidosis (Gastrointestinal strongylosis)	Stro	01.02.37	Cattle, sheep, goats, and camels	*Strongyloides papillosus*
38	Surra	Sur	01.02.38	Camels, cattle, sheep, goats, horses, donkeys, and mules	*Trypanosoma evansi*
39	Tick infestations	TI	01.02.39	Cattle, sheep, goats, and camels	Different species of ticks
40	Toxoplasmosis	Toxo	01.02.40	Cattle, sheep, goats, and camels	*Toxoplasma gondii*
41	Trematode infestations	TrI	01.02.41	Cattle, sheep, goats, and camels	Species of *Fasciola, Schistosoma* and *Paramphistomum*
42	Trichinellosis (Trichinosis)	Trich	01.02.42	Sheep, oats, and cattle	*Trichinella spiralis*
43	Trichodektosis	Trichd	01.02.43	Cattle, sheep, goats, and camels	*Bovicola bovis, Bovicola ovis*
44	Trichostrongylidosis	TriS	01.02.44	Cattle, sheep, goats, and camels	*Trichostrongylus axei, T. colubriformis, T. vitrinus, and T. capricola*
45	Trombidiosis (Trombidiasis)	Tromb	01.02.45	Cattle, sheep, goats, and camels	*Neotrombicula autumnalis*
46	Trypanosomosis	Tryps	01.02.46	Cattle, sheep, goats, and camels	*Trypanosoma congolense, T vivax, and T brucei brucei*
*47	Varroosis of honey bee	VHB	01.02.47	Bees	Genus Varroa, primarily *Varroa destructor*

*Diseases that affect animal species other than cattle, sheep, goats, and camels (which are not the focus of this document) but are still being reported by the health system at the MoA.

** Diseases that are reported by MoA data collection system (i.e. DOVAR 2) and affecting the species of s interest (i.e. cattle, sheep, goats, and camels)

5.4.2.2. Diseases & Disorders categorized by systems affected.

In addition to the above infectious and parasitic diseases, the following are disorders or diseases that are common to most animals, including cattle, sheep, goats, and camels. The above tables list the etiological categories of animal diseases, while the table below lists diseases/ disorders based on their organ/system-based names.

Table 63: List of Diseases/Disorders Categorized by Systems Affected

No.	Disorders/Diseases Affecting Different Systems	Abbr.	Code
I) Integumentary System Disorder			**01.03.01**
A) Disorder/disease of skin, subcutis, and coat			01.03.01.01
1	Abscess	AbSSC	01.03.01.01.01
2	Acne	Acne	01.03.01.01.02
3	Alopecia (hair loss)	Alop	01.03.01.01.03
4	Dermal tumors	DermT	01.03.01.01.04
5	Dermatitis	Derm	01.03.01.01.05
6	Furunculosis (Boils)	Furu	01.03.01.01.06
7	Hyperkeratosis	HypK	01.03.01.01.07
8	Injuries of skin, subcutis, and coat	ISSC	01.03.01.01.08
9	Parakeratosis	ParaK	01.03.01.01.09
10	Seborrhea (Pityriasis)	Sebor	01.03.01.01.10
11	Skin tumor	SkinT	01.03.01.01.11
12	Subcutaneous edema	SubCE	01.03.01.01.12
13	Subcutaneous emphysema	SubCEm	01.03.01.01.13
14	Subcutaneous hematoma	SubCH	01.03.01.01.14
15	Urticaria	Urti	01.03.01.01.15
B) Horn diseases (Disorder)			01.03.01.02
16	Fracture of osseous core of horns (Fractura processus cornualis)	FOCH	01.03.01.02.01
17	Horn deformation	HorD	01.03.01.02.02
18	Horn injuries	HorI	01.03.01.02.03
19	Horn tumor	HorT	01.03.01.02.04
20	Loss of horn covering	LosHC	01.03.01.02.05
21	Other horn disorders	OHD	01.03.01.02.06
II) Lymphoid System Abnormalities			**01.03.02**
22	Hereditary disease of the lymphoid system	HDLS	01.03.02.01
23	Lymphadenitis	Lyphi	01.03.02.02

No.	Disorders/Diseases Affecting Different Systems	Abbr.	Code
24	Lymphadenosis	Lypho	01.03.02.03
25	Lymphangitis	Lyphg	01.03.02.04
26	Lymphoid tumor	LymT	01.03.02.05
27	Other lymphoid system abnormalities	OLSA	01.03.02.06
III) Diseases of the Cardiovascular System			**01.03.03**
28	Anemia	Anem	01.03.03.01
29	Cardiac insufficiency	CardI	01.03.03.02
30	Cardiovascular system anomalies	CVSA	01.03.03.03
31	Haemoglobinuria	HGU	01.03.03.04
32	Heart inflammation	HearI	01.03.03.05
33	Hemorrhage (bleeding)	Hemor	01.03.03.06
34	Other cardiovascular system abnormalities	OCVSA	01.03.03.07
35	Phlebitis	Phle	01.03.03.08
36	Shock (acute circulation insufficiency)	Shok	01.03.03.09
37	Spleen disorders	SplD	01.03.03.10
38	Traumatic pericarditis	TrauP	01.03.03.11
IV) Diseases of the Respiratory Tract			**01.03.04**
39	Asphyxia	Asph	01.03.04.01
40	Bronchitis	Bron	01.03.04.02
41	Chylothorax	ChyT	01.03.04.03
42	Epistaxis (Nosebleed)	Epist	01.03.04.04
43	Haemothorax	HaemT	01.03.04.05
44	Hydrothorax	HydT	01.03.04.06
45	Pneumonia	Pneu	01.03.04.07
46	Respiratory system tumor	ResST	01.03.04.08
47	Rhinitis	Rhin	01.03.04.09
48	Sinusitis	Sinu	01.03.04.10
49	Tracheitis	Trach	01.03.04.11
V) Diseases of the Digestive Tract			**01.03.05**
50	Abscess in digestive tract	AbsDT	01.03.05.01
51	Ascites	Asci	01.03.05.02
52	Atresia ani et recti	AAER	01.03.05.03
53	Diarrhea	Diarr	01.03.05.04

No.	Disorders/Diseases Affecting Different Systems	Abbr.	Code
54	Digestive tract tumor	DigTT	01.03.05.05
55	Drooling	Droo	01.03.05.06
56	Esophagus Obstruction	OesO	01.03.05.12
57	Foreign body in digestive tract (in various organs)	FBDT	01.03.05.07
58	Hepatitis	Hepat	01.03.05.08
59	Icterus (Jaundice)	Icte	01.03.05.09
60	Intestinal obstruction	IntO	01.03.05.10
61	Intestinal volvulus	IntV	01.03.05.11
62	Other oral cavity disorder/disease	OOCD	01.03.05.13
63	Palatine cleft	PalC	01.03.05.14
64	Pancreatitis	Panc	01.03.05.15
65	Peritonitis	Perit	01.03.05.16
66	Prolapse	Prol	01.03.05.17
67	Ruminal tympany	RumT	01.03.05.18
68	Simple indigestion	SimpI	01.03.05.19
69	Stomatitis	Stom	01.03.05.20
70	Teeth problem/disease	TeetP	01.03.05.21
71	Tongue problem/disease	TongP	01.03.05.22
72	Tongue ulceration	TongU	01.03.05.23
73	Traumatic reticuloperitonitis	TRP	01.03.05.24
VI) Diseases or Disorder of the Urinary System			**01.03.06**
74	Cystitis (Bladder inflammation)	Cysti	01.03.06.01
75	Kidney developmental anomaly	KidDA	01.03.06.02
76	Kidneys diseases	KidD	01.03.06.03
77	Haematuria	Haema	01.03.06.04
78	Haemoglobinuria	HaemGU	01.03.06.05
79	Uremia	Urem	01.03.06.06
80	Urinary bladder diseases	UBD	01.03.06.07
81	Tumor of urinary system	TumUS	01.03.06.08
82	Urolithiasis	Uroli	01.03.06.09
VII) Diseases of the Locomotory System			**01.03.07**
83	Arthritis	Arth	01.03.07.01
84	Bone fracture	BonF	01.03.07.02

No.	Disorders/Diseases Affecting Different Systems	Abbr.	Code
85	Bursitis	Burs	01.03.07.03
86	Developmental disorder of bone	DevDB	01.03.07.04
87	Digital dermatitis	DigD	01.03.07.05
88	Foreign bodies on/in hoof	ForBH	01.03.07.06
89	Hoof abscess	HooA	01.03.07.07
90	Hoof deformities	HooD	01.03.07.08
91	Hoof fissures	HooF	01.03.07.09
92	Hoof injuries	HooI	01.03.07.10
93	Hoof necrosis	HooN	01.03.07.11
94	Hoof tumor	HooT	01.03.07.12
95	Hoof ulcer	HooU	01.03.07.13
96	Interdigital phlegmon	IntDPh	01.03.07.14
97	Lameness	Lamen	01.03.07.15
98	Laminitis	Lami	01.03.07.16
99	Myositis	Myos	01.03.07.17
100	Paralysis	Paral	01.03.07.18
101	Sole hemorrhage	SolH	01.03.07.19
102	Tendinitis	Tendi	01.03.07.20
103	Tumor of locomotory apparatus	TumLA	01.03.07.21
VIII) Diseases of the CNS and Sensory Organs			**01.03.08**
104	Brain diseases	BrainD	01.03.08.01
105	Ear diseases	EarD	01.03.08.02
106	Eye diseases	EyeD	01.03.08.03
107	Hydrocephalus	HydroC	01.03.08.04
108	Spinal cord disease	SpiCD	01.03.08.05
109	Traumatic injury of eye	TraIE	01.03.08.06
110	Tumor of CNS and sensory organs	TumCS	01.03.08.07
IX) Reproductive Disorder			**01.03.09**
A) Female reproductive disorder or disease			01.03.09.01
111	Abnormal shape of the udder	AShU	01.03.09.01.01
112	Abortion	Abor	01.03.09.01.02
113	Acyclia (absence of heat with inactive ovaries)	Acy	01.03.09.01.03
114	Anaphrodisia (Anoestria)	Anaph	01.03.09.01.04

No.	Disorders/Diseases Affecting Different Systems	Abbr.	Code
115	Atrophy of the udder	AtroU	01.03.09.01.05
116	Bloody milk	BlooM	01.03.09.01.06
117	Bradytocia (tedious labor)	Brad	01.03.09.01.07
118	Calf anomalies	CalfA	01.03.09.01.08
119	Calf irregular position	CalfIP	01.03.09.01.09
120	Calf irregular posture	CalfIPo	01.03.09.01.10
121	Calf irregular presentation	CalfIPr	01.03.09.01.11
122	Calf oversize	CalfOS	01.03.09.01.12
123	Cervicitis	Cervi	01.03.09.01.13
124	Cystic ovarian degeneration	CytOD	01.03.09.01.14
125	Dermatitis at the udder	DermU	01.03.09.01.15
126	Dystocia	Dysto	01.03.09.01.16
127	Embryonic death	EmbD	01.03.09.01.17
128	Endometritis	EndoM	01.03.09.01.18
129	Failure of milk ejection	FME	01.03.09.01.19
130	Fallopian tube disease/Oviduct diseases	FaTD	01.03.09.01.20
131	Fetal emphysema	FetaE	01.03.09.01.21
132	Fetal maceration	FetaM	01.03.09.01.22
133	Fetal mummification	FetMum	01.03.09.01.23
134	Foreign body in the mammary gland	FBMG	01.03.09.01.24
135	Freemartinism	Freem	01.03.09.01.25
136	Infantilism in females	InfanF	01.03.09.01.26
137	Irregular interestrus intervals	IrrIEI	01.03.09.01.27
138	Lochiometra	LochM	01.03.09.01.28
139	Metritis	Metri	01.03.09.01.29
140	Nymphomania	Nympho	01.03.09.01.30
141	Other disorders of pregnancy	OtherDP	01.03.09.01.31
142	Ovarian atrophy	OvaA	01.03.09.01.32
143	Ovarian cysts	OvaC	01.03.09.01.33
144	Ovarian diseases	OvaD	01.03.09.01.34
145	Perineal laceration	PeriL	01.03.09.01.35
146	Persistence of corpus luteum	PersCL	01.03.09.01.36
147	Preterm rupture of the fetal membranes	PrRFM	01.03.09.01.37

No.	Disorders/Diseases Affecting Different Systems	Abbr.	Code
148	Prolonged gestation	ProlG	01.03.09.01.38
149	Pyometra	Pyom	01.03.09.01.39
150	Retained placenta	RetP	01.03.09.01.40
151	Stillbirth	StilB	01.03.09.01.41
152	Teat end hyperkeratosis	TEHK	01.03.09.01.42
153	Teat fistula	TeaF	01.03.09.01.43
154	Teat injuries	TeaI	01.03.09.01.44
155	Teat stenosis	TeaS	01.03.09.01.45
156	Teratism	Terat	01.03.09.01.46
157	Termination of pregnancy	TermP	01.03.09.01.47
158	Tumor of Female reproductive system	TumFRS	01.03.09.01.48
159	Udder abscess	UddA	01.03.09.01.49
160	Udder acne	UddAcn	01.03.09.01.50
161	Udder edema	UddE	01.03.09.01.51
162	Udder hematoma	UddH	01.03.09.01.52
163	Udder injuries	UddI	01.03.09.01.53
164	Uterine diseases	UterD	01.03.09.01.54
165	Uterine prolapse	UterP	01.03.09.01.55
166	Uterine torsion	UterT	01.03.09.01.56
167	Vaginal diseases	VagiD	01.03.09.01.57
168	Vaginal prolapse	VagiP	01.03.09.01.58
169	Vaginitis	Vagi	01.03.09.01.59
170	Virilism	Viril	01.03.09.01.60
171	Vulval diseases	VulvD	01.03.09.01.61
B) Reproduction disorders in males			01.03.09.02
172	Balanopostitis	BalaP	01.03.09.02.01
173	Cryptorchidism	Cryptor	01.03.09.02.02
174	Injuries of male reproductive system	InjMRS	01.03.09.02.03
175	Orchitis	Orch	01.03.09.02.04
176	Paraphimosis	Paraph	01.03.09.02.05
177	Penis bending	PenB	01.03.09.02.06
178	Penis diseases	PenD	01.03.09.02.07
179	Penis fracture	PenF	01.03.09.02.08

No.	Disorders/Diseases Affecting Different Systems	Abbr.	Code
180	Penis prolapse	PenP	01.03.09.02.09
181	Phimosis	Phimo	01.03.09.02.10
182	Posthitis (Preputial inflammation)	Posth	01.03.09.02.11
183	Preputial prolapse	PrepP	01.03.09.02.12
184	Spermatozoa anomalies	SperA	01.03.09.02.13
185	Testicular degeneration	TestD	01.03.09.02.14
186	Tumor of male reproductive system	TumMRS	01.03.09.02.15
X) Metabolic Diseases and Deficiencies			**01.03.10**
187	Acidosis	Acido	01.03.10.01
188	Adipositas	Adipo	01.03.10.02
189	Atypical parturient paresis	AtyTP	01.03.10.03
190	Cerebrocortical necrosis (necrosis of the cerebral cortex)	CerCN	01.03.10.04
191	Downer cow syndrome	DCS	01.03.10.05
192	Epiphysiolysis (Metacarpal or metatarsal)	Epiph	01.03.10.06
193	Excessive weight loss	ExcWL	01.03.10.07
194	Hyperketonemia /acetonemia	HyperK	01.03.10.08
195	Hypocalcemia (Lactation paresis, Parturient paresis, milk fever)	HypoC	01.03.10.09
196	Ion balance disturbances	IoBDi	01.03.10.10
197	Ketosis	Keto	01.03.10.11
198	Metabolic bone disorder	MetBD	01.03.10.12
199	Metabolic liver disorder	MetLD	01.03.10.13
200	Mineral deficiency	MinD	01.03.10.14
201	Vitamin deficiency	VitD	01.03.10.15
XI) Poisoning			**01.03.11**
202	Chemical poisoning	ChemP	01.03.11.01
203	Drug poisoning	DrugP	01.03.11.02
204	Hypervitaminosis	HypeV	01.03.11.03
205	Mineral poisoning	MinP	01.03.11.04
206	Plant poisoning	PlanP	01.03.11.05
XII) Behavioral Disorders and General Findings			**01.03.12**
207	Aggressiveness	Aggr	01.03.12.01
208	Diarrhea	Diar	01.03.12.02
209	Disturbed digestion	DistD	01.03.12.03

No.	Disorders/Diseases Affecting Different Systems	Abbr.	Code
210	Fever	Feve	01.03.12.04
211	Kicking	Kick	01.03.12.05
212	Performance depression	PerfD	01.03.12.06
213	Pica	Pica	01.03.12.07
214	Poor body development	PooBD	01.03.12.08
215	Recumbency	Recum	01.03.12.09

5.4.3. Diagnosis

Diagnostic techniques or tests are any procedures used to distinguish normal and abnormal states in an animal. The techniques are also essential for confirming the health status of animals and identifying the causes of a disease(s). Veterinarians undertake careful and clinical examinations of animal diseases to understand the nature of conditions and develop effective treatment and control measures. During diagnosis, a clinician (veterinarian) may conduct one or more tests to support or possibly exclude a hypothesis based on patient history and physical examination. There are different diagnostic techniques used in veterinary medicine with different institutional capacity as well as demands. Common strategies used for tentative or confirmatory diagnoses are listed below.

5.4.3.1. Clinical Examination[65]

A clinical examination is a fundamental approach to diagnosing animals brought to veterinary facilities with "abnormal" characteristics observed by attendants and/or owners. A clinical examination identifies the organ systems affected via differential and final diagnoses. The person conducting a veterinary clinical examination must have knowledge of anatomy, physiology, pathology, animal behavior, the methods and techniques of clinical examination, and the signs and pathogenesis of disease. As a general principle, knowledge of an animal's environment, behavior, and previous health history is critical for understanding the causes of change in its behavior. However, further information might be needed for the final diagnosis of some clinical cases. Several details need to be collected during clinical examination, including the history of the diseased animal, the history of the farm, and the clinical signs previously exhibited by the animal. Such details can be collected via interviews with the owner or keeper of the animal. Veterinarians involved in clinical diagnosis should thus use different tools, including *history* (immediate and past history), *clinical observation* of animals, and thorough *physical examination* (hands on animal). Their diagnoses may either be tentative or confirmatory in nature. A confirmatory diagnosis may require further tests depending on the signs exhibited during clinical examinations.

[65] Abdisa T. (2017) Review on Practical Guidance of Veterinary Clinical Diagnostic Approach. Int J Vet Sci Res 3(1): 030-049. DOI: 10.17352/ijvsr.000020

- *Observation:* This is a general inspection of the animal(s) from a distance; the observer may sometimes go around the animal or herd/flock to get a general impression about the case. Attention should be paid to the following factors: behavior, appetite, defecation, urination, posture, gait, body condition, body conformation, and lesions on the outer surface of the body (skin and coat, nose, mouth, eyes, legs, hooves, and anus).

- *History taking:* History taking or anamnesis is the process of obtaining information about illness, the onset of illness, and feeding practices through careful questioning of the owner. A disease is usually presented indirectly in the form of a complaint by the owner or attendant. However, the owner or attendant often fails to provide a pertinent and adequate history; as such, the clinician must substantiate the information provided. Collected disease information should include the group(s) affected, the numbers of animals affected (morbidity), the identities of the animals affected, and the number of animals that have died (mortality). In addition, patient history should include present, past, and environmental and patient information. Patient data should include owner's name, owner's address (postal address, telephone, kebele, peasant association), species, breed, sex, age, name, ID number, body weight, and description, including color, marking, polledness, and other identification marks of the patient.

- *Physical examination*: General inspection, palpation, percussion, and auscultation are methods used to detect clinical abnormalities. Physical examination can be carried out by taking vital signs such as temperature, pulse, respiration, and capillary refill time (CRT) and observing physical body condition and demeanor (normal or abnormal).

5.4.3.2. Laboratory Examination

This is a test that follows the clinical diagnosis of animals. It is intended to rule out other possible disease outcomes that share common clinical signs. The sample required depends on the clinical diagnosis, animal species, testing method, and availability of the requested test facility. Some common laboratory tests and procedures are as follows:

Veterinary Medical Tests[66]

- *Microbiology*: This is the study of small organisms such as bacteria, virii, fungi, and other single-celled life forms. Typically, bacteria, fungi, and viruses are first grown (cultured) and then identified. Some microorganisms are difficult to grow in the laboratory, but antibodies or other chemicals may be used to detect the presence of microorganisms in a sample. Samples that can be used to culture microorganisms include blood, urine, feces, secretions from the nose or lungs, and swabs taken from a wound or abscess.

[66] Whitbread, T.J.. (2019). MSD Manual, Types of Veterinary Medical Tests. https://www.msdvetmanual.com/special-pet-topics/diagnostic-tests-and-imaging/types-of-veterinary-medical-tests

- *Bacteriology*: Bacteriological techniques include screening tests (specific antibody detections), bacterial isolation (with culture and biochemical tests), and further molecular analysis (polymerase chain reaction [PCR], Western blotting, and sequencing).
- *Virology*: Virology is the study of viruses via several tests, including viral isolation, electron microscopy, fluorescent antibody techniques, enzyme-linked immunosorbent assay for antigens (ELISA-Ag), agar gel immunodiffusion, enzyme-linked immunosorbent assay for antibodies (ELISA-Ab), indirect fluorescent antibody), virus (serum) neutralization (VN/SN), viral antigens or nucleic acid (RNA and DNA) detection, and others that detect and quantify antibody responses to infection and/or vaccination (viral).
- *Mycology*: Techniques to detect fungi include screening tests (KOH solution, calcofluor white stain), fungal cultures, antibody detections, and molecular detections (antigen detections).

- *Parasitology*: Parasitic diagnostic techniques range from detection with the unaided eye, stereomicroscopy, and light microscopy to the use of molecular tools. For endoparasites, it includes flotation, sedimentation, smear of fecal samples, and smear (wet, thin, or thick) of blood for hemoparasites. Ectoparasites are mainly detected using key identification documents and unaided and/or aided eyes.

- *Molecular biology*: The molecular methods (bacteriology, virology, parasitology and mycology) are summarized under this title. The common molecular techniques are nucleic acid detection (RNA, DNA) with PCR, accompanied by sequencing (whole genome or nucleic acid) for more pathogen details.

- *Clinical chemistry*: This is a test to analyze the chemical composition of a liquid blood sample (serum or plasma), although other body fluids may also be studied. Clinical chemistry tests are important for determining how well different organs (kidneys, liver, etc.) are working. They can further help identify specific disorders such as diabetes or pancreatitis. These tests may also be used to monitor how the animal is responding to treatment.

- *Cytology*: To get information about the cells in the animals' body, samples of tissue or fluid are first collected. Thereafter, slides are prepared and stained for microscopic examination to determine the kinds of cells present. Pathologists are often called upon to identify cancerous cells or determine whether a tumor is benign or cancerous (malignant). The presence of infectious agents can also be determined by pathologists. Some microorganisms can be identified, but bacteria require microbiology testing for identification.

- *Fluid analysis*: This involves checking a sample for cells and proteins. The samples are body fluids other than blood (urine, joint fluid, etc.).

- *Hematology*: This test determines the number and types of cells circulating in the bloodstream and provides basic information about anemia, inflammation, and clotting. Determining the number of red blood cells, their size and shape, and their hemoglobin content (the molecule that carries oxygen) helps identify disorders such as anemia. The number of different types of white blood cells gives information about inflammation, which could be due to an infection or other cause. Platelets are also examined during a complete blood count; changes in platelet numbers or appearance can help identify blood clotting disorders.
- *Histopathology*: This a diagnostic approach whereby histological techniques such as paraffin techniques are coupled with microscopic views to identify abnormal cells and tissues in suspected organ systems.
- *Serology*: This determines the level of antibodies (called the titer) that are present and reactive against a particular infectious microorganism. A high level of antibodies, or an increase in their level from one sample to another taken a few weeks later, shows that an animal has been exposed to the microorganism and its immune system has produced antibodies against the infectious agent.
- *Toxicology*: Samples are collected for toxicologic tests to identify a poison and measure the amount of damage it may have caused.
- *Others*: Other tests, such as the tuberculin test for bovine tuberculosis, may be carried out. In a tuberculin test, intradermal administration of tuberculin is made through the dermis (i.e., upper skin layer) for the possible reaction of the skin. Single and comparative tuberculin tests are available that are used mostly for screening tuberculosis in domestic animals.

Diagnostic Procedures[67]

- *Radiography*: Radiography (generation of transmission planar images) is one of the most commonly used diagnostic tools. This non-invasive method of imaging provides a large amount of information and does not alter the disease process or cause unacceptable discomfort to the animal.
- *Ultrasonography, or ultrasound imaging or ultrasound scanning or sonography*: This is a method whereby high-frequency sound (ultrasound) waves are used to produce images of internal organs and other tissues. Abdominal ultrasound imaging is performed to evaluate different organs and structures (kidneys, liver, gallbladder, pancreas, spleen, blood vessels of the abdomen).
- *Computerized tomography (CT) scan*: CT is used to detect structural changes deep within the body, including tumors, abscesses, vascular abnormalities, occult fractures, and hematomas.

[67] Lattimer J.C. (2019). MSD Manual, Radiography of Animals. https://www.msdvetmanual.com/clinical-pathology-and-procedures/diagnostic-imaging/radiography-of-animals

Modern, high-speed scanners are also used to evaluate dynamic physiologic processes such as blood flow, changes in respiratory volume, cardiac function, and intestinal dynamics.

- *Magnetic resonance imaging (MRI)*: MRI is often used for the evaluation of blood vessels deep within the body, particularly those of the legs, neck, and head, in addition to its function for neuroimaging.
- *Cystoscopy:*[68] This is an endoscopic examination of the bladder.
- *Colonoscopy:*[69] This is a method of colon observation, used in the diagnosis of chronic colonic disease, including large bowel diarrhea (exhibited by tenesmus, dyschezia, hematochezia, or the passage of mucoid feces). Colonoscopy is particularly useful in the diagnosis of inflammatory bowel disease (lymphocytic-plasmacytic colitis) in both dogs and cats.
- *Endoscopy:*[70] An endoscopy is a minimally invasive procedure used with dogs and cats to help diagnose gastrointestinal conditions, abnormal cells, tumors, and some forms of cancer, including lymphoma.
- *Rhinoscopy:*[71] This is a nasal endoscopy used as a diagnostic tool by veterinarians to examine the nasal cavity of animals.
- *Bronchoscopy:*[72] Bronchoscopy is commonly used in the evaluation and management of canine and feline respiratory diseases.
- *Endocrine testing*: A broad range of endocrine tests are performed using validated immunoassay technologies and methods, including radioimmunoassay, enzyme-linked immunosorbent assay, and chemiluminescent immunoassay.
- *Fluoroscopy:*[73] Fluoroscopy is used to observe the motion that occurs while an animal is swallowing and breathing. This allows veterinarians to see when abnormalities occur and diagnose and monitor various disorders.
- *Biopsy*: A biopsy is performed by taking a small sample of tissue for laboratory analysis. Biopsies are very safe and routine procedures. The risks associated with a biopsy depend on several factors, including the overall health of the patient, the location of the area to be biopsied, and how many samples are taken. Veterinarians often use ultrasound to guide a small needle to diseased areas of tissue for biopsy.

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68 https://vethospital.tamu.edu/small-animal/internal-medicine/cystoscopy/

69 Jergens A.E. (2002). Colonoscopy in the Dog and Cat. WSAVA. https://www.vin.com/apputil/content/defaultadv1.aspx?id=3846198&pid=11147&#:~:text=Indications%3A%20Clinical%20signs%20of%20chronic,in%20both%20dogs%20and%20cats

70 https://www.animaltrust.org.uk/our-services/pet-endoscopy/

71 https://warrenhousevets.com/rhinoscopy/

72 Rha J., Mahony O. (1999). Bronchoscopy in small animal medicine: indications, instrumentation, and techniques. *Clinical Techniques in Small Animal Practice.* 14 (4): 207-212. https://doi.org/10.1016/S1096-2867(99)80012-7

73 https://vhc.missouri.edu/small-animal-hospital/small-animal-internal-medicine/diseases-and-treatments/what-is-fluoroscopy/

Table 64: Diagnostic Methods and Their Abbreviations

S.No.	Diagnostic Methods	Abbreviation	Code
1	Clinical examination	ClinEx	02.01
2	Bacteriology	Bact	02.02
3	Virology	Virol	02.03
4	Mycology	Mycol	02.04
5	Parasitology	Paras	02.05
6	Molecular biology	MolBio	02.06
7	Clinical chemistry	ClinChem	02.07
8	Cytology	Cytol	02.08
9	Fluid Analysis	FluiAna	02.09
10	Hematology	Hemat	02.10
11	Histopathology	HistPath	02.11
12	Serology	Serol	02.12
13	Toxicology	Toxic	02.13
14	Radiography	RadiGra	02.14
15	Ultrasonography (ultrasound imaging or ultrasound scanning or sonography)	UltGra	02.15
16	Computerized tomography scan	CTS	02.16
17	Magnetic resonance imaging	MRI	02.17
18	Cystoscopy	CytoSc	02.18
19	Colonoscopy	ColSc	02.19
20	Endoscopy	EndoSc	02.20
21	Rhinoscopy	RhinSc	02.21
22	Bronchoscopy	BronSc	02.22
23	Endocrine testing	EndTest	02.23
24	Fluoroscopy	FlurSc	02.24
25	Biopsy	Biop	02.25
26	Others	Oth	02.26

5.4.4. Treatment[74]

Veterinary treatment refers to the preventative and curative measures used to treat a sick animal or group of sick animals for a given disease, in accordance with a prescription and for a limited

[74] https://veteriankey.com/treating-sick-animals-and-end-of-life-issues/

period. After the diagnosis is carried out as per the above-mentioned procedures and techniques, treatment(s) is (are) given to the sick animals to heal or give relief from pain. Treatment includes surgeries, procedures, medications, supplements, prescription foods, orthotic devices, prosthetic devices, carts, nursing, and other care.

- **Palliative:** This is a treatment given to relieve the signs and reduce the suffering of life-threatening diseases (e.g., cancer). This treatment does not cure the disease.

- **Preventive:** Also called chemoprophylaxis, this is a treatment in which drugs can be administered to animals prior to the occurrence of disease. For example, antibiotics might be administered prior to shipping animals from one place to another to prevent opportunistic microorganisms from causing disease. Animals can become immunocompromised due to transportation stress - for instance, *Pneumonic mannheimiosis* (formerly *Pneumotic pasteurellosis*) or shipping fever is caused *Mannheimia haemolytica* (formerly *Pasteurella haemolytica*), a normal flora that can change its virulence if an animal is immunocompromised during shipping.

- **Curative:**[75] Curative or therapeutic care is a treatment protocol followed to overcome disease with an outcome of recovery. This curative treatment can include antibiotics for bacterial infections, chemotherapy or radiation therapy for cancer, a cast for a broken bone, or dietary programs for certain conditions.

- **Antimicrobials:** Antimicrobials are medicines used to prevent and treat infections in humans, animals, and plants. It is a collective name given to antibiotics, antivirals, and antifungals. Antimicrobials can be applied topically or systemically. Topical antimicrobials can be used either to prevent or treat disease. The clinical presentation will determine the choice of drug (Whelan, 2022[76]; WHO, 2021[77]). These drugs can be used alone or in combination with each other.
    - ***Antibacterial:*** Antibacterials are drugs used to treat bacterial infection. These antibacterial drugs can exist in liquid form (for injection or spray (nasal)) or bolus form. Antibacterials are classified in different ways, such as effect on bacteria (bacteriostatic or bactericidal), bacterial spectrum (gram-positive, gram-negative, or both), and efficacy against aerobic and anaerobic organisms.
    - ***Antiviral:*** Effective vaccine development is the conventional approach to controlling viral diseases, which is not always possible. Antiviral therapy is given against viral infection with the intention of preventing further viral invasion. However, the method of replication of viruses means they cannot be treated like bacteria. Antivirals are often used empirically

[75] https://www.caringinfo.org/types-of-care/curative-care/#:~:text=Curative%20or%20therapeutic%20care%20refers,a%20cure%20is%20not%20possible

[76] Whelan N. (2022). MSD Manual, Antimicrobial Use in Animals. https://www.msdvetmanual.com/pharmacology/systemic-pharmacotherapeutics-of-the-eye/antimicrobial-use-in-animals

[77] WHO (2021). Antimicrobial resistance. https://www.who.int/news-room/fact-sheets/detail/antimicrobial-resistance#:~:text=What%20are%20antimicrobials%3F,in%20humans%2C%20animals%20and%20plants

to help manage clinical signs and slow or stop disease progression. The optimal activity of some drugs depends on an adequate host immune response. Some antiviral drugs may enhance the immune system of the host (Mercer, 2022).[78]

- ***Antifungals:*** Antifungal drugs are administered to treat fungal infections; they can be applied by topical and systemic routes for local and systemic mycoses, respectively (Whelan, 2022).

- **Anthelmintic:** Anthelmintic chemicals are antiparasitic agents that are vital tools in helminth parasitic control.

- **Ectoparasiticide:** This is a collective drug name for insecticides and acaricides. It is an antiparasitic drug used in the treatment of ectoparasitic infestations (i.e., a drug that kills the parasites that live on the body surface). Different methods, including dipping, spraying, or pour-on, can be applied to eliminate or decrease the parasitic burden on animals.

- **Antidote:** An antidote is a drug or a management approach that can be done to reverse, decrease, or prevent action of a toxicant. They can also help stabilize vital signs, directly or indirectly, and promote excretion of a toxicant. An antidote can be a general one given without knowing the toxicant, or specific if directed against the specified toxicant.

- **Anti-pain:** These are types of drugs used to relieve pain. They include opioids, nonsteroidal anti-inflammatory drugs, corticosteroids, and alpha2 agonists.

- **Surgical intervention:** This is a medical intervention and, in some cases, a husbandry practice for better performance and animal welfare issues (see more under "Husbandry practice"). These procedures include dehorning, removal of foreign bodies in rumen/reticulum, trocarization, or rumenotomy. In general, surgical interventions can be classified as minor and major:
  - ***Minor surgery:*** Minor surgery does not expose a body cavity and causes little or no physical impairment. Some minor surgeries are wound abscess removal, castration, vasectomy, dehorning, suturing of a wound, and prolapse repair. In general, many veterinary laparoscopic procedures are considered to be minor. Animals that recover from minor surgical procedures are expected to have little or no postoperative complications and can easily get back to normal life within a short time period.
  - ***Major surgery (operative procedure)*:** Major surgeries generally penetrate and expose a body cavity, produce substantial impairment of physical or physiologic functions, or involve extensive tissue dissection or transaction. These include, for example, ovariohysterectomy (common in dogs and cats), thoracotomy, and laparotomy.

[78] Mercer M.A. (2022). MSD Manuals, Overview of Antiviral Agents Used in Animals. https://www.msdvetmanual.com/pharmacology/antiviral-agents/overview-of-antiviral-agents-used-in-animals

Table 65: Possible Treatment and Their Abbreviations

S.No.	Possible treatment	Abbreviations	Code
1	Palliative	Pall	03.01
2	Preventive	Prev	03.02
3	Curative	Curat	03.03
4	Antibacterial	AntBac	03.04
5	Antiviral	AntVir	03.05
6	Antifungals	AntFun	03.06
7	Anthelmintic	AntHelm	03.07
8	Ectoparasiticide	EctPar	03.08
9	Antidote	AntDot	03.09
10	Anti-pain	AntPai	03.10
11	Minor surgery	MinSurg	03.11
12	Major surgery (operative procedure)	MajSurg	03.12

Husbandry Procedures: Husbandry procedures, commonly practiced in cattle, sheep, goats and camels, include cesarean section, dehorning, fetotomy, hoof trimming, neutering, shortening of horns, grooming or brushing, and wound management. In Table 66, the common procedures are given a code following the same logic used in disease abbreviations.

Table 66: Husbandry Procedures and Their Abbreviations

Husbandry/Interventions Procedures		Abbreviations	Code
1	Cesarean section	CS	04.01
2	Dehorning (amputation of horn)	Deho	04.02
3	Fetotomy	Feto	04.03
4	Grooming or brushing	Groom	04.04
5	Hoof trimming	HooTr	04.05
6	Laparotomy	Lapa	04.06
7	Neutering (castration)	Neut	04.07
8	Ovariohysterectomy	OvHy	04.08
9	Shortening of horns	ShorH	04.09
10	Rumenotomy (Trocarization)	Rumt	04.10
11	Thoracotomy	Thort	04.11
12	Wound management	WouM	04.12

Route Drug Administration

Drug administration to animals can be done per the specified prescription. The most commonly known routes of drug administration include intravenous, intramuscular, subcutaneous, *per os*, intramammary infusion, intrauterine bolus, intranasal droplet, intraperitoneal, and topical (Pharmacology Vocabulary[79]). The following are the most common routes of drug administration:

- Parenteral route[80]
  - *Intravenous (IV)*: IV is the administration of therapeutic drugs and/or supportive fluids through the veins. This route is considered the fastest route for absorption of drugs. In large animals, the jugular vein in the neck is the most frequently used. Drugs should be administered at body temperature and at a slow pace. This is the preferred route if a rapid drug effect or continuous administration (infusion) is needed. It is also preferred for large drug dosage volumes and drugs that cause local tissue damage if given by other routes.
  - *Intramuscular (IM)*: IM is the administration of a drug deep in the muscle for proper absorption. This route allows the second fastest rate of absorption. The site of injection varies for different species of animal. The most common are the gluteal muscle, neck muscle, or thigh muscle.
  - *Subcutaneous (SC)*: SC is administration of a drug by applying it to the skin. Drugs of a nonirritating nature are given through this route. This route is relatively inexpensive and simple. Drug absorption rate is considered to be slower through this route (Turner, et al., 2011).[81]
  - *Intramammary infusion (IMMI)*: With IMMI, drugs are applied to the teat canal using a plastic teat infusion cannula. It is used to treat mastitis for lactating and nonlactating (dry) cows.

- Per os (PO): PO is a route of drug administration through the mouth in the form of a bolus (pill) or a liquid. Liquids or pastes are placed in the mouth and animals are allowed to swallow them. In some cases, a stomach tube can be used to administer the drugs directly in the digestive tract.

- Intrauterine (IU): IU drugs are administered into the uterus by passing a sterile plastic insemination pipette through the cervix. This route of administration is often used to treat metritis (uterine infection).

- Intranasal (IN): IN is administration of therapeutic drugs through the nostrils. This is a suitable way for administration of some vaccines.

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79 Pharmacology vocabulary. https://www.vfu.cz/files/05.-tyden-pharmacology.-mrl.pdf

80 Turner P.V., Brabb T., Pekow C., Vasbinder, M.A. (2011). Administration of substances to laboratory animals: routes of administration and factors to consider. *Journal of the American Association for Laboratory Animal Science*, *50*(5. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3189662/#:~:text=Nonirritating%20substances%20may%20be%20given,routes%2C%20providing%20a%20sustained%20effect

81 Turner P.V., Brabb T., Pekow C., Vasbinder M A. (2011). Administration of substances to laboratory animals: routes of administration and factors to consider. *Journal of the American Association for Laboratory Animal Science*, *50*(5), 600-613. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3189662/#:~:text=Nonirritating%20substances%20may%20be%20given,routes%2C%20providing%20a%20sustained%20effect

- Intraperitoneal (IP): IP drugs are injected directly into the peritoneal cavity, a space in the abdomen, and often used in combination with IV injections to prolong the availability of the medication to the animal. The absorption rate of drugs through this route is slow.

- Topical (TO): Topical drugs are applied to the skin or surface of the body. Those drugs could be in the form of ointment, pour-on, or dust.

5.4.5. Livestock Vaccines

Animal vaccines are vaccines prepared to protect animals from diseases and only limited to veterinary use. Vaccines administered in Ethiopia are mostly produced in the country by the National Veterinary Institute (NVI) or imported from abroad. The vaccines produced or imported have different forms (i.e., lyophilised, powder, liquid, etc.) that protect against specified diseases in specific species of animals. Vaccines need different cold chain levels depending on their type (i.e., killed or live attenuated).

The common routes of vaccine administration in large animals are either subcutaneous or intradermal. However, poultry may have different routes of administration such as subcutaneous, drops (eye), drinking (drench), or aerosol (fumigation).

List of Vaccines for Animal Diseases

There are various types of animal vaccines that are produced locally at the National Veterinary Institute, Bishoftu. Dead, live, and/or inactivated/attenuated vaccines are produced to prevent various diseases affecting different animal species (cattle, sheep, goats, horses, donkeys, mules, dogs, cats, poultry, etc.). Additionally, there are a lot of vaccines with different forms that are imported from various parts of the world. These vaccines are imported because they are not locally produced or are scarce.

The following list of the most common vaccines produced in Ethiopia (Table 67) includes their corresponding abbreviations and codes. Some imported and locally produced vaccines have similar names. However, there is limited information to prove they are similar or different in their biological contents. Therefore, they are listed as separate vaccines in the tables below. Vaccines can be identified by the first letter in the abbreviation - “L” for local or “I” for imported. For example, the inactivated Newcastle vaccine produced locally (i.e., in NVI, Ethiopia) is given the abbreviation as ‘***LVaccNCDI”*** while the imported inactivated Newcastle

Table 67: List of Vaccines Produced in Ethiopia with Their Abbreviations and Animal Species

No	Vaccine name	Abbrev.	Code	Animal species
I	**Vaccines for bacterial diseases**	**Abbr.**	**05.01.01**	**Species**
1	Anthrax vaccine	LVaccAnt	05.01.01.01	Cattle, sheep, goats, Camel
2	Blackleg Vaccine	LVaccBL	05.01.01.02	Cattle, sheep, goats, and camel
3	Bovine pasteurellosis (Haemorrhagic Septicemia) vaccine	LVaccBPast	05.01.01.03	Cattle
4	Contagious bovine pleuropneumonia vaccine	LVaccCBPP	05.01.01.04	Cattle (including calves)
5	Contagious caprine pleuropneumonia vaccine	LVaccCCPP	05.01.01.05	Goats
6	Ovine pasteurellosis vaccine	LVaccOPast	05.01.01.06	Sheep and goats
II	**Vaccine of viral diseases**		**05.01.02**	
7	African horse sickness vaccine	LVaccAHS	05.01.02.01	Horses, donkeys, and mules
8	Camelpox vaccine	LVaccCaPo	05.01.02.02	Camel
9	Foot and mouth disease vaccine (Trivalent vaccine containing O, A, SAT 2 serotype)	LVaccFMDT	05.01.02.03	Cattle
10	Fowl cholera vaccine	LVaccFoCh	05.01.02.04	Chickens
11	Fowlpox vaccine	LVaccFoPo	05.01.02.05	Chickens
12	Fowl typhoid vaccine	LVaccFoTh	05.01.02.06	Chickens
13	Newcastle disease vaccine		05.01.02.07	
	Inactivated Newcastle vaccine	LVaccNCDI	05.01.02.07.01	Chickens
	Inactivated Newcastle oil-emulsion vaccine	LVaccNCDIE	05.01.02.07.02	Chickens
	Live Newcastle disease vaccine	LVaccNDVLE	05.01.02.07.03	Chickens
	Newcastle thermostable vaccine	LVaccNCDT	05.01.02.07.04	Chickens
14	Infectious bursal disease/Gumboro vaccine	LVaccIBD	05.01.02.08	Chickens
15	Lumpy skin disease vaccine	LVaccLSD	05.01.02.09	Cattle
16	Marek's disease vaccine	LVaccMrk	05.01.02.10	Chicken
17	Peste des petits ruminants vaccinés		05.01.02.11	
	Peste des petits ruminants vaccinés	LVaccPPR	05.01.02.11.01	Goats and sheep
	Peste des petits ruminants vacciné thermotolerant vaccine	LVaccPPRT	05.01.02.11.02	Goats and sheep
18	Rabies vaccine	LVaccRab	05.01.02.12	Dog
19	Sheep and goat pox vaccine	LVaccShGPo	05.01.02.13	Goats and sheep

Source: NVI website[82]

[82] National veterinary institute (NVI), Products. https://www.nvi.com.et/

Table 68: List of Imported Vaccines that are Registered by Ethiopian Agricultural Authority

No	Vaccine name (generic name)	Abbrev	Code	Animal species
1	**Avian encephalomyelitis virus + fowl pox +laryngotracheitis virus)**	IVaccAEFPL	05.02.01	Chickens
2	**Avian infectious bronchitis vaccine**		05.02.02	
	♣ Attenuated infectious bronchitis coronavirus cr88121 strain	IVaccIBCV	05.02.02.01	Chickens
	♣ Avian infectious bronchitis virus, live attenuated, strain l1148	IVaccIBVLA	05.02.02.02	Chickens
	♣ Avian infectious bronchitis virus, h120 strain	IVaccIBV	05.02.02.03	Chickens
	♣ Avian infectious bronchitis virus, strain h120 + Avian infectious bronchitis virus, strain d247	IVaccIBVIFBV247	05.02.02.04	Chickens
	♣ Avian infectious bronchitis virus, strain h120 + Avian infectious bronchitis virus, strain d248	IVaccIBVFBV248	05.02.02.05	Chickens
	♣ Avian infectious bronchitis virus, Massachusetts h120 strain		05.02.02.06	Chickens
	♣ Inactivated infectious bronchitis virus, strain m41 +inactivated infectious bursal disease virus strain d78, + inactivated Newcastle disease virus strain clone 30	IVaccIBVIBDND	05.02.02.07	Chickens
	♣ Live attenuated infectious bronchitis virus, strain 1/96	IVaccLAIB	05.02.02.08	Chickens
3	**Avian infectious bursal disease (IBD) virus vaccine**		05.02.03	
	♣ Avian infectious bursal disease virus LIBDIV strain	IVaccIBD	05.02.03.01	Chickens
	♣ Avian infectious bursal disease virus strain syza26	IVaccIBD26	05.02.03.02	Chickens
	♣ Avian infectious bursal disease virus strain winter field 2512 g- 61	IVaccIBD61	05.02.03.03	Chickens
	♣ Bursal disease viral tissue, Lukert strain	IVaccBDL	05.02.03.04	Chickens
	♣ Infectious bursal disease virus (winter field 2512, strain g-61	IVaccIBDW61	05.02.03.05	Chickens
	♣ Inactivated avian infectious bursal disease (IBD) virus, strain D78 + inactivated ND virus strain clone 30	IVaccIBDND	05.02.03.06	Chickens
	♣ Live avian IBD virus, strain d78, containing at least 4,0 log 10 TCID 50	IVaccIBD78	05.02.03.07	Chickens
	Marek's disease vaccine		05.02.04	

No	Vaccine name (generic name)	Abbrev	Code	Animal species
4	♣ Live Marek's disease virus serotype 1, strain cvi988	IVaccMD988	05.02.04.01	Chickens
	♣ Marek's disease chicken herpes virus infected cell suspension strain cvi988 + Marek's disease turkey herpesvirus infected cell suspension strain fc 126	IVaccMDH	05.02.04.02	Chickens
	♣ Marek's disease hvt strain + Marek's disease Rispens CVI 988 strain	IVaccMDR988	05.02.04.03	Chickens
	♣ Marek's disease - Newcastle disease vaccine, serotypes 1& 3, live virus	IVaccMDND	05.02.04.04	Chickens
	♣ Marek's disease vectored bursal disease recombinant virus	IVaccMDVBD	05.02.04.05	Chickens
	♣ Marek's disease virus serotype 1	IVaccMD	05.02.04.06	Chickens
5	**Mycoplasma Gallisepticum vaccine**		05.02.05	
	♣ Live attenuated mycoplasma Gallisepticum strain mg 6/85	IVaccMycG6	05.02.05.01	Chickens
	♣ Mycoplasma Gallisepticum bacterin	IVaccMycG	05.02.05.02	Chickens
	♣ Mycoplasma Gallisepticum, strain s6/85:23.02 mg bacterial antigen containing at least 0.23 o.d. units	IVaccMycGs6	05.02.05.03	Chickens
6	**Newcastle disease virus vaccine**		05.02.06	Chicken
	♣ Inactivated newcastle disease virus strain NDV-SZ	IVaccNCDSZ	05.02.06.01	Chickens
	♣ Live Newcastle disease virus	IVaccNCD	05.02.06.02	Chickens
	♣ Newcastle disease virus, B1 type, B1 strain + bronchitis virus, mass. serotype, strain #1263	IVaccNDB1B	05.02.06.03	Chickens
	♣ Newcastle disease vaccine; B1 type, Lasota strain	IVaccNDV1L	05.02.06.04	Chickens
	♣ Newcastle disease virus Lasota strain	IVaccNDL	05.02.06.05	Chickens
	♣ Newcastle disease virus strain B1	IVaccNDB1	05.02.06.06	Chickens
	♣ Newcastle disease virus strain phy.lmv.42 + Avian infectious bronchitis virus strain h120	IVaccNDIB	05.02.06.07	Chickens
	♣ Newcastle disease virus, inactivated	IVaccNDI	05.02.06.08	Chickens
	♣ Newcastle disease Vg/Gaavinew strain	IVaccNDVG	05.02.06.09	Chickens
7	**Rabies vaccine**		05.02.07	
	Inactivated rabies virus antigen	IVaccRab	05.02.07.01	Dogs and cats
	Rabies killed virus strain SVR -289	IVaccRab289	05.02.07.02	Dogs and cats

No	Vaccine name (generic name)	Abbrev	Code	Animal species
8	Avian infectious bronchitis virus Massachusetts type b-48 strain + Newcastle disease virus Hitchner b1 strain	IVaccIBVND	05.02.08	Chickens
9	Attenuated salmonella enteritidis bacteria strain sm24/rif12/SSQ	IVaccSE	05.02.09	Chickens
10	Avibacterium paragalinarum serotype a +serotype b + serotype c + salmonella enteritidis	IVaccAPSE	05.02.10	Chickens
11	Canine distemper adenovirus type 2-parainfluenza-parvovirus vaccine, modified live virus, Leptospira canicola-Grippotyphosa Icterohaemorrhagiae Pomona bacterin	IVaccCDPLGP	05.02.11	Dogs and cats
12	Clostridium chauvei-Hemolyticum-novyi-sordeli-perfringens-type c &d bacterin-toxoid	IVaccClHNP	05.02.12	Cattle and sheep
13	Escherichia coli bacterial culture (ec34195 strain)	IVaccEC	05.02.13	Chickens
14	Fowl pox viral membranes and fluids	IVaccFPV	05.02.14	Chickens
15	Live recombinant turkey herpes virus (HVt) with inserted f (fusion) gene of Newcastle disease virus (NDV)	IVaccHVND	05.02.15	Chickens

Source: Ethiopian Agricultural Authority website[83]

[83] Ethiopian agricultural authority. https://www.eaa.gov.et/en/home/ Accessed date: August 21, 2023

5.5. Additional Attributes

This section will cover all other attributes of data that otherwise do not fall into any of the categories previously listed. These can include standard definitions of observation dates, farming systems, farmer recording, age group, or animal grade.

5.5.1. Definitions

Animal Movement

Moving livestock to and from one premises to another. (*See various types of premises under the topic "Premises"*).

Animal Welfare

The physical and mental state of an animal in relation to the conditions in which it lives and dies (i.e., humane treatment); it is closely linked to animal health and wellbeing.

Body Condition Score

Body condition scoring (BCS) is a means of evaluating an animal based on muscle and external fat cover. BCS evaluates fatness or thinness according to a five-point scale, and scores are used to fine-tune dairy nutrition and health. BCS is a useful tool that guides breeding, selection, management, and selling decisions. The use of this tool helps producers evaluate the feeding of their animals, make reproductive and culling decisions, and evaluate animals when selling and buying. BCS is a subjective method used in livestock to estimate the amount of animal body reserves at different stages of production, based on visual and tactile assessments.

Conformation Score

A qualitative categorization of animal features (excellent, good, or fair) based on body frame, animal height, and defects.

Eruption

The emergence, penetration, or piercing of the tooth or teeth through the gingiva (the gum line).

Grade

The defined parameters that segregate live cattle into homogenous groups based on weight, age, sex, body condition, and body conformation.

Live Weight

The weight of an animal before slaughter, which can be determined through an appropriate and acceptable method. Some acceptable methods include weight band, visual appraisal, and body linear measurements (this includes height at withers, heart girth, chest depth, body length, fore cannon bone, rump height, distance between eyes, ear length, ear width, paunch girth, and tail

length).[84] Live weight measurements can be used for different purposes, such as monitoring growth rates of animals.

Premises

Any physical location where animals are managed or held, including all locations where livestock are born, raised, marketed, or exhibited. Premises may include farms, feedlots, quarantine stations, abattoirs, ranches, holding grounds, lairages, livestock markets, hobby farms, animal health posts, border posts, artificial insemination stations, livestock breeding centers, veterinary clinics, livestock research stations, stables, or livestock exhibitions organized for different purposes.

- Abattoir (slaughterhouse): Any premises approved and registered by a controlling authority in which animals are slaughtered and dressed for human consumption.
- Aquaculture establishment/premises: An establishment/premises where the breeding, raising, and harvesting of fish and shellfish takes place. This occurs in various bodies of water like lakes, ponds, or rivers. Aquatic animals' area all viable life stages (including eggs and gametes) of fish, mollusks, crustaceans, and amphibians originating from aquaculture establishments or the wild.
- Beehive: A structure for keeping honey bee colonies. It includes frameless hives, fixed frame hives, and all designs of moveable frame hives (including nucleus hives), but does not include packages or cages used to confine bees for the purposes of transport or isolation. In general, beehives can be categorized as traditional, transitional, and modern.
- Farm: A plot of land, usually with a house, barn, or silo, on which animals are raised for livelihood.
- Feedlot: A feedlot is an enclosed area where animals are fed and fattened before being slaughtered for food.
- Hatchery: A premises where eggs are hatched to produce commercial day-old chicks or ducklings.
- Hobby farms: A small-scale farm that is run for pleasure rather than a business venture. It is not usually the primary source of livelihood.
- Holding pen: Part of lairage where food animals are rested, fed, and watered. Antemortem inspections are carried out at such locations. A pen may be divided into different compartments, the size of which depends on the number of animals to be slaughtered.
- Lairage: Part of the abattoir where animals are kept until they are slaughtered; it comprises a ramp (where slaughtered animals are loaded and off loaded), holding pen (where animals fed, watered, and rested), and a weigh bridge.

[84] Mahmud, M.A., Shaba, P. and Zubairu, U.Y. 2014. Live Body Weight Estimation in Small Ruminants-A Review. *Global Journal of Animal Scientific Research.* 2(2):102-108. https://www.researchgate.net/publication/263734650_Live_Body_Weight_Estimation_in_Small_Ruminants-A_Review

- ♣ Livestock exhibition: An event where livestock are exhibited and judged on certain phenotypic breed traits (as specified by their respective breed standard).
- ♣ Livestock market: A specific location with dedicated facilities where buyers and sellers come together to buy or sell live animals. Livestock are usually brought to the market areas of such venues, tethered or corralled in temporary pens, and exchanged through private treaty haggling between buyers and sellers.

Proclamation No. 819/2014 provides classifications of livestock markets in Ethiopia, with respect to the selling of live animals (i.e., cattle, sheep, goats, and camels) and others designated as such by the Ethiopian Ministry of Trade and Regional Integration. Based on the proclamation, the sale of live animals shall be carried out at first-level and second-level live animal market centers. Even though the role of markets beyond the first and second level (farm-gate and tertiary markets) is not clearly stated in the proclamation and needs refinement, the project is obliged to follow the rules and regulations in the stated proclamation.

First-Level Live Animal Market:

Some of the criteria to be met by the First-level Live Animal Market Centers are listed below:

- An area with at least 5000 square meters;
- A fence built of local materials;
- Facilities such as market information board, loading and unloading facilities, solid waste burning, and liquid waste sewage facilities;
- Common facilities and toilets for market actors;
- A partition to accommodate different types of animals;
- Adequate facilities to provide feed, water, and health service for animals and isolation places for animals identified to have health problems; and
- Clean and convenient for information service.

Second-Level Live Animal Market:

Some of the criteria to be met by the Second-level Live Animal Market Centers are listed below:

- An area of at least 20,000 square meters;
- A fence built of block or wire;
- A partition to accommodate different types of animals;
- Space partitioned and allocated for market actors, such as cooperative union, breeder, and feedlot operator, for selling live animals;
- A scale for weighing live animals owned by the center and certified by the Ethiopian Meteorological Institute; and
- Adequate water and power supply, communication infrastructure, guarding quarters, and sales offices.

- ♣ Quarantine: A strict separation imposed to prevent the potential introduction and/or spread of disease by a new animal(s) brought to the premises/area/country. These animals are necessarily not known to be sick. Quarantine measures may be applied to animals that are being moved between countries, animals being introduced to a new area (farm, village, etc.), animals with infectious diseases, or animals that may have been in contact with suspected or infected animals. This prevents disease exposure to the rest of animals. Certain places require new animals to be quarantined to prevent introduction of diseases.

- ♣ Ranch: An establishment maintained for raising livestock, generally grazing animals like cows or sheep, under range conditions. Most of the time, only one kind of animal is raised at a ranch.

- ♣ Stable: A building in which domestic animals are sheltered and fed, especially a building that has stalls or compartments (for example, a horse stable).

- ♣ Veterinary premises: Any premises or facility where the practice of veterinary medicine occurs, including but not limited to, a veterinary clinic, veterinary hospital, mobile clinic, outpatient clinic, or satellite clinic.

  Veterinary clinic: A facility where domestic animals are cared for and medically treated. It primarily offers outpatient care and minor procedures involving hospitalization for short periods.

  Veterinary hospital: Usually a larger facility that offers more services, including boarding and keeping animals overnight if necessary, and is equipped to perform more complicated surgical procedures. Often, these facilities have in-house diagnostic equipment, including x-rays, laboratories, and ultrasounds. Animal hospitals may also have more veterinarians and other certified staff to care for emergency and overnight patients.

5.5.2. Type of Livestock Production/Farming System

Farming system

A mixture of farm enterprises engaged in crop production, livestock rearing, aquaculture, and agroforestry.

Agricultural farming

The process of growing crops and raising livestock for food, fiber, or fuel. It can be divided into two main categories: *crop farming* and *livestock farming*.

- **Crop farming** involves planting seeds in the ground and harvesting the resulting plants.
- **Livestock farming** involves the breeding and management of domestic livestock or farm animals for the purpose of obtaining their products and byproducts

Livestock (Farm animals)

Domesticated animals raised in an agricultural setting to provide labor and produce diversified products for human consumption (such as meat, milk, fur, leather, and wool). The term livestock includes cattle, sheep, goats, camels, and other domestic animals ordinarily raised or used on the farm, with the exception of poultry.

The livestock production/farming/system can be classified into different categories based on various parameters:

I) Based on Production System

A production system can be classified as urban, peri-urban, or rural. A rural system, in turn, may entail mixed farming, pastoral, and agro-pastoral livestock production. Therefore, it is possible to list and discuss as urban, peri-urban, mixed, pastoral and agro-pastoral livestock production systems as follows:

- **Urban livestock production:** Livestock production of various types and sizes in the urban setting. Livestock reared in an urban setting are conventional animals like cattle for milk, small ruminants and pigs for meat, and poultry for eggs and meat.

- **Per-urban livestock production:** Raising livestock in peri-urban areas; these are areas located between the outer limits of urban and regional centers and the rural environment. The boundaries of peri-urban areas are porous and transitory as urban development extends into rural and industrial land.

- **Mixed farming:** The type of diversified agriculture in which livestock production is a complementary enterprise. In this system, crops and livestock play interdependent roles, with livestock providing draft power and manure for crop agriculture while crop residues provide feed for the livestock. In the mixed farming system, livestock follow crops *as the means of livelihood.*

- **Pastoral livestock production:** Livestock raised in a situation where the agricultural holder has no permanent place of residence and does not practice regular cultivation or crop production. Livestock moves from place to place with the agricultural holder and his/her household, depending on the season and the availability of feed and water. In pastoral farming, the land is usually covered by natural grass, and the primary purpose is to raise cattle, sheep, goats, or camels. This type of farming is important for getting wool, hides, meat, milk, butter, and cheese.

- **Agro-pastoral livestock production:** A way of life or a form of social organization based on the growing of crops and, mainly, the raising of livestock as the primary means of economic activity. Agropastoralism is characterized by dominance of livestock husbandry and limited crop production. It refers to livestock raised by holders who live a semi-nomadic life. Typically, the holder has a permanent residence to which he/she returns for several months of the year, according to seasonal factors. For transhumance and semi-pastoral systems, the holder establishes a semi-permanent home for several months or years and may cultivate crops as a supplementary food source. Herds are moved on seasonally to assure forage and water.

Table 69: Urban, peri-urban or rural livestock production system field

Field Name	livestockProductionSystem	
Description		
Display Name	**Type**	**Acceptable Values / Example**
Livestock Production System	Enumeration String	**e.g.,** "livestockProductionSystem": "MixedFarming",

Production System (Enumeration values)
Urban livestock production
Per-urban livestock production
Mixed farming
Pastoral
Agro-pastoral

II) Based on the Proportion of Land, Labor, and Capital Investment

- **Intensive farming:** Livestock rearing wherein large numbers of animals are reared in a small space with advanced inputs, technologies, and techniques, together with genetic manipulation and artificial insemination practices. In other words, it refers to a production method that is based on the intensification and mechanization of livestock practices. Furthermore, livestock are medicated to increase their productivity. Generally, animals are reared in an environment that is suitable for-profit maximization. Such an environment includes housing, water, and nutrition resources; farmers can also manage the temperature, humidity, and health (veterinary protection) of the environment. The intensive management system is used for market-oriented products (like dairy for milk & poultry for egg) in urban and periurban areas, where exotic breeds or crossbred animals are mainly kept for their high yields.

- **Extensive farming:** A low-input production system that mostly relies on natural or semi natural grasslands and characterized by low productivity per animal and surface area. It uses small amounts of inputs, capital, and labor compared to a farmed land area. Extensive livestock production systems usually have a low stocking rate and are essentially based on grazing (permanent grasslands, natural pastures, and others). Grazing management follows specific rotations. Pastoralism/nomadic herding is an extreme example of extensive farming, where herders move their animals to graze pastures enriched by occasional rainfall.

- **Semi-intensive livestock farming:** A system in which animals are housed and fed but allowed to graze or move within an enclosed area.

Table 70: Intensive, Extensive, Semi-intensive livestock production system field

Field Name	investment	
Description		
Display Name	**Type**	**Acceptable Values / Example**
investment	Enumeration String	**e.g.,** "investment": "semi-intensive",

Investment (Enumeration values)
Intensive
Extensive
Semi-intensive

III) On the Basis of Farm Size

The farm size classification usually varies with the type of farming (dairy farm, feedlot, etc.) and species of animals kept in the farm (cattle, sheep, goats, camels, etc.). Taking the above factors into consideration (number of cattle in the farms, occupied land, and investment), farms are classified as *small*, *medium,* and *large*. The range of each animal species (cattle, sheep, goats, and camels) at each farm size was determined based on data available from ELSAME (2021)[85], Shapiro, et al. (2017)[86] (Ethiopian Livestock Sector analysis document) and Total Economic Valuation of Agro-pastoral and Pastoral Systems of Ethiopia (ICPALD, 2020).[87] As the mentioned document outlines the mean for small and medium pastoral areas, a simple estimation of the mean was used to designate small and large sizes. For the agro-pastoral system, the size was an estimate as the document only kept a single average number without identifying small, medium, or large.

Table 71: Herd/Flock Size (Extensive System)

Species	Pastoral			Agro-Pastoral			Mixed Farming		
	Small	Medium	Large	Small	Medium	Large	Small	Medium	Large
Cattle	≤10	[11–25]	≥ 26	≤ 7	[8–15]	≥ 16	≤ 5	[6–15]	≥ 16
Sheep	≤12	[13–28]	≥ 29	≤6	[7–21]	≥ 22	≤ 4	[5–15]	≥16
Goats	≤18	[19–31]	≥ 32	≤10	[11–21]	≥ 22	≤ 4	[5–12]	≥13
Camels	Not applicable								

Source: Modified from ELSAME (2021) & ICPALD, 2020

[85] Ethiopian Livestock Sector Analysis, Management Entity (ELSAME). 2021. Ethiopia's Livestock Systems: Overview and Areas of Inquiry. Gainesville, FL, USA: Feed the Future Innovation Lab for Livestock Systems. https://livestocklab.ifas.ufl.edu/media/livestocklabifasufledu/pdf-/LSIL_Livestock_Systems_Overview_Ethiopia_2021_08.pdf.

[86] Shapiro, B.I., Gebru, G., Desta, S., Negassa, A., Nigussie, K., Aboset G. and Mechale. H. 2017. Ethiopia livestock sector analysis. ILRI Project Report. Nairobi, Kenya: International Livestock Research Institute (ILRI). https://cgspace.cgiar.org/bitstream/handle/10568/92057/LSA_Ethiopia.pdf.

[87] ICPALD (2020): Total Economic Valuation of Pastoralism in Ethiopia. Technical report. IGAD Regional Pastoral Livelihoods Resilience Project (RPLRP). Nairobi, Kenya. https://icpald.org/wp-content/uploads/2021/07/TEV-of-Agro-Pastoral-and-Pastoral-Systems-of-Ethiopia.pdf.

Table 72: Feedlot and Dairy Size Based (Intensive, Semi-Intensive)

Species	Feedlot						Dairy					
	Semi-intensive			Intensive			Semi-intensive			Intensive		
	Small	Medium	Large	Small	Medium	Large	Small	Medium	Large	Small	Medium	Large
Cattle	≤10	[11–20]	≥21		[51–200]			[5–10]		≤30	[31–100]	≥101
Sheep	**NB**: There are no registered commercialized sheep, goat, and camel feedlot and dairy farms*											
Goat												
Camels												

N.B. Summarized from Ethiopian Livestock sector analysis (2017), African Sustainable Livestock_2050 (FAO, 2018) and Livestock Master Plan (2015), Shapiro B.I., Gebru G., Desta S., Negassa A., Nigussie K., Aboset G., Mechal H. 2015. Ethiopia livestock master plan. ILRI Project Report. Nairobi, Kenya: International Livestock Research Institute (ILRI).

*Unlike feedlot and dairy cattle categorization, other species of animals (sheep, goats, and camels) have no reference points to estimate the range in terms of intensive and semi-intensive farming systems. As such, research-based information about available farming systems, along with the supported numbers of these three species of animals (sheep, goats, and camels), is required. In the meantime, the Ethiopian live animals' exporters directly export live sheep, goats, and camels without conditioning them after fulfilling the quarantine requirements, which makes the assessment of established farming systems longer than for quarantine.

Table 73: Farm Size field

Field Name	**farmSize**	
Description		
Display Name	**Type**	**Acceptable Values / Example**
Farm Size	Enumeration String	**e.g.,** "farmSize": "small",

Farm Size (Enumeration values)
Small
Medium
LargeScale

Limitation: The farm size categorization and inclusion of specific animals to each category need to be supported by an organized national study. The above categories (Table 72) have been established based on limited information and unpublished records.

5.5.3. Animal Age Classes

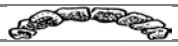
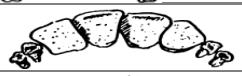
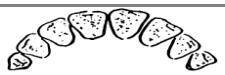
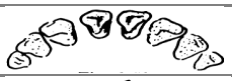
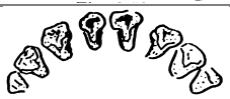
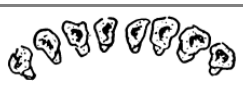
The age of an animal is based on its birth date, and when actual birth dates are not available, other indicative parameters like dentition, horn rings, or the length of the tail brush can be used. Whatever the information obtained or methodology followed, age categorization is very important for herd management.

5.5.3.1. Cattle Age Category

The life span of farm animals is relatively short, and their productiveness or usefulness declines with advancing years. The age of cattle, therefore, is of practical importance to the breeder, the seller, and the buyer. Cattle have 32 teeth at maturity, of which eight are incisors in the lower jaw. The two central incisors are known as pinchers; the next two are called first intermediates; the third pair are called second intermediates or laterals; and the outer pair are known as the corners. There are no upper incisor teeth; only the thick, hard dental pad. The approximate cattle age can be determined by observing the teeth (Table 74). The following categories can be used in the Ethiopian context:

- Calf: [0–1) year
- Young: [1–3) years
- Adult: [3–0) years
- Old: ≥ 10 Years

Table 74: Cattle Age Determination Based on Dentition

Age of Cattle	Description of Teeth	Diagram
About less than a year	Full set of deciduous incisors	
1-2 years	Two or more of the temporary incisor teeth present.	
3 years	Permanent first intermediates, one on each side of the pinchers, are cut. Usually these are fully developed at three years	
3 and half years	The second intermediates or laterals are cut. They are on a level with the first intermediates and begin to wear at four years	
4 and half years	The corner teeth are replaced. At five years, the animal usually has the full complement of incisors with the corners fully developed.	
5 to 6 years	The permanent pinchers are leveled, both pairs of intermediates are partially leveled, and the corner incisors show wear.	
7 to 10 years	At seven or eight years, the pinchers show noticeable wear; At eight or nine years, the middle pairs show noticeable wear; and at 10 years, the corner teeth show noticeable wear.	
Above 10 years	After the animal passes the sixth year, the arch gradually loses its rounded contour and becomes nearly straight by the 12th year. In the meantime, the teeth gradually become triangular in shape, distinctly separated, and show progressive wearing to stubs. These conditions become more marked with increasing age.	

Adapted from Ensminger M.E., (1962)[88]

[88] Ensminger M.E. (2017). R.F. Johnson. The Stockman's Handbook by Ensminger, 2nd ed., Page 608. http://avc-beef.org/AgingCattle-Griffin/AgingCattle-CL712.pdf

5.5.3.2. Camel Age Category

Camel life expectancy and age at maturity are different from cattle, sheep, and goats. Even within the same species (i.e., camels), age at puberty varies among the sexes. Age at puberty for male camels ranges from 3-4 years (Beil, 1999)[89] while for females it ranges from 3-5 years (Matharu, 1966[90]; Williamson and Payne, 1978[91]). This information is used to determine the age category, and age determination can be done from records (information from the owner) or observation of dentition (Table 75). Camel age can be categorized as follows:

- Immature [0–3) years
- Young: [3–7) years
- Adult: [7–15) years
- Old: >15 years

Table 75: Camel Age Determination Based on Dentition

Age	Features
Less than 3 years	Eruption of all deciduous teeth DI1, DI2, DI3
	DI1 in wear
About 3 years	DI2 in wear
About 4 years	All the incisors are quite worn down, with square or irregular table and eruption of permanent canine teeth
About 5 years	Eruption of permanent I1 (central)
About 6 years	Eruption of permanent I2 (lateral)
About 7 years	Eruption of permanent I3 (corner)
About 7 1/2 years	All the permanent incisors have erupted and canine teeth have reached their full size
About 9 years	Permanent I1 in wear
About 10 years	Permanent I2 in wear
About 11 years	Permanent I3 in wear
About 12 years	I1 is stub with square table
About 13 years	I2 is stub with square table
About 14 years	I3 is stub with square table
Above 15 years	Increase wide gap in the interdental space

DI1: Deciduous central incisors, DI2: Deciduous lateral incisors, DI3: Deciduous corner incisors, I1: Permanent central incisors, I2: Permanent lateral incisors, I3: Permanent corner incisors (The above table is adapted from Bello et al. (2013)[92]

[89] Beil, C. 1999. Reproduction in female camels (Camelus dromedarius and Camelus bacterianus). Thesis, Tierarztliche Bochschule Hannover, Hannover, Germany. Pp 180.

[90] Matharu, B.S. 1966. Camel care. Indian Farming, 19, 16-22.

[91] Williamson, G. and Payne, W.J.A. 1978. An Introduction to Animal Husbandry in the Tropics. Longman, London. Pp 755.

[92] Belloa, A. Sonfadaa, M.L., Umara, A.A., Umarub, M.A., Shehua, S.A.Henaa,S.A. Onua, J.E., Fatimaa O.O. (2013). Age estimation of camel in Nigeria using rostral dentition. *Scientific Journal of Animal Science*. **2**(1) 9-14. https://dspace.unijos.edu.ng/jspui/bitstream/123456789/2644/1/278-1418-1-PB.pdf

5.5.3.3. Sheep and Goat Age Classes

Age at first lambing/kidding varies from 12 to 24 months (SGP Handbook for Ethiopia)[93] depending on the various production systems and breeds. In the Ethiopian context, the goat age can be classified as young (< 1 years), adult (1–4 years) and old (>4 years). For sheep, classifications are young (< 1 years), adult (1–3 years) and old (>3 years) (Table 76).

Table 76: Age Estimated for Sheep and Goats Based on Dentition

No. of permanent incisors	Estimated age range (years)	
	Goat	Sheep
0 pair	Under 1	
1 pair	1-2	1-1½
2 Pairs	2-3	1½-2
3 Pairs	3-4	2½-3
4 Pairs	> 4	> 3
Broken Mouth	Aged	

Source: Vatta et al. (2006)[94]

5.5.4. Live Animals Grading (Cattle, Sheep, Goats, Camels)

5.5.4.1. Cattle Grading for Feedlot

Animal grading is the segregation of live animals for meat trade into homogenous groups based on weight, age, sex, body condition, and body conformation.

5.5.4.1.1. Body Condition Score

The overall body state of an animal, assessed through visual observation and taking into account fat and muscle deposition in various places on the animal's body. BCS is the score assigned through visual appraisal of specific body parts. The score of a live animal depends on the visibility of the gross anatomical parts and the flesh and fat that covers these points. The gross anatomical parts that are important determinants include tail-head, brisket and hump, transverse processes of the lumbar vertebrae, hips (trochanter major) and ribs; and the shape of the muscle mass between the tuber coxae (hooks) and tuber ischia (pins). Additionally, the following points are important in the understanding and identification of different gross anatomical parts of cattle:

- Vertebral column is the sum of all the vertebrae, which are divided into cervical (n=7), thoracic (n=13 pairs), lumbar (n= 6), sacral (n= 6 fused vertebrae forming the sacrum), and the coccygeal vertebrae (n=18- 20) in the tail.

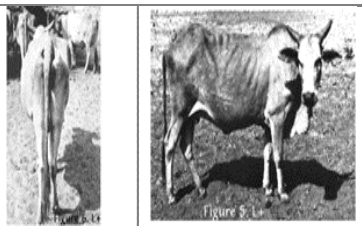
[93] Sheep and Goat Production Handbook for Ethiopia. Chapter 5: Reproduction in Sheep and Goats by Abebe G. http://esgpip.langston.edu/sites/default/files/Chapter%205_%20Reproduction%20in%20Sheep%20and%20Goats.pdf. Accessed date August 1, 2023.

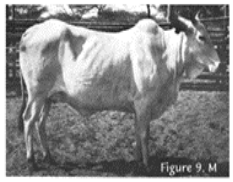
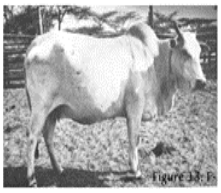
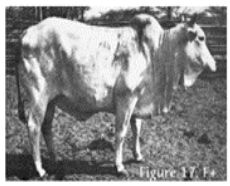
[94] Vatta A., Abbot M., Villiers J., Gumede S., Harrison L., Krecek R., Letty B., Mapeyi N., Pearson R. (2006). Goat keepers' animal health care manual. *Agricultural Research Council*. Onderstepoort Veterinary Institute with KwaZulu-Natal Department of Agriculture and Environment.

- For condition scoring, only the thoracic and the lumbar vertebrae are of importance.
- Ribs are attached to the thoracic vertebrae, while the lumbar vertebrae have horizontal "wings"' (the transverse processes), and all 19 vertebrae have vertical processes known as dorsal spines or spinous processes.
- The sublumbar fossa is a triangular area under the transverse processes, beneath which is the rumen on the left side. When the fossa is indented, it does not necessarily mean that the animal's condition is poor but rather that gut contents (water or food) are at a low level.
- The score of an animal depends on the visibility of the anatomical parts and the flesh and fat cover at these points.
- Cattle should preferably be scored early in the morning, having had no access to food or water overnight.
- Scoring has been found to be least reliable in the case of young calves and weaners, as growing animals do not tend to have heavy deposits of fat.
- Body condition scoring in cattle should be done from the rear right side to minimize the effect of rumen fill, which can reduce the visibility of long and short ribs on the left-hand side of cattle when the rumen is full.

With the above knowledge of gross anatomy and suggested considerations, one can categorize animals as excellent, very good, good, fair, and poor (Table 77).

Table 77: Categories of Cattle BCS (1 to 5) Based on Anatomical Parts, the Flesh, and Covering Fat

Score	Body Condition	Fatness	Description	Pictorial Presentation
1	Poor	Very Thin	The spinous process is prominent and sharp. The transverse processes are also sharp; the fingers pass easily under the ends, and it is possible to feel between each process. The eye muscle areas are shallow with no fat cover.	
2	Fair	Thin	The spinous process feels prominent but smooth, and individual processes can be felt only as fine corrugations. The transverse process is smooth and rounded, and it is possible to pass the fingers under the ends with a little pressure. The eye muscle area is of moderate depth, but has little fat cover.	

Score	Body Condition	Fatness	Description	Pictorial Presentation
3	Good	Moderate	The spinous process is detected only as a small elevation; it is smooth and rounded and individual bones can be felt only with pressure. The transverse process is smooth and well covered, and firm pressure is required to feel over the ends. The eye muscle area is full and has a moderate degree of fat cover.	 
4	Very Good	Fat	The spinous processes can just be detected with pressure as a hard line between the fat-covered eye muscle area. The end of the transverse process cannot be felt. The eye muscle area is full and has a thick covering of fat.	 
5	Excellent	Very Fat	The spinous processes can just be detected with pressure as a hard line between the fat-covered eye muscle area. The end of the transverse process cannot be felt. The eye muscle area is full and has a very thick covering of fat.	 

5.5.4.1.2. Body Conformation Score for Feedlot Cattle

Body conformation is a qualitative categorization of animal features based on body frame, animal height, and defects. Scores are described as excellent, good, or fair. It is the ***symmetry***, ***size,*** and ***shape*** of the various body regions of an animal relative to each other or the general appearance of the animal, according to what is considered a desirable appearance (Table 78). Features of an animal that comprise the "desirable appearance" include:

- *Big frame or skeletal size of the animal*: Height and length are crucial elements to consider. Top quality animals are tall with large body frames
- *Good muscling*: thick and long muscling is preferred
- *Good appearance of feet and legs*: A long and straight (level) rump, long and broad loin, long and straight back, and well-set and straight legs

Table 78: Cattle Body Conformation Score

Score	Grading based on body conformation	Description
1	Fair	● Very short ● Small heart girth in relation to overall body size ● Features on the skeletal size, such as lordosis or kyphosis, or feet and legs, such as being post-legged, buck-kneed, splay-footed, or sickle-hocked, among others
2	Good	● Animals of medium height ● Shorter but straight rump, loin, and back ● Medium heart girth

Score	Grading based on body conformation	Description
		Straight legs
3	Excellent	• Cattle of good height (tall) • Long and straight rump, loin, and back • Large heart girth • Straight legs

5.5.4.1.3. Grade Summary for Feedlot Cattle

Cattle grade is the sum of body condition scores and body conformation scores that range numerically from 1 to 4, with the consideration of the age, sex, and weight of cattle (Table 79). Cattle grades 1 and 2 are more preferable for meat production.

Table 79: Cattle Grading Based on the Five Parameters

Grade	Sex	Weight (Kg)	Age (years)	BCS	BCofS
1	Neutered male Non-neutered male Female	Minimum 300 Minimum 300 Minimum 200	1-4 1-4 1-4	Excellent Excellent Excellent	Excellent Excellent Excellent
2	Neutered male Non-neutered male Female	Minimum 200 Minimum 200 No Limit	1-5 1-5 4-5	Good Good Good	Good Good Good
3	All sex categories	No limit	Min. 2	Fair	Fair
4	All sex categories	No limit	No limit	Poor	Fair

BCS: Body Condition Score, BcofS: Body Conformation, Min.: Minimum (Adapted from: Kenya Standard Grading live animal for meat trade - Specification[95])

N.B: Cattle less than one year do not appear for feedlot and are not graded here.

Field Name	grade	
Description		
Display Name	Type	Acceptable Values / Example
Grade	Enumeration String	**e.g.,** "grade": "3",
Implications if field is not completed / accurate		

[95] Grading live animal for meat trade (2017). Kenya Standard. Specification Part 1: Cattle. 1st ed. https://ec.europa.eu/growth/tools-databases/tbt/en/search/?tbtaction=get.project&Country_ID=KEN&num=603&d

Grade (Enumeration values)
1
2
3
4

5.5.4.2. Dairy Cattle Grading

5.5.4.2.1. Body Condition Scoring for Dairy Cattle

BCS is affected by different factors, including breed. Breeds with a dual purpose generally have more muscle than pure dairy breeds. Therefore, a change in BCS mainly reflects a change in fat reserves in dairy breeds, whereas a change in the BCS of dual-purpose breeds largely reflects a change in muscle tissue. On the other hand, BCS interpretation for feedlot and dairy cattle is different, as the increased fat level in dairy cows are ruled out of the dairy production system as undesirable traits (i.e., BCS of 4 and 5). This is likely because greater adipose tissue on mammary glands significantly limits the milk production of fat dairy cows. For this reason, the classification of poor, fair, good, and excellent used for feedlot cattle is not applied in dairy cattle. The BCS scoring scale ranges from 1 (emaciated) to 5 (fat) (Table 80). Importantly, the target BCS of cows will vary depending on stage of lactation.

Table 80: Lactating Cattle BCS

Score	Condition	Description	Pictorial Description
1	Emaciated	Ends of short ribs sharp to touch. Loins have a prominent shelf-like appearance. Individual vertebrae of backbone are prominent. Hook and pin bones are sharply defined and angular in appearance. Sunken and hollow on either side of the tail head, and the vulva is prominent. Tail head is a deep cavity with no fatty tissue under the skin. Skin is fairly flexible but coat condition is often rough.	
2	Thin	Ends of short ribs can be felt, but less prominent than BCS 1, and less of a shelf-like appearance. Hook and pin bones are still prominent, but rounder and more smoothed over. Both sides of the tail are still fairly sunken and hollow, but the vulva is less prominent. Some fat under the skin. Skin is flexible.	
3	Average	Short ribs can be felt with moderate pressure. Overhanging shelf-like appearance gone. Hook and pin bones are visible, but smooth and rounded, and a fat pad is palpable. Both sides of the tail are somewhat hollow, but better filled out than previous BCS, no evidence of fat deposits.	
4	Heavy	Short ribs not visible and only felt with firm pressure and have a rounded over appearance. Ridge of the backbone flattening over loin, rump and chine areas. Area between hooks and pins is almost flat. Sides of the tail are no longer hollow and some fat deposits are palpable.	

Score	Condition	Description	Pictorial Description
5	Fat	Short ribs cannot be seen or felt. Vertebrae in chine, loin, and rump are not visible. Obvious fat deposits around the tailbone and over the ribs. Thighs curve out and the brisket and flanks are heavy.	

NB: The following timing should be taken into consideration when the BCS of dairy cattle is planned (Adapted from DEFRA, 2001)[96]:

- Drying off (7–8 weeks pre-calving)
- Pre-calving (3 weeks pre-calving)
- Pre-service (i.e., prior to services [can be artificial or natural services])

Lactation stage can have an influence on the desired BCS. The list below shows the recommended dairy cattle BCS during various stages of lactation (per dairy cattle code of practice).

Table 81: Recommended BCS for different lactation stages of dairy cattle

[97]Lactation stage	Recommended target BCS
Dry off	3.25-3.75
Calving.	3.25-3.75
Early lactation	2.50-3.25
Mid-lactation	2.75- 3.25
Late lactation	3.00 - 3.50
Growing heifers	2.75 - 3.25
Heifers at calving	3.25 - 3.75

5.5.4.2.2. Undesired BCS Traits of Dairy Cows

In the dairy cattle production system, some BCS characteristics are not favorable traits. These include fatness and thinness, as these significantly hamper production and productivity of cattle. Nutritional and/or husbandry management of dairy cows must strike a balance between over- and under-conditioning.

- **Over-conditioning** may result from poor nutrition or reproduction management. A fat cow (obese) is more susceptible to metabolic problems and infections and is more likely to have difficulty at and after calving. Common causes of over-conditioning are prolonged dry periods or overfeeding during dry periods. Fat (obese) heifers have been shown to be difficult to breed, and if fat/obese when near calving, they have difficult calving and produce less milk.

[96] Department for Environment, Food & Rural Affairs (DEFRA) (2001). Condition scoring of dairy cows. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69371/pb6492-cattle-scoring-diary020130.pdf. Accessed date August 11, 2023.

[97] Body condition Scoring for dairy cows. https://www.mcgill.ca/research/files/research/dc-301_body_condition_scoring_for_dairy_cows_0.pdf

- **Under-conditioning** lowers production and milk fat levels because of insufficient energy and protein reserves to maintain production. Thin and emaciated cows often do not show heat or conceive until they start to regain or at least maintain body weight.

5.5.4.2.3. Body Conformation Scoring for Dairy

Desirable dairy conformation denotes high milk production over a long, trouble-free, productive life. For body conformation scoring, a phenotype assessment of anatomical structures and other dairy cow characteristics, followed by a subjective score, will be done. Female dairy and dual-purpose breeds are inspected, classified, and assigned grades/scores ranging from 50-97 points on any of the five main breed traits mentioned on ICAR (2023).[98] These five main breed traits are *frame (including rump), dairy character, body capacity, feet and legs, and udder*. The following points (see below) are allocated to the five traits, and the measurements are subjective. The final decisions are made based on the overall/summative assessment given by the evaluator. Points as a percentage of the final score are allotted as follows (Table 82):

Table 82: Percentage score of body conformation with description

Scored value (%)	Observed structure	Descriptions
15	Frame, including rump	The skeletal parts of the cow, with the exception of feet and legs, should be evaluated. - Rump: Long and wide throughout with pin bones slightly lower than hip bones. Thurls need to be wide apart and centrally placed between hip bones and pin bones. The tailhead should be set slightly above and neatly between pin bones. A long bone pattern throughout the body structure is desirable. Height at the withers and hips should be relatively proportionate. Shoulder blades and elbows need to be firmly set against the chest wall. The crops should have adequate fullness. - Back: Straight and strong. - Loin- broad, strong, and nearly level. - Breed Characteristics: Overall style and balance. Head should be feminine, clean-cut, slightly dished with a broad muzzle, and large open nostrils, and a strong jaw is desirable.
20	Dairy Character	Major consideration is given to general openness and angularity while maintaining strength, flatness of bone, and freedom from coarseness. - Ribs: Wide apart. Rib bones are wide, flat, deep, and slanted toward the rear. - Thighs: Lean, incurving to flat, and wide apart from the rear. - Withers: Sharp with the chine prominent. - Neck: Long, lean, and blending smoothly into shoulders. A clean-cut throat, dewlap, and brisket are desirable. - Skin: Thin, loose, and pliable.
10	Body Capacity	The volumetric measurement of the capacity of the cow is evaluated, with age taken into consideration. - Barrel: Long, deep, and wide. Depth and spring of the rib increase toward the rear, with

[98] ICAR (2023). Section 5- ICAR Guidelines for Conformation Recording of Dairy Cattle, Beef cattle, Dual purpose cattle and dairy goats. Version January, 2023. https://www.icar.org/Guidelines/05-Conformation-Recording.pdf. Accessed date August 5, 2023.

Scored value (%)	Observed structure	Descriptions
		a deep flank. - Chest- Deep and wide floor with well-sprung fore ribs blending into the shoulders.
15	Feet and Legs	Feet and rear legs are evaluated. - Feet- steep angle and deep heel with short, well-rounded, closed toes. - Rear Legs: Rear view - straight, wide apart with feet squarely placed. Side view - a moderate set (angle) to the hock. - Hocks: Cleanly molded, free from coarseness and puffiness with adequate flexibility. - Pasterns: Short and strong with some flexibility.
40	Udder	- Teat placement: squarely placed under each quarter, plumb and properly spaced from side and rear views. - Rear udder: Wide and high, firmly attached, with uniform width from top to bottom and slightly rounded to udder floor. - Udder cleft: Evidence of a strong suspensory ligament indicated by adequately defined halving. - Fore udder: Firmly attached with moderate length and ample capacity. - Teats: Cylindrical shape and uniform size with medium length and diameter. Quarters should be evenly balanced; soft, pliable and well collapsed after milking.

Adapted from Stamschror, et al. (2000)[99]

BCS of dairy and dual-purpose breeds of cattle.

Excellent	[90–97]
Very Good	[85–9]
Good Plus	[80–84]
Good	[79–75]
Fair	[65–74]
Poor	[50–67]
Insufficient	<50

The judging of dairy heifers differs from the judging of cows as very little emphasis is placed on a heifer's udder (unless it contains excess fatty tissue). A heifer's udder conformation is not very predictive of what the udder will look like once the heifer freshens.

Heifers can be scored in 5 grades, namely:

Very Good	85–89 points
Good plus	80–84 points
Good	75–79 points
Fair	65–74 points
Poor	Below 65

[99] Stamschror J, Seykora T., Hansen L.. (2000): Judging Dairy Cattle. https://extension.umaine.edu/4h/wp-content/uploads/sites/38/2010/08/judging_dairy_cattle.pdf.

5.5.4.2.4. Grade Summary for Dairy Cattle

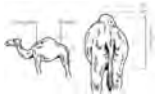
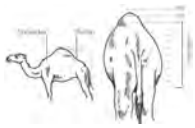
Grading of dairy cattle is not similar to that of the feedlot cattle, sheep, goat and camel grading, which is the summary of BCS, conformation, age, sex, and weight (ICAR, 2023). Dairy cattle have their own peculiarities, with different considerations like stage of lactation, calving, parity, and stage of development. With this complexity, a simple table summary - like that of a feedlot production system - is not possible**.** Unlike feedlot cattle grading, which puts more emphasis on BCS, the body conformation is more valuable in dairy cow grading and is considered more than other factors (such as body condition).

5.5.4.3. Camel Grading

5.5.4.3.1. Camel BCS

The hump of a camel, used to estimate its body condition, reflects the internal fat reserves and provides a good indication of total body fat. A camel deposits excess energy as fat in its hump and some internal linings. This differs from the energy reserves of other species, where fat is deposited in subcutaneous tissues, internal linings, and within muscles. Therefore, the BCS of a camel range from 1 through 5 (Table 83).

Table 83: Camel body condition score

Score	Body Condition	Fatness	Descriptions	Pictorial description
1	Poor	Emaciated	Little or no fat in the hump, hump hairy, and may be leaning to one side. Ribs clearly visible (skin on bones), transverse apophysis clearly prominent and sacro-tuberal ligament concave.	
2	Fair	Thin	Hump with moderate development rising 5% higher than chest depth, but may also be leaning to one side. Ribs visible in front, transverse apophysis visible all along the back and sacro-tuberal ligament flat	
3	Good	Medium	Hump with good development and rising to 10% higher than chest depth. Hump is still sculptured inwards on both sides and still fits over the chest and abdominal area. Ribs invisible in front of the thorax, transverse apophysis slightly visible and sacro-tuberal ligament flat to convex. Camels with BCS 3 are generally considered suitable for slaughter.	
4	Very Good	Fat	Hump fully developed and rising to 15% higher than chest depth. Hump rounded outwards on both sides and runs from the shoulder to the rump. Ribs invisible, transverse apophysis invisible and sacro-tuberal ligament convex. Camels in BCS 4 are generally considered suitable for slaughter.	

Score	Body Condition	Fatness	Descriptions	Pictorial description
5	Excellent	Very Fat	Hump over-extended and rises more than 15% higher than the chest or the hump is so full that it is rounded on the sides like a semicircle. Camels in BCS 5 are considered to be excessively fat.	

Adapted from Federal TVET Agency, (2019)[100] and KENYA STANDARD (2017)[101]

Field Name	bodyConditionScore	
Description		
Display Name	Type	Acceptable Values / Example
Body Condition Score	Enum	**e.g.,** "bodyConditionScore": "VeryGood",
Implications if field is not completed / accurate		

body Condition (Enumeration values)
Excellent
Very Good
Good
Fair
Poor

5.5.4.3.2. Body Conformation Score of Camels

The body conformation is based on the symmetry, size, and shape of the various body regions of the camel relative to each other or the general appearance of the animal. The camels should be categorized as Excellent, Good, Fair, and Poor (Table 84).

Table 84: Camel body conformation with its description

Score	Body conformation	Description
1	Fair	Camels with short height and small frame, straight rump, loin and back, medium heart girth and straight legs and may have some defective features

[100] Federal TVET Agency, 2019. Animal Production Level-II Training Module –Learning Guide 24-26 Based on Version 3 March 2018 Occupational Standard (OS)

[101] WTO_Kenya Standard DKS 2774: PART 4: 2017. Grading live animals for meat trade - Specification Part 4: Camels. (https://members.wto.org/crnattachments/2018/SPS/KEN/18_3090_00_e.pdf)

Score	Body conformation	Description
		such as lordosis or kyphosis, or feet and legs such as being post-legged, buck-kneed, splay footed, or sickle-hocked.
2	Good	Camels of medium height (not as tall as the one with excellent conformation), with medium frame, shorter but straight rump, loin and back, medium heart girth and straight legs.
3	Excellent	Camels of good height (tall), with large frame and long and straight rump, loin and back, large heart girth, and straight legs.

Adapted from WTO_KENYA STANDARD (2017)

5.5.4.3.3. Camel Grade Summary

In the Ethiopian context, pastoralists give special consideration to their camels, as they represent social prestige and are a precious means of livelihood. In the camel herd structure of pastoralists, females under three years of age with different body conditions are kept in the herd and are not for sale. When female camels up to the age of seven with excellent body condition appear in the herd, they are not usually brought to the market. Rather, they are preferred for reproduction.

Male camels are usually meant for sale and slaughter, while certain age groups of females are mainly kept for reproduction. Accordingly, pastoralists commonly keep a higher number of female camels than males across all age categories, reflecting the importance of reproduction and milk production in arid areas. On the other hand, female camels are not usually culled, except for reasons such as disease, old age, or poor (re)production performance.

In Ethiopia, live animal exporters are exporting camels to different countries based on the request of the destination countries. As per the above reasons, male camels are the most dominant number in the Ethiopian camel market with different age categories. Although the best age for camel slaughtering is less than 3 years old due to its delicious veal with less fat and good quality of meat (Kadim et al., 2013)[102], only a few of these age groups are usually taken to the market. Taking this into consideration, the following grading description (Table 85) is constructed based on age classification, sex (i.e., only male camels are considered as they dominate the markets), body condition, and body conformation parameters.

Table 85: Camel grading in relation to age, sex, BCS, and conformation

GRADE	AGE (years)	SEX	BODY CONDITION	BODY CONFORMATION
I	< 7	Male	Excellent	Excellent
	[7-15]	Male/Female	Excellent	Excellent
II	< 3	Male	Good	Good
	[3-15]	Male/Female	Good	Good
	< 3	Male	Fair	Good

[102] Kadim I., Mahgoub O., Faye B., Farrouk M., 2013. Camel meat and meat products, (CAB International, Oxfordshire, UK & Boston, USA).

GRADE	AGE (years)	SEX	BODY CONDITION	BODY CONFORMATION
III	(7-15]	Male/Female	Fair	Good
	[3-7]	Male/Female	Fair	Good
IV	< 3	Male	Poor	Poor
	(7-15]	Male/Female	Poor	Poor
	[3-7]	Male/Female	Poor	Poor
	> 15	Male/Female	Poor	Poor

Adapted from WTO-Kenya Standard (2017)[103]

5.5.4.4. Sheep and Goat Grading

5.5.4.4.1. Sheep and Goat BCS

In sheep and goats, fat and muscle reserves are estimated via palpation of specific parts of the body. The BCS of sheep and goats range from 1 to 5. A BCS of 1 is an extremely thin animal with no fat reserves, while a BCS of 5 is a very over-conditioned (obese) animal. In most cases, healthy sheep and goats should have a BCS between 2.0 and 3.5. A BCS below 2.0 indicates a management/husbandry or health problem. A BCS of 4.5 or 5 is almost never observed under normal management conditions (ESGPIP, Bulletin 8).[104]

Visual observation is done from both sides (from the front and from the rear) by palpating the loin in the area of the lumbar vertebrae, the brisket, the ribs, and the lower part of the flank to detect meat and fat coverage. Specific anatomical regions considered to specified body conditions are mentioned in Table 86.

Table 86: Scales for BSC of Sheep and Goats

Body Condition	Score	Descriptions		
		Lumbar region	Rib cage	Sternum
Poor	1	The spinous processes are prominent and sharp. The transverse processes are also sharp; the fingers pass easily under the ends, and it is possible to feel between each process. The eye muscle areas are shallow with no fat cover.	Ribs are clearly visible.	Sternal fat is easily grasped and moved from side to side.
	2	The spinous processes feel prominent but smooth, and individual processes can be felt only as fine corrugations. The transverse processes are smooth and rounded, and it is possible to pass the fingers under the ends with a little	Some ribs can be seen. There is a small amount of fat cover. Ribs are still felt.	Sternal fat is wider and thicker but can still be grasped and moved slightly from side to side.

[103] WTO_KENYA STANDARD DKS 2774: PART 4: 2017. Grading live animals for meat trade - Specification Part 4: Camels. https://members.wto.org/crnattachments/2018/SPS/KEN/18_3090_00_e.pdf. Accessed date: August 11, 2023.

[104] ESGPIP. Technical bulletin no.8 body condition scoring of sheep and goats By Abebe G., edited by Yami A. and Merkel R.C. http://esgpip.langston.edu/sites/default/files/Technical%20Bulletin%20No.%208.pdf. Accessed date: August 11, 2023.

Body Condition	Score	Descriptions		
		Lumbar region	Rib cage	Sternum
		pressure. The eye muscle areas are of moderate depth, but have little fat cover.		
Good	3	The spinous processes are detected only as small elevations; they are smooth and rounded and individual bones can be felt only with pressure. The transverse processes are smooth and well covered, and firm pressure is required to feel over the ends. The eye muscle areas are full, and have a moderate degree of fat cover.	Ribs are barely seen; an even layer of fat covers them. Spaces between ribs are felt using pressure.	Sternal fat is wide and thick. It can still be grasped but has very little movement.
Excellent	4	The spinous processes can just be detected with pressure as a hard line between the fat covered eye muscle areas. The ends of the transverse processes cannot be felt. The eye muscle areas are full, and have a thick covering of fat.	Ribs are not seen.	Sternal fat is difficult to grasp and cannot be moved from side to side.
	5	The spinous processes cannot be detected even with firm pressure, and there is a depression between the layers of fat in the position where the spinous processes would normally be felt. The transverse processes cannot be detected. The eye muscle areas are very full with thick fat cover. There may be large deposits of fat over the rump and tail.	Ribs are not visible and are covered with excessive fat.	Sternal fat extends and covers the sternum. It cannot be grasped
Note: 1) Thin and very thin as poor; 2) Moderate as Good; 3) Fat and very fat as Excellent (Source: ESGPIP, 2019)[105]				

Adapted from ESGPIP, Bulletin 8

5.5.4.4.2. Sheep and Goat Body Conformation

Body conformation is the symmetry, size, and shape of the various body regions of sheep and goats relative to each other, or the general appearance of the sheep and goats according to what is considered a desirable appearance.

Similar to cattle, the features of sheep and goats that create the desirable appearance include:

- Big frame or skeletal size: Height and length are crucial elements to consider. Top quality sheep and goats are those that are tall with large body frames
- Good muscling: thick and long muscling is preferred
- Good appearance of feet and legs: A long and straight (level) rump; long and broad loin; long and straight back; and well-set and straight legs.

[105] Ethiopia Sheep and Goat Productivity Improvement Program (ESGPIP) (2019). Technical bulletin no.8 . Body condition scoring of sheep and goats, Addis Ababa, Ethiopia

Table 87: Sheep and Goat Grading Based on Body Conformation

Score	Body conformation	Descriptions
1	Fair	Goats/sheep with defects including a short and small frame, a small heart-girth in relation to the overall body size; lordosis or kyphosis, or feet and legs that are post-legged, buck-kneed, splay-footed, or sickle-hocked.
2	Good	Goats/sheep of medium height with medium frame; shorter but straight rump, loin, and back; medium heart girth and straight legs.
3	Excellent	Goats/sheep of good height (tall), with large frame and long and straight rump, loin, and back; large heart girth and straight legs.

Source: Ethiopian Standard, 2019[106]

Field Name	bodyConformation	
Description		
Display Name	Type	Acceptable Values / Example
Body Conformation Score	Enum	**e.g.,** "bodyConformation": "VeryGood",
Implications if field is not completed / accurate		

Body Conformation Score (Enumeration values)
Excellent
Very Good
Good
Fair
Poor

5.5.4.4.3. Weight

The live weight shall be determined by any appropriate method, including weighing scale, weight band, or estimation with heart girth measurement. The minimum weight of 20 to 25 kgs will apply for Grade 1 and 2.

5.5.4.4.4. Sheep and Goat Grade Summary

In terms of grading, female sheep and goats are not considered in this document. Only male sheep and goats to be slaughtered are considered Most farmers do not sell female goats for slaughtering

[106] Ethiopian Standard: ES 65 35- 2019, Live animal grading: Part - 2 Sheep and Goat Specification

purposes unless they are poor in productivity and very old (Ayele, et al.,[107]; Legese, et al., 2014[108]). In areas where export abattoirs and live animal exports are common, farmers buy entirely male yearlings (Legese, et al., 2014). Therefore, the most commonly sold sheep and goats as live sales and/or for slaughtering are male, which is why the following table is limited to male animals. Age, live weight, body condition, and conformations are used to determine sheep and goat grading (Table 88).

Table 88: Grades and Grading Parameters for Male Sheep and Goats

Grade	Age/months		Live body weight (kg)		Body condition score	Body conformation score
	Sheep	Goat	Sheep	Goat		
1	6-24	6-24	≥25	≥20	Excellent	Excellent
2	6-24	6-24	≥20	≥15	Good	Good
3	<6 or >24	<6 or >24	No limit	No Limit	Good	Fair
4	<6 or >24	<6 or >24	No Limit	No Limit	Poor	Fair
N.B. For the purpose of breeding; female grading could be needed and hence, additional female grading might be needed to be incorporated into this document.						

Adapted from Ethiopian Standard (2019)

5.5.5 Animal Owner

Owner information should include the owner's name, phone number, location, GPS coordinates, and identification number.

Table 89: Animal owner data field

Item	Description	Data field	Type	Required
Full Name	Full name of the owner	fullName	string	
Sex	Sex of the owner (Male, Female)	sex	enum	
Phone number	Phone number of the owner	phoneNumber	string	
Location	Region, Zone, Woreda, Kebele, Village of the owner	location	object	
GPS coordinates	GPS coordinates of the owner's location (if available)	latitude	Array (lat, long)	
ID Number	*If available*		string	

[107] Ayele G., Mohammad A. J., Teklewold H., Mulugetab E., Kebede G. Seasonal and inter-market differences in prices of small ruminants in Ethiopia. Journal of Food Products Marketing(USA), 12(4): 59-77. https://www.efdinitiative.org/sites/default/files/2_0.pdf.

[108] Legese G., Haile A., Duncan A.J., Dessie T., Gizaw S., Rischkowsky B. 2014. *Sheep and goat value chains in Ethiopia: A synthesis of opportunities and constraints.* ICARDA/ILRI Project Report. Nairobi, Kenya: International Center for Agricultural Research in the Dry Areas/International Livestock Research Institute.

6. LOCATIONS

A central data repository will be established for the main LIS. The repository will house official location data sourced from the Ethiopian Geospatial Information Agency. This repository will store a wide range of geographic information, including region, zone, district/woreda, kebele, and village names. Moreover, it will incorporate authoritative boundary delineations that are intended to serve as consistent references for location-related data across all livestock systems. This standardized location database within the LIS will play a pivotal role in enhancing data accuracy and coherence across the livestock management ecosystem.

7. IMPLEMENTATION AND MAINTENANCE

- **Assessment:** Before adopting the standard, a comprehensive assessment of the current data system needs to be conducted. Identification of gaps, redundancies, and potential challenges needs to be done as part of this process.
    - **Note**: This step has been completed for the five prioritized systems where systematic mapping of existing fields against the adopted data standard data fields and types is available. Further collaborative efforts with system owners to assess and validate the mapped fields will be conducted.
- **Outreach and Training:** Outreach and training sessions for data managers, technicians, and end users will be organized. These sessions should cover the essentials of the new standard, explain how it contrasts with the priority systems, highlight the advantages it offers, and demonstrate how to use the data standard to ensure compatibility and consistency across systems.
- **Data Migration:** Existing data will be moved to the new standard format. During this process, it will be crucial to ensure that data integrity is maintained and no information is lost or misinterpreted.
- **Testing:** After migration, rigorous tests will need to be conducted to confirm that data is accurate, retrievable, and consistent with the new standard.

Implementation of a data standard is not a one-time activity. It requires continuous maintenance and improvement to keep up with the changing needs and expectations of all stakeholders and the evolving technologies and standards in the data domain. Therefore, a governance structure should also be established to manage the data standard. The already established and actively working data standard task force can be used as a foundation for establishing this governance structure. A data standard working group can include members of this task force, livestock specialists from the MoA, members from projects working in the livestock sector, development partners, donors, and academia.

The working group will be led by a nominated livestock sector representative from the MoA. This group will need to meet at least twice a year to discuss updates and maintenance (if there are no urgent meetings in between). The working group can meet on an ad-hoc basis whenever required to update required data fields.

8. LIMITATIONS AND RECOMMENDATIONS

In Ethiopia, information about the states of different indigenous breeds - such as body condition and confirmation scores, age categorization, and grading - is limited. Some of the information documented in this document is based on various policy and strategy documents, guidelines, research findings, and sector-based assessment results. However, this information is stored in a fragmented way for different purposes. Due to the scarcity of information about indigenous breeds, some information is extracted from other countries (mainly Europe, USA, Australia, and/or New Zealand) and adapted to the Ethiopian context. Under certain conditions, such extrapolation of the findings may not necessarily represent the reality on the ground.

There is also scarce information about the classifications of farming types in the Ethiopian context. There are also grave disparities across various documents about the categorization of Ethiopian farming systems. For this reason, a new farming classification system was agreed upon after a thorough desk review, though some gaps still exist (e.g., determining the parameters of the farm size category).

Therefore, there needs to be well structured, intensive, and national-level research to generate first-hand information about the above-mentioned information gaps (body conformation score, age categorization, farming systems, etc.).

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10. APPENDICES

Appendix 1. Breeds of Donkeys, Horses, Mules, and Poultry in Ethiopia

Donkey

Code	Name
5.01.01	Abyssinian
5.01.02	Afar
5.01.03	Haraghe
5.01.04	Omo/Hamer
5.01.05	Ogaden
5.01.06	Sinnar

Horse

Code	Name
6.01.01	Dongola
6.01.02	Oromo

Mule

With the exception of two well-known breeds of mule, the Sinnar and Wollo Mule breeds, there are no other well-defined hybrids in the country.

Code	Name
7.01.01	Sinnar
7.01.02	Wollo

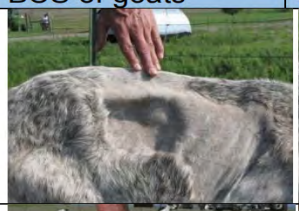
Poultry

Code	Name
8.01.01	Chefe
8.01.02	Gebsima
8.01.03	Horro
8.01.04	Jarso
8.01.05	Keyi
8.01.06	Naked Neck

8.01.07	Netch
8.01.08	Tepi
8.01.09	Tikur
8.01.10	Tilili

Code	Name
8.02.01	Kuroiler
8.02.02	Sasso
8.02.03	Sasso-R

Appendix 2: Pictorial Presentation of the BCS of Goats

Body Condition Score (BCS)	Spinous process in BCS of goats	Transverse process in BCS of goats	Sternal fat in BCS of goats
BCS 1 →			
BCS 2 →			
BCS 3 →			
BCS 4 →			
BCS 5 →			

Source: ESGPIP. Technical bulletin No.8. Body condition scoring of sheep and goats, Addis Ababa, Ethiopia.

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Data Standard