METHODOLOGICAL FRAMEWORK (NATIONAL INDICATORS) TO MEASURE VETERINARY SERVICE COVERAGE OF ETHIOPIA

Submitted to: Ethiopian Veterinary Association

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EXECUTIVE SUMMARY

National policies, livestock master plans, and animal health strategies of Ethiopia have given due attention to improve coverage, quality, and regulatory aspects of animal health services with the ultimate goal of improving productivity and increasing supply of safe livestock and livestock products to domestic and international markets. The effectiveness of the veterinary service of a country relates directly to the coverage and quality of the services provided to the community. However, little information is available to justify the real coverage and quality of veterinary services in Ethiopia. The Terrestrial Animal Health Code of the World Organization for Animal Health (WOAH) formerly known as the Office International des Epizooties (OIE) regarding the evaluation of veterinary services encourages member countries to undertake periodic self-evaluation of their veterinary services as part of their quality management system. Therefore, a methodological framework that enables assessment of performances against set strategic goals and objectives of the country is needed to ensure that the livestock sector has received adequate services needed to utilize the resources positively and sustainably. The objective of this task was, therefore, to prepare a comprehensive, nationally and internationally acceptable standard methodological framework with key performance indicators that help to evaluate the current and future veterinary service coverage of Ethiopia. In the process of identifying and formulating the national indicators, international practices and recommendations were consulted through meticulous desk reviews and experiences of authors' and senior experts in the field of veterinary medicine were exploited. A theory of change was formulated around the economic and public health challenges of animal diseases as a basis for selecting performance indicators. Accordingly, sets of performance indicators were drafted and classified into input (36 indicators), output (27 indicators) and outcome measures (14 indicators). Each performance measure was then subdivided into major focus areas.

- Focus areas for input measures include: a) Enabling regulatory frameworks, b) Governance of the veterinary service, c) Inputs and supplies (infrastructure and facilities, human resource, budget allocation), d) The veterinary profession and e) Stakeholder engagement and communication.
- Focus areas for output measures included: i) Veterinary clinical and laboratory services, ii) Disease prevention and control services, iii) Regulatory inspections and veterinary public health services, iv) Quality control and residue monitoring of veterinary medicinal products and vaccines, v) Animal welfare, vi) International trade.
- Focus areas for outcome measures include: a) Increased veterinary service access/coverage, b) Improved livestock productivity, c) Reduced public health risks of livestock and livestock products, d) Increased recognition/trust from international trading partners and organizations and e) Animal welfare protocols integrated in regulations and institutional work documents

Overall, 76 performance indicators were identified which are believed to measure the veterinary service coverage of Ethiopia. For each indicator, a short description, purpose, measurement, disaggregation parameters and possible sources of data were outlined. Some indicators are suggested to be numerical/ quantitative while others are qualitatively measured

by Likert scales. Considering the weighted value of the 76 indicators to be 100, each indicator has been given a weight (ranging between 0.5 and 2.5) according to its importance. Finally, recommendations for data collection, based on the proposed national indicators, are forwarded.

ACKNOWLEDGEMENT

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LIST OF ACRONYMS

ADNIS	Animal Disease Notification and Investigation System
AHS	African Horse Sickness
AMR:	Antimicrobial Resistance
CBPP	Contagious Bovine Pleuropneumonia
CCPP	Contagious Caprine Pleuropneumonia
DOVAR	Disease Outbreak and Vaccination Reporting
EAICD	Export Abattoirs Inspection and Certification Directorate
ETB	Ethiopian Birr
EVA	Ethiopian Veterinary Association
FAO	Food and Agricultural Organization
FMD	Foot and Mouth Disease
GDP	Gross Domestic Product
GTP	Growth and Transformation Plan
HACCP	Hazard Analysis Critical Control Point
HEARD	Health of Ethiopian Animals for Rural Development
IBD	Infectious Bursal Disease
ILRI	International Livestock Research Institute
ISO	International Standard Organization
LITS	Livestock Identification and Traceability Study
LSD	Lumpy Skin Disease
NPS	National Prevention System
NCD	New Castle Disease
PPR	Peste des Petits Ruminants
PVS	Performance of Veterinary Service
SGP	Sheep and Goat Pox
SMART	Specific, Measurable, Achievable, Realistic and Time bounded
TAD	Transboundry Animal Disease
TLU	Tropical Livestock Unit
VLU	Veterinary Livestock Unit
VS	Veterinary Service

1. INTRODUCTION

National Veterinary Services provide the fundamental management system for animal health and welfare and veterinary public health in any country. To achieve these objectives, the National Veterinary Services must have the capacity and the sustainability to ensure the delivery of their outputs including inspection and certification of animals and animal products, management of the animal health and welfare situation and the control of diseases at the animal-human-environment interface including trans-boundary diseases. This capacity and sustainability is linked to the availability of resources and the integrity of the management system including policies, procedures and staffs, the processes for auditing and evaluation of performance; and preparedness for response to emergencies and other critical situations[1]. This report is therefore prepared in response to the request made by the Ethiopian Veterinary Association under the program of the "Health of Ethiopian Animals for Rural Development (HEARD) project. The main objective is developing a methodological framework or national indicators to measure the veterinary service coverage of Ethiopia.

Accordingly, sets of performance indicators were drafted and classified into input (36 indicators), output (27 indicators) and outcome measures (13 indicators). Each performance measure was then subdivided into major focus areas. In the process of identifying and formulating the national indicators, international practices and recommendations were consulted through meticulous desk reviews and experience of authors' and senior experts in the field of veterinary medicine were exploited.

While PART ONE of this document provides the rationale, scope and methodology for the development of the national indicators, PART TWO deals with background information regarding livestock production and veterinary services in Ethiopia. PART THREE is dedicated to the actual methodological framework and associated indicators. Recommended data collection analysis methods are treated under PART FOUR.

[1] *OIE (2018). OIE Competency Guidelines for Veterinary Paraprofessionals*

PART ONE

2. RATIONALE

Approximately, 80% of Ethiopians live in the rural areas. They depend to a greater extent on agriculture of which livestock production is an integral component. The country is home to about 70 million cattle. The sheep, goat, camel and poultry population is also estimated to be 42.9 million, 52.5 million, 8.1 million and 57 million, respectively[2]. Development and commercialization of this vast livestock resource have already been given due attention in Ethiopia's agricultural and more specifically livestock development policies and strategies. Major challenges that got more attention in such policies include: negative feed balance, animal diseases, and sub-optimal production performance of the animals. In fact, sustainable production and marketing of quality livestock and livestock products undoubtedly demands robust animal health and welfare programs.

Key objectives in the Animal health strategy and vision for Ethiopia of the 2013[3] and agriculture strategic plan of the 2021[4], hence, gave due emphasis on transforming and improving livestock health with subsequent economic growth and poverty reduction. Moreover, Ethiopia is known to earn a significant amount of foreign revenue through the export of livestock and livestock products. The Ethiopian government has adopted World Organisation for Animal Health (WOAH) standards to fulfil growing export quality needs. This subsector which is believed to contribute about 40% of the agricultural GDP generates approximately 20% of the national GDP and constitutes roughly 20% of export earnings by value[5].

National policies, livestock master plans[6] , and animal health strategies have been attempting to improve coverage, quality, and regulatory aspects of animal health services with the ultimate goal of increasing productivity, foreign exchange revenues, and reducing poverty. In this respect, the 2013 Veterinary Service Strategy[7] has envisioned that by the year 2025, the animal health service coverage will reach 80% and the overall service will improve its level of advancement from the 2.63/5[8] level to 4/5 level in the WOAH PVS evaluation. However, significant gaps still exist despite the more than 60 years of attempts to improve animal health services in Ethiopia. Organisational issues, conflicting demands for resources, implementation capacity, and numerous other reasons have all been implicated in these discrepancies.

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[2] *CSA (2021). Agricultural sample survey (2020/21), Report on Livestock and Livestock Characteristics, Central Statistical Agency, Ethiopia*

[3] *MoA (2013). Animal health strategy and vision for Ethiopia, Ethiopia livestock master plan background paper*

[4] *MoA(2021). 10-year Agriculture strategic plan, Ministry of Agriculture, Ethiopia*

[5] *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).*

[6] *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).*

[7] *MoA (2013). ibid*

[8] *OIE (2011). Oie - PVS evaluation report of the veterinary services of Ethiopia. 3rd may 2011 to 17th may 2011*

Veterinary services in Ethiopia are primarily provided by the public sector with minimal private sector engagement despite sporadic efforts to promote this segment. More recently, in order to boost private sector involvement in the field of veterinary services, the Veterinary Service Rationalization Road Map[9] was developed and is currently being implemented under the umbrella of 'Health of Ethiopian Animals for Rural Development (HEARD)" by the International Livestock Research Institute and the Ethiopian Veterinary Association (EVA), Oromia, Amhara and Somali Regional States. The overall aim is to strengthen the animal health sector and build capacity through sustainable public-private partnerships.

The effectiveness of the veterinary service of a country relates directly to the coverage and quality of the services provided to the community. However, little information is available to justify the real coverage and quality of veterinary services including clinical and laboratory services, quarantines and certification, abattoir inspection, disease surveillance and outbreak reporting. Information on the involvement of the private sector, their distribution across different geographical areas of the country and the range of services they provide is also scarce.

In this regards, a nationally adopted standardized methodological framework for assessing the animal health service coverage in the country is lacking. There is also no adequate data to provide the operational and physical status of diverse animal health infrastructures across the different regions of the country. Circumstantial evidences and the 2010 Performance of Veterinary Service (PVS) evaluation by the WOAH suggest that there were gaps in infrastructure, facilities, competency of professionals, operational capacity, etc. that require major improvements[10, 11, 12]. Chapter 3.3 of the WOAH Terrestrial Animal Health Code (2021) regarding the evaluation of veterinary services encourages member countries to undertake self-evaluation of their Veterinary Services periodically as part of their quality management system, and Member Countries may develop their own mechanisms and methods for the evaluation of their Veterinary Services.

Therefore, a methodological framework that enables assessment of performances against set strategic goals and objectives is needed to ensure that the livestock sector has received adequate services needed to utilize the resources positively and sustainably. Methodological framework with its performance indicators is expected to provide beneficiaries and stakeholders with systematic and periodical feedback on the implementation of the national livestock and animal health policies and strategies. The framework is believed to provide early indications of the progress, achievement or gaps, such that a timely interventions and adjustments could be undertaken. It also helps to demonstrate compliance of the Veterinary

[9] *HEARD (2019). Veterinary Service Rationalization Road map. Health of Ethiopian Animals for Rural Development (HEARD)*

[10] *OIE (2011). Performance of Veterinary Services (PVS) Evaluation Report for Ethiopia. Paris*

[11] *Gizaw S, Woldehanna M, Anteneh H, Ayledo G, Awol F, Gebreyohannes G, Gebremedhin B and Wieland B (2021). Animal health service delivery in crop-livestock and pastoral systems in Ethiopia. Front. Vet. Sci. 8:601878*

[12] *Admassu B (2003) Primary animal health care in Ethiopia: The experience so far. Veterinary Field Officer Community-based Animal Health and Participatory unit. p: 1-13.*

Services with Chapter 3.2 of the WOAH Terrestrial Animal Health Code[13], to better advocate for, allocate and prioritize resources; and to generate trust between trading partners in the quality and integrity of Veterinary Services. Furthermore, accurate statistics on the national animal health service coverage of a country enable decision makers to efficiently plan and implement required policy and strategic interventions.

3. OBJECTIVE

The objective of this task is to study and design a comprehensive, nationally and internationally acceptable standard methodological framework or indicators to be employed to evaluate the current and future veterinary service coverage of Ethiopia.

This provides a basis for Ethiopia to self-assess and monitor the progress in achieving its strategic goals and objectives set in various policies and strategies and at the same time comply with international standards.

4. SCOPE/FOCUS AREAS

Major animal health service areas were taken into consideration while designing a comprehensive methodological framework or national indicators to assess veterinary services coverage of Ethiopia. The scope of the study as defined by the EVA can be grouped into general information, inputs (policies/regulations, governance, human and financial resources), technical aspects (activities/outputs) and outcomes. Most of the focus areas in these three categories are the key targets in Chapter 3.2 of the WOAH Terrestrial Animal Health Code[14] for the evaluation of the Veterinary Services of a country.

5. METHODOLOGY

This consultancy work was carried out by a team of three experienced experts specialized in various fields of Veterinary Medicine. The methods used to collect data and relevant information that makes the foundation for the development of methodological framework/indicators was as follows:

5.1. Desk review

Published and unpublished reports from national and international sources were explored. More specifically, the WOAH terrestrial animal health code[15], WOAH PVS evaluation tool[16] and WOAH PVS evaluation report of Ethiopia[17] were taken as springboard to select indicators. The PVS Tool developed by the WOAH is aligned with the WOAH standards, in

[13] *OIE (2022). Quality of Veterinary Services, Chapter 3.2. Terrestrial Animal Health Code - 19/07/2021*
[14] *OIE (2022). Quality of Veterinary Services. Terrestrial Animal Health Code - 10/08/2022*
[15] *OIE (2022). ibid*
[16] *OIE (2019). Oie tool for the evaluation of performance of veterinary services. 7th Edition*
[17] *OIE (2011). ibid*

particular, with the quality standards for veterinary services defined in Chapter 3.2. Relevant government publications such as yearly performance reports, animal health strategy and vision[18] and the draft 10 years agricultural policy and strategic plan of the Ministry of Agriculture[19] were explored. Practices of other sectors and countries were reviewed and those which best fit to the veterinary service were adopted. In this regards, the approach followed by Jubarah and Paul[20] for developing monitoring and evaluation framework for veterinary policy of the South Sudan was adopted after being customized to fit into the Ethiopian situation.

5.2. Consultations with senior experts and key informants

For this purpose, a number of key informants and senior experts were consulted based on their relevance to the subject matter regarding the national and regional veterinary service delivery and coverage and priority areas for performance measures.

[18] *MoA (2013). ibid*
[19] *MoA (2021). ibid*
[20] *Salah Khatir Jubarah, Isaac Aleardo Paul. Monitoring and Evaluation Framework for Veterinary Policy: A Case of Veterinary Services in South Sudan. Science Journal of Business and Management. Vol. 9, No. 1, 2021, pp. 1-14.*

PART TWO

6. LIVESTOCK PRODUCTION AND VETERINARY SERVICE IN ETHIOPIA

6.1. Livestock production in Ethiopia

Ethiopia's livestock sector is estimated to contribute 17-25% of the national gross domestic product (GDP), 39-47% of the agricultural GDP and 16–30% of the foreign exchange earnings of the country[21, 22]. Between 2000 and 2016, the average stock of livestock, measured in tropical livestock units (TLU) per 100 people, stood at 51 TLU, which is more than double the continental median of 23 TLU. The gross production value average growth rate during the same period was 4.5% — also twice the continental median of 2.2%[23]. The national herd supports, at least in part, the livelihoods of more than 11.3 million rural households, including 27– 35% of the highland livestock keepers, and a large proportion of the lowland herders, who live below the established poverty line by the Government of Ethiopia[24, 25].

Livestock are managed under three major production systems[26], namely: i) mixed crop-livestock production system comprising some 40% of the land area supporting 75% of cattle, 50% of sheep and 30% of goats population; ii) pastoral and agro-pastoral production system covering about 60% of the land area and supporting 25% of cattle,70% of goats and 50% of sheep population of the country and iii) commercial production system consisting of small, medium or large scale commercial dairy farms, feedlots and chicken farms[27]. The livestock production system is predominantly extensive, with indigenous breeds and low-input/low-output husbandry practices. The productivity of this sector is constrained by several factors, including poor genetics, climatic stress, poor availability of quality feed and high disease incidence often with low accessibility to services and inputs[28].

[21] *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).*
[22] *IGAD, (2011). The contribution of livestock to the Ethiopian Economy. Working paper No.2*
[23] *FAO. 2019. FAOSTAT database. www.fao.org/faostat/en/*
[24] *Management Entity (2021). Ethiopia's Livestock Systems: Overview and Areas of Inquiry. Gainesville, FL, USA: Feed the Future Innovation Lab for Livestock Systems*
[25] *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).*
[26] *Ayele S., Assegid W., Jabbar M.A., Ahmed M.M. and BelachewHurissa (2003):Livestock marketing in Ethiopia: A review of structure, performance and development initiatives.Socio-economics and Policy Research Working Paper 52, ILRI, International Livestock Research Institute, Nairobi, Kenya. 35 pp*
[27] *Ministry of Livestock and Fisheries, MoLF (2018): Improving Sanitary Capacity to Facilitate Livestock and Meat Exports, STDF/PG/477*
[28] *Management entity (2021). ibid*

6.2. Geographical distribution of selected animal diseases

Many diseases are rampant in Ethiopia with variability with respect to geographic distribution, production systems, animal species and breed. The selection of disease listed hereunder is mainly based on their economic and public health importance and impact on livestock and livestock product trade. Among the most important diseases, Foot and Mount Disease (FMD), Contagious Bovine Pleuropneumonia CBPP), Contagious Caprine Pleuropneumonia (CCPP), Peste des Petits Ruminants (PPR), African Horse Sickness (AHS), New Castle Disease (NCD), Infectious Bursal Disease (IBD), Coccidiosis, Trypanosomosis, Lumpy Skin Disease (LSD), etc are responsible for high morbidity and mortality in different places of Ethiopia[29, 30, 31, 32, 33, 34, 35, 36, 37]. Moreover, external parasite infestations are responsible for major losses in the quality of hides and skins throughout the country. From public health and food safety points of view, the presence of diseases such as zoonotic tuberculosis and poor food hygienic practices are common challenges that need due attention of the veterinary Profession[38, 39].

6.3. Animal disease impact and government's strategy

Animal diseases which are widespread in all agro-ecological zones of the country cause major economic and social losses to the livestock owners. The impacts of these diseases though devastating nationally vary from place to place and based on production systems. In pastoral and remote rural areas, where lives of the communities entirely depend on their livestock, the loss from animal diseases means huge instability in the livelihoods of the community. Studies show that of the total livestock population the country has, 8-10% of cattle, 12-14% of sheep and 11-13% of goats die annually because of diseases alone. Moreover, replacement stocks are reduced due to young stock mortality in 13% of calves,

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[29] Rufael, T., Catley, A., Bogale, A., Sahle, M., & Shiferaw, Y. (2008). Foot and mouth disease in the Borana pastoral system, southern Ethiopia and implications for livelihoods and international trade. Tropical animal health and production, 40(1), 29-38.

[30] Negussie, H., Kyule, M. N., Yami, M., and Ayelet, G. (2011). Outbreak investigations and genetic characterization of foot-and-mouth disease virus in Ethiopia in 2008/2009. Tropical Animal Health and Production. 43(1):235-243. https://doi.org/10.1007/s11250-010-9683-2

[31] Ministry of Agriculture (2012). ibid

[32]Molla, W., de Jong, M.C.M. & Frankena, K. (2017). Temporal and spatial distribution of lumpy skin disease outbreaks in Ethiopia in the period 2000 to 2015.'BMC Vet Res, 13:310

[33] Gari, G., Bonnet, P., Roger, F., and Waret-Szkuta, A. (2011). Epidemiological aspects and financial impact of lumpy skin disease in Ethiopia. Preventive Veterinary Medicine. 102(4):274-283.

[34] Gedlu, M. (2004). Serological, clinical and participatory epidemiological survey of contagious bovine pleuropneumonia in Somali region, Ethiopia. AAU. MSc thesis, Addis Ababa University, Ethiopia.

[35] Waret-Szkuta, A., Roger, F., Chavernac, D., Yigezu, L., Libeau, G., Pfeiffer, D. U., and Guitian, J. (2008). Peste des petits ruminants (PPR) in Ethiopia: analysis of a national serological survey. BMC Veterinary Research. 4:34. doi: 10.1186/1746-6148-4-34

[36] Getaw Yeshitila and Dejene Bekele, (2017). A study on the sero epidemiology of African horse sickness in three Districts of Sidama Zone, Hawassa, Ethiopia, J. Vet. Med. Anim. Health, Vol. 9(9), pp. 235-239

[37] Ministry of Agriculture (2018). Annual report of List A diseases

[38] *Gumi, B., Schelling, E., Berg, S. et al. Zoonotic Transmission of Tuberculosis Between Pastoralists and Their Livestock in South-East Ethiopia. EcoHealth 9, 139–149 (2012).*

[39] Nyokabi, N.S., Phelan, L., Gemechu, G. et al. From farm to table: exploring food handling and hygiene practices of meat and milk value chain actors in Ethiopia. BMC Public Health 23, 899 (2023).

24% of lambs and 27% of goat kids[40]. This implies that the expectation from efficient and effective veterinary services is very high.

Global food consumption patterns are changing in numerous ways, which will also exert increasing pressure on our veterinary services delivery. Intensification of livestock production into larger units and global trade will increase the challenges resulting from the resurgence of serious animal diseases, food safety hazards and veterinary public health-related problems[41]. The growing livestock potential, the devastation from various livestock diseases threatening the livelihood of Ethiopian farmers and pastoralists and the increasing understanding of the contribution of animal health professionals seem to have prompted the establishment of a several veterinary teaching establishments and correspondingly, expansion of diagnostic laboratories, veterinary clinics and animal health posts in Ethiopia. Moreover, the global importance of veterinary services demands continuous improvement and updating of the services provided to the level of international standard. National and regional veterinary services should be able to meet standards adopted by each country, but should also be able to comply with appropriate international standards and recommendations, particularly those in the WOAH's Terrestrial Code[42].

One of the five goals of the past GTP II (2015-2020) for ensuring improved livestock production and productivity is set as 'improving the coverage, quality and regulatory aspects of animal health services. To achieve this goal, 10 most important diseases were ranked according to their impact on rural households and their livelihoods, markets and value chains, and intensification pathways. These include: FMD, LSD, CBPP, animal trypanosomosis, bovine tuberculosis and brucellosis for cattle, PPR, sheep and goat pox (SGP) and CCPP for sheep and goats and trypanosomosis (surra) for camels[43.] Most of these and many other diseases can be prevented or controlled through an efficient and effective vaccination programs.

The 10-year Agricultural Strategic Plan of the Government of Ethiopia envisages advancing veterinary service coverage to 90% in 2030. One-third of the achievement is expected to be from private services[44]. This is expected to promote the PVS evaluation from the current 2.65/5 to 3.5/5 as per the WOAH evaluation criteria[45]. The principal approach will be through preventive interventions including increasing vaccination coverage in addition to the

[40] *Ministry of Agriculture, MoA, and International Livestock Research Institute, ILRI (2013): Animal Health Strategy and Vision for Ethiopia, Livestock Master plan Background Paper.*

[41] Cheneau, Y., El Idrissi, A. H., & Ward, D. (2004). An assessment of the strengths and weaknesses of current veterinary systems in the developing world. Revue scientifique et technique (International Office of Epizootics), 23(1), 351–401

[42] *OIE (2012). OIE recommendations on the Competencies of graduating veterinarians ('Day 1 graduates') to assure National Veterinary Services of quality. PVS pathway, World Organisation for Animal Health*

[43] *MoA and ILRI (2013). Animal Health Strategy and vision for Ethiopia. Ministry of Agriculture and International Livestock Research institute*

[44] *MoA (2021). Ibid*

[45] *OIE (2011). Ibid*

currently practiced control approach[46]. Consequently, the collective interventions are assumed to increase the performance of transboundary anima disease control, reduce young-stock mortality and significantly improve the productivity of livestock and assist in achieving planned targets.

6.4. Veterinary services in Ethiopia

Compared to many developed countries, modern veterinary service is a relatively recent phenomenon in Ethiopia. A French Veterinary Mission began providing veterinary services in 1908[47]. The Italian invasion brought in cattle plague (Rinderpest) in the late 1880s. This has devastated the cattle population and ravaged 90% of the animals leading to the great Ethiopian famine[48]. However, up until the 1950s, modern veterinary service was barely known in Ethiopia. With the help of international donors (Food and Agriculture Organization of the United Nations) and the Ethiopian government, an Animal Health Institute was established in 1963 in the middle of the life-and-death struggle with the viral disease, rinderpest. Subsequent to this, the National Veterinary Institute was established in 1964 with a mission of producing livestock vaccines. These were big boost in the fight against many rampant livestock diseases of the time. A decade and a half later, the first Faculty of Veterinary Medicine in the country was established by Addis Ababa University in 1979. The growing livestock potential, the devastation from various livestock diseases such as rinderpest threatening the livelihood of Ethiopian farmers and pastoralists and the increasing understanding of the contribution of animal health professionals to combat against such societal problems have prompted the expansion of Veterinary services and veterinary teaching institutions[49, 50]. Veterinary services include curative clinical services, disease prevention and control activities, supply of vaccines and pharmaceuticals, diagnostic services, animal welfare and animal health research.

6.4.1. Policy and regulatory context

Ethiopia has some relevant proclamations that are used to guide/control the regulatory functions along the livestock value chain. The Live Animals Marketing Regulation No.341/2015, Live Animals Marketing Proclamation No. 819/2014, the Veterinary Drug and Feed Administration and Control Proclamation No. 728/2011, the Animal Diseases Prevention and Control Proclamation No. 267/2002 and the Meat Inspection Proclamation No. 274/1970 are among the existing functional legal frameworks. The Ministry of Agriculture has also drafted additional proclamations awaiting ratification either to supplement existing ones or to replace them. Pursuant to such proclamations and regulations

[46] *Gizaw S, Woldehanna M, Anteneh H, Ayledo G, Awol F, Gebreyohannes G, Gebremedhin B and Wieland B (2021). Animal health service delivery in crop-livestock and pastoral systems in Ethiopia. Front. Vet. Sci. 8:601878*

[47] *Admassu B (2003). Ibid*

[48] *Tizard IR. (2021). A brief history of veterinary vaccines. Vaccines for Veterinarians, 1-12.e1. https://doi.org/10.1016/B978-0-323-68299-2.00010-1*

[49] *Anon (1974). Proposal and Justification for the Construction of a School of Veterinary Medicine at Alemaya - Haile Sellassie I University - February 1974. Folder ID: 201251, ISAD Ref. Code: WB IBRD/IDA AFR. World Bank Group Archives, Washington D.C, United States*

[50] *Dugassa BF (2018) Colonialism and Public Health: The Case of the Rinderpest Virus in Oromia Regional State in Ethiopia. J Prev Med., 3 (1):4*

and often driven by international livestock and livestock product markets, a number of standards and guidelines have also been developed and implemented especially in relation to quality and safety requirements of export markets.

6.4.2. Veterinary service governance

According to the WOAH terrestrial animal health code[51], good veterinary governance is the key to competence, integrity and confidence. In particular, mutual confidence between relevant official veterinary services of trading partner countries contributes fundamentally to stability in international trade in animals and animal-related products.

The Competent Authority under the Ministry of Agriculture is the legal entity empowered by Proclamation No.267/2002 to control epizootic and zoonotic diseases. It is in charge of providing veterinary services, inspection of premises and animal products. The competent authority is also responsible for establishment and control of quarantine stations; entrance and exit posts for animals and animal products and issuance of sanitary certificates.

The Office of the State Minster for Livestock and Fisheries has a designated Chief Veterinary Officer representing Ethiopia in the WOAH. At the Federal level, the animal health section has two major components: the Animal Health and Veterinary Public Health Executive lead under the State Minister for Livestock and Fisheries and the livestock regulatory deputy executive directorate organized under the Ethiopian Agricultural Authority. The former has three main desks: - Veterinary Public Health Desk, Animal Disease Prevention and Control Desk and Epidemiology Desk. Similarly, the regulatory wing has four regulatory teams for: livestock products, veterinary pharmaceuticals, animal feed and quarantine, and an animal product and input quality control center.

Presumably, most of the regulatory activities of the Competent Authority at the federal level are delegated to similar functional bodies at regional levels. Regional veterinary laboratories and veterinary services (clinical, disease outbreak investigation and other related services) are accountable to the veterinary service sections in the regional bureaus of agriculture or pastoral and agro-pastoral bureaus. However, offices in most Regional States have no or few such division of responsibilities into different sections equivalent to the organizational structure at the federal level. In addition, vertical and horizontal integration between federal and regional offices responsible for livestock development and veterinary services is not as expected.

51 OIE (2019). Terrestrial Animal Health Code 28/06/2019, Chapter 3.2.- Evaluation of Veterinary Services

6.4.3. Budget allocation

According to a study by Alleweldt et al.[52], substantial differences in the public expenditure for the National Prevention System for animal diseases and zoonoses exist between case study countries they studied (Costarica, Krygyzstan, Mongolia, Morocco, Turkey, Uganda and Vietnam), reaching from 10 million international dollars to 167 million international dollars. The national prevention system (NPS) for animal diseases and zoonoses cost per VLU varies from 1.92 USD in Uganda to 9.40 USD in Turkey[53]. A veterinary livestock unit (VLU) is an equivalence unit for the estimation of annual veterinary cost and care. In the case study countries, total public expenditures for the NPS are closely related to the livestock population, the Gross Domestic Product (GDP), and per capita income of the sampled countries. According to the same study, while the overall average NPS cost per VLU for the seven countries amounts to 5.66 international dollars, the average for the three low-income countries, Uganda, Kyrgyzstan and Vietnam, is only 3.82 international dollars. The average for the two lower-middle-income countries, Mongolia and Morocco, was 5.28 international dollars, while that for the upper-middle income countries, Costa Rica and Turkey, was 8.79 international dollars.

According to the Ethiopian Ministry of Finance, the budget allocated for the 2020/21 fiscal year to the Ministry of Agriculture and related departments was approximately 3.7% of the country's GDP[54]. However, it is unclear how much of this budget was specifically allocated to the veterinary services. A report by the WOAH[55] suggests that the resources allocated to veterinary services in Ethiopia are insufficient and that there is a need for increased investment in this sector. Data on veterinary service expenditure in Ethiopia are not readily available from official records and accounts. Since, the actual allocation of budget is at district level, to obtain precise measurements, there appears to be no easy alternative to the method of direct recording of expenditures through visits to randomly sampled representative District veterinary service offices. Some evidences have already shown that budget allocation for veterinary services in general is inadequate[56].

6.4.4. Human resource

The aggressive manpower development strategy of the country has led to establishment of several public universities and technical colleges most of which produce graduates trained in general agriculture, animal production sciences, veterinary medicine and related disciplines at various levels. This is aimed at tremendously improving the human resource of the sector and

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[52] Alleweldt F., Upton M., Kara S., Pflug S., Kim Cuc N.T., Béteille R., Doré MP von Gall P (2012). Cost of National Prevention Systems for Animal Diseases and Zoonoses in Developing and Transition Countries. The World Organisation for Animal Health

[53] Alleweldt, F., Upton, M., Kara, S., Beteille, R (2012). The cost of national prevention systems for animal diseases and zoonoses Rev. sci. tech. Off. int. Epiz., 2012, 31 (2), 619-630
in developing and transition countries

[54] Ministry of Finance. (2020). Federal Democratic Republic of Ethiopia Ministry of Finance. Retrieved from https://www.mof.gov.et/web/guest/budget-and-expenditure

[55] World Organization for Animal Health (OIE). (2019). Evaluation of the Performance of Veterinary Services in Ethiopia. Retrieved from https://rr-africa.oie.int/docspdf/en/2019/ethiopia_evaluation_report.pdf

[56] Mulugeta S, Yokamo S, Hayiso H (2019) Assessment of Veterinary Service Delivery in Shebedino District of Sidama Zone, Southern Ethiopia. J Vet Sci Technol, 10: 588.

reducing the gap between demand and supply of trained professionals. According to the WOAH estimate in 2019[57] however, Ethiopia would have more than 31,000 veterinarians and para-veterinary professionals by the year 2022, and this number was considered inadequate for the livestock population the country would have in the same year. Circumstantial evidences also show the prevalence of understaffing in various competency areas such as clinical service, meat inspection, quarantine, research and diagnostic laboratories.

According to the FAO recommendation, a veterinarian could manage to take care of 30000 to 50000 animals as far as preventive measures are concerned and 5000 for curative services[58]. Other sources suggest 20000 Tropical Livestock Unit (TLU) or Veterinary Livestock Unit (VLU) per veterinarian in charge[59]. A TLU or VLU is an animal unit, introduced to aggregate the work requirements for animal health care of different livestock species. One VLU corresponds to 1 cow or 1 camel or 2 horses or 2 pigs or 2 donkeys or 10 small ruminants or 100 poultry. However, this greatly varies based on the body weight/size of animals within each species. For instance, global Livestock Units consider 1 TLU equivalent to 1 cattle in USA while a TLU for sub-Saharan Africa is equivalent to a mature cow of 250kg[60] . Derived from this general estimate, the average conversion equivalent of Sub-Saharan livestock is 0.5 TLU for cattle, 0.1 for sheep and goats, 0.8 for horses, 1.1 for camels and 0.01 for chicken[61]. As data regarding number of practicing veterinarians is fragmented and often incomplete, there is no consensus on whether Ethiopia has achieved the sector's desired human resource or not. Moreover, the 2011 Performance of Veterinary Service (PVS) by the WOAH[62] has heralded several gaps in competency of veterinary professionals of the country.

6.4.5. Service provision

Clinical Services: Majority of the districts in the regional states have one public veterinary clinic per District but the quality of the services varies with respect to their human resources, facilities and supplies. Livestock extension unit encompassing animal health posts may also exist at Kebele level with the intention of increasing access to the services. However, some regions are gradually reducing budget allocation to such units which is believed to undermine the services in the livestock sector. In principle, the Veterinary Services should be accommodated in premises suitable for efficient performance of their functions (Figure 1). Adequate number of functional veterinary clinics and animal health posts must be there to deliver the desired clinical services. These clinics and health post should also have the necessary budget, facilities, consumables and veterinary drugs. However, some research evidences show that this is not always the case[63, 64].

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[57] *World Organization for Animal Health (OIE). (2019). Evaluation of the Performance of Veterinary Services in Ethiopia. Retrieved from https://rr-africa.oie.int/docspdf/en/2019/ethiopia_evaluation_report.pdf*

[58] *Admassu B (2003). Ibid*

[59] *Dina L. Umali, Gershon Feder, Cornelis de Haan (1994). Animal health services: Finding the balance between Public and private delivery. The World Bank Research Observer, 9 (1): 71-96*

[60] *Chilonda, P & Otte, J (2006). Indicators to monitor trends in livestock production at national, regional and international levels. Livestock Research for Rural Development 18 (8).*

Njuki,J., Poole, J., Johnson, N., Baltenweck, I., Pali,P., Lokman , Z., Mburu, S. (2011). Gender, livestock and livelihood indicators

[62] *OIE (2011). OIE - PVS evaluation report of the veterinary services of Ethiopia 3rd may 2011 to 17th may 2011*

[63] *Admassu B. (2003). Ibid*

[64] *Njuki et al (2011). ibid*



Figure 1. A Veterinary Teaching Hospital at the College of Veterinary Medicine and Agriculture of the Addis Ababa University; an example of a veterinary service establishment fulfilling the necessary facilities

Diagnostic Services: The quality of the veterinary diagnostic laboratories of a country underpins evidence-based veterinary services and the whole control and certification processes of the sanitary status of exported animals and animal products. Therefore, some of these laboratories should be subject to rigid quality assurance procedures and should use international quality assurance principles for standardizing test methodologies.

In this context, for routine clinical services, a unit equipped with minimum basic laboratory equipment is required. On the other hand, Regional and National veterinary diagnostic laboratories should have the capacity of filling gaps regarding disease surveillance and monitoring, confirmation of suspected animal health problems based on samples submitted from field veterinary service centers and provide capacity-building trainings to frontline practitioners. In this regards, the National Laboratory in the Ethiopian Animal Health Institute is mandated to undertake the diagnosis of infectious diseases, outbreak investigations and disease surveillance throughout the country. The laboratory is ISO 17025 accredited for 12 tests mainly of serological type and it is an WOAH reference lab for avian influenza and Newcastle diseases in East Africa. However, the situation of all regional labs is different from this picture. Regional veterinary laboratories often complain of serious constraint in laboratory facilities and consumables and when they are present lack adequate technical capacity and manpower to effectively deliver their duties.

Disease reporting and outbreak investigation: Disease reporting systems are based on reporting of animal health-related events to the Veterinary Authority. Data derived from disease reporting systems can be used in combination with other data sources to substantiate claims of animal health status, to generate evidence for risk analysis or for early warning and response[65]. Ethiopia is currently implementing active and passive surveillance systems as part of its national animal disease surveillance system. Active surveillance is an essential tool for early detection of diseases and introduction of exotic diseases. It provides information for declaring a country or a zone disease free. Passive surveillance is continuous monitoring of the existing disease status using regularly collected data.

The MoA is implementing national web-based monthly Disease Outbreak and Vaccination Activity Reporting (DOVAR II) and smart phone based real time Animal Disease Notification and Investigation System (ADNIS) for its disease surveillance system. DOVAR II is used to collect, store and analyse diseases outbreak data on monthly bases. Disease outbreak and vaccination data are recorded on a paper at district level and sent to regional laboratories through post and directly by hand; the regional laboratories enter the data into the web based system and make it accessible to epidemiology desk of the MoA. The android mobile component enables alerts to be pushed to specific users if a notifiable disease is reported. In areas where the systems were effectively implemented to track the situation of *Peste des Petits Ruminants* (PPR), national average monthly reporting rates have grown from 35% in 2015 to 73% in June 2019[66]. Aaccording to the information from the Ministry of Agriculture, disease surveillance and reporting rate has shown a tremendous progress reaching up to 75% in 2019 at a national level from a baseline figure of 44% in 2010[67]. However, all major diseases taken together, the outbreak reporting rate is still below the 80% minimum requirement of the WOAH. Under-reporting is particularly high in pastoral and agro-pastoral settings[68] and the quality of data is inadequate as almost all diseases reported were unconfirmed cases; suggesting the need to strengthen the diagnostic capacities of regional veterinary laboratories.

Livestock disease surveillance is reported to be carried out at both federal and regional levels. At the federal level, the Epidemiology Directorate of the MoA guides overall surveillance activities, data collection, documentation, analysis and dissemination of animal health information. The Ethiopian Animal Health Institute, besides serving as a referral diagnostic center, also plays a significant role in executing and coordinating surveillance activities of Regional Veterinary Laboratories mainly focusing on major viral and bacterial diseases of transboundary nature. Planned annual surveillance activities are performed for many disease problems[69].

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[65] *OIE (2019): Strengthening Veterinary Services through the OIE PVS pathway: the case for engagement and investment.*

[66] *FAO (2020). Final evaluation of "Pursuing pastoralist resilience through improved animal health service delivery in pastoralist areas of Ethiopia". Project Evaluation Series, 04/2020. Rome.*

[67] *Ministry of Agriculture and Rural Development, MoARD, Animal and Plant Health Regulatory Directorate, APHRD (2010). Animal Health Yearbook of Ethiopia*

[68] *FAO (2018). Africa Sustainable Livestock 2050: Zoonotic diseases spotlight-The case for an expert elicitation protocol on zoonoses in Ethiopia*

[69] *Ministry of Agriculture (2012). Ethiopia Animal Health Yearbook*

Disease risk analysis and Emergency response: Animal disease emergencies may occur when there are unexpected outbreaks of epidemic diseases or other animal health-related events which have the potential to cause serious socio-economic consequences for a country. These emergencies are frequently caused by outbreaks of transboundary animal diseases (TADs), which are of significant economic, public health, trade and/or food security importance for many countries. Therefore, continuous animal disease risk analysis should be made in order to ensure entry of such problems into the country as well as while exporting animals and their products. In this regards, the mandate of risk analysis in Ethiopia is under the Federal Ministry of Agriculture, Veterinary Service Unit. Specifically, the Epidemiology Directorate handles this duty. However, the coordination between the federal veterinary service and the regional bureaus is not always clear.

Quarantine services: Ethiopia has constructed five quarantine stations at Mille, Jigjiga, Metema Humera and Almehal. The Mille Quarantine Station got recognition some time ago from Gulf countries that are importing live animals from Ethiopia. Its strategic location made it suitable for accommodating livestock destined for both live animal export and those for export abattoirs. The Quarantine, Import-Export Inspection and Certification Directorate of the MoA has reported that the Mille station is recently transferred to a private entrepreneur and this is expected to greatly improve the quality and efficiency of the quarantine service.

Meat inspection and food hygiene: For many years, the weak food safety management practices in Ethiopia have coasted the country by limiting its competitiveness in the live animal and meat export markets. Over the last few decades however, Ethiopia has been continuously updating food safety regulations in response to increasingly stringent food quality and safety requirements of international customers and to meet the needs of the fast growing food retail and whole sale establishments in the country. According to the Export Abattoirs Inspection and Certification Directorate of the Ministry of Agriculture, currently there are 11 functional export abattoirs with the capacity of supplying 54,000 tons/year of meat the vast majority of which is derived from sheep and goats. Most of these abattoirs are ISO 22000: 2005 food safety systems/HACCP certified. However, the situation of abattoirs owned by town municipalities serving domestic consumers is not as clear as those for export purposes.

6.4.6. Animal welfare

Animal welfare is an issue of growing interest in the international trade for livestock and livestock products. There is an increasing awareness among consumers about the effects that breeding, farming, transporting and slaughtering techniques may have on animals, on their health and welfare. The European welfare quality assessment system for farm livestock enunciates four welfare principles of; good feeding, good housing, good health and appropriate behavior. These principles focus attention on the practical measures needed to

achieve desirable welfare outcomes[70]. In this regards, although animal welfare as a separate entity, is not covered by any of the existing regulation, the Live Animal Marketing Proclamation No. 819/2014 prescribes some requirements on market places and transportation of animals that are of relevance to respecting animal welfare.

[70] *Mellor, D.J.(2016). Updating animal welfare thinking: Moving beyond the "Five Freedoms" to "A Life worth Living". Animals, 6, 21*

PART THREE

7. METHODOLOGICAL FRAMEWORK

A methodological framework is a set of procedures, methods, and tools that guide an evaluation process in a systematic and structured manner. It provides a structure for conducting research, collecting and analysing data, and drawing conclusions. It involves methods that are useful, feasible, ethical, and accurate. The framework comprises steps in evaluation practice and standards for effective evaluation. The steps may include engaging stakeholders, describing the program or the national veterinary service (goals, activities, resources, etc), focusing the assessment design (performance indicators), gathering credible evidences (data collection), justifying conclusions and ensuring the use and sharing lessons learned. The quality of the performance indicators and assessment tools will be monitored by a set of standards based on utility, feasibility, propriety and accuracy criteria to answer the question, "Will the evaluation be effective?" [71].

This methodological framework builds up on the above basic concepts and proposes a mixed methods research framework which combines quantitative and qualitative data collection methods to address the research questions in alignment with the theory of change specifically formulated for this purpose. It involves collecting both numerical and non-numerical data and using both statistical analysis and interpretive techniques to analyse the data.

7.1. Theory of change

A theory of change is a method that explains how a given intervention, or set of interventions, are expected to lead to a specific development change or goal, drawing on a causal analysis based on available evidence[72]. The process for developing methodological frameworks and national indicators should begin at the conceptualization and design phase of the animal health strategy which also includes formulating a theory of change at the outset. In this regards, although the 2013[73] Animal Health Strategy and Vision for Ethiopia has outlined intervention areas to improve the coverage and quality of veterinary services, no clear indicators were put in place to guide assessment of their achievements. Therefore, based on authors' experiences and consultation with senior experts and various literatures, the following theory of change is proposed to guide the evaluation of the Ethiopian Veterinary service through specific indicators.

[71] *Centers for Disease Control and Prevention (1999). Framework for program evaluation in public health. MMWR, 48(No.RR-11):1-42*

[72] *Anne Gienapp and Cameron Hostetter (2022). Developing a Theory of Change: Practical Guidance Vol 1. The Annie E. Casey Foundation. file:///C:/Users/User/Desktop/aecf-theoryofchange-guidance-2022%20(1).pdf*

[73] *MoA and ILRI (2013). Animal Health Strategy and vision for Ethiopia. Ministry of Agriculture and International Livestock Research institute*

Animal diseases are responsible for mortality, significant reduction in productivity, increased risks to human health and limit livestock and livestock products trade in international markets. It is assumed that investing on veterinary services and expanding provision of quality animal health and related services significantly reduces impacts of animal health problems. This will in turn reduces mortality due to diseases, improves production and reduce risk to human health; ultimately improving the economy and livelihood of the livestock rearing community, reducing poverty and enhancing Ethiopia's capacity to supply increased volume of high quality livestock and livestock products to national and international markets. Key elements to be covered in this process of evaluating the performance of the veterinary service therefore include resource adequacy based on available livestock potential including policies and management capability (input), diversity, quality and coverage of services (output), and the benefits the community has gained out of the services received (outcome). By carefully designing indicators that track the various components of the theory of change, one can be able to test whether the Ethiopian Veterinary Service has achieved its goals as per the theorized relationships among inputs invested, activities performed and outcomes observed as depicted in the flow chart below (Figure 2).

Inputs are those things that we use to implement the veterinary service activities. It includes staffing, financial, organizational and community resources to deliver the service. Outputs are those results which are achieved immediately after implementing the various forms of the veterinary service activities. For example, a veterinarian (input) treats an animal (activity) and the animal gets cured (output). On the other hand, outcomes are expected changes or mid-term results arising from the veterinary service delivery. If an animal is healthy because of the veterinary intervention, its productivity is expected to be improved (outcome).

Measurements of the contribution of the veterinary service should go further to evaluating the impacts of the intervention. However, in the absence of a baseline socioeconomic study data collected prior to the start of the services and in the presence of many development activities that can be considered as confounding factors, the authors believe that including impact indicators may not allow generating credible data.

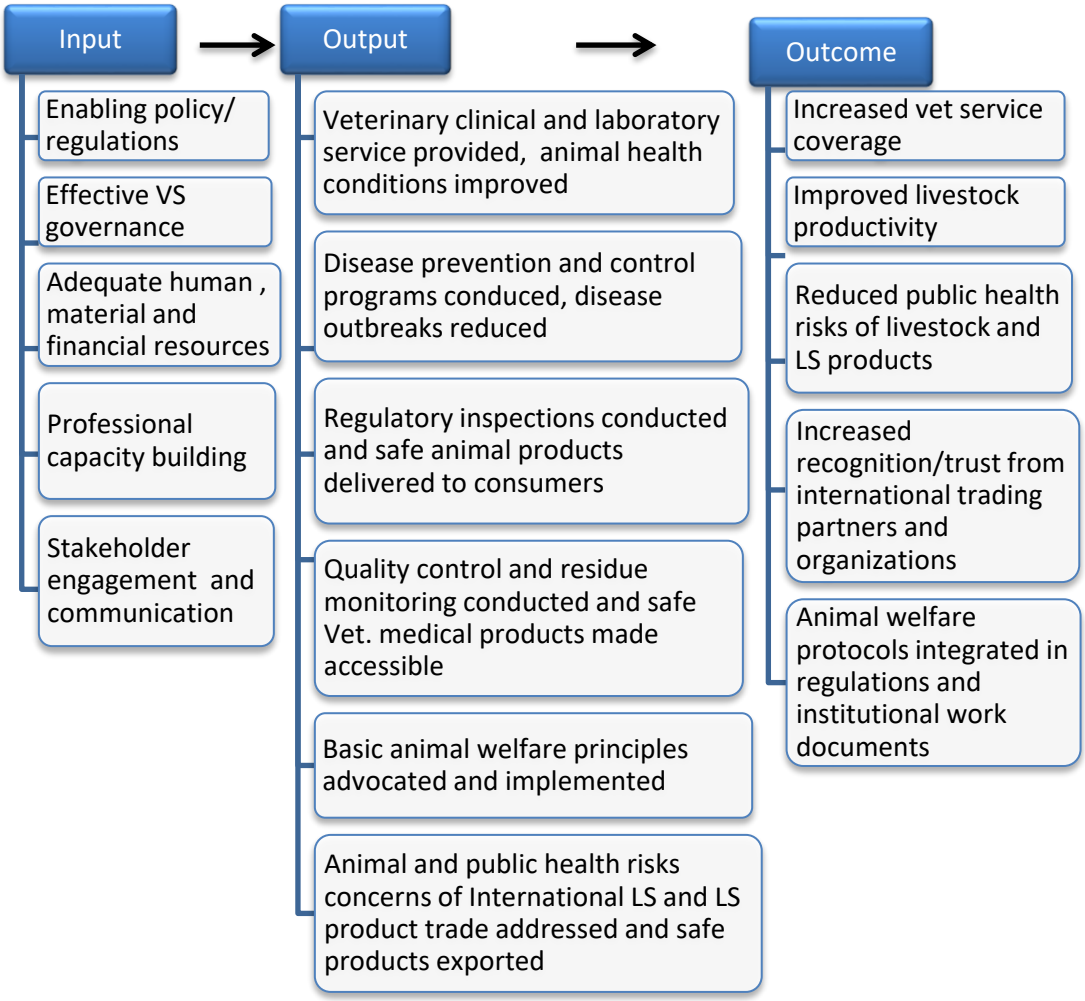


Figure 2. Methodological framework based on input, output and outcome areas of focus

7.2. Basic criteria for selection of indicators

Indicators can be used to track the resources that are used in development programming, and the activities of the private and public veterinary service staff and their partners. Information on inputs and activities is essential as a management tool, to determine if services are efficient and economical, and to inform decisions about whether, and how, to scale up or replicate those which are successful. They should also enable to assess whether an investment in veterinary service objectives is delivering the anticipated benefits. Quantitative output indicators, that describe the number of tasks achieved or products produced are often important measure of progress. While selecting and coining key performance indicators, the following important issues were taken into account[74].

- **Relevance:** The selection of VS coverage indicators starts from a precise understanding of national veterinary service objectives and the overall VS situation.

[74] *Indicators to Measure the Performance of a National SPS System STDF / OECD Working Paper (DRAFT) (2010). https://standardsfacility.org/sites/default/files/DraftWorkingPaper_RevDec10_0.pdf*

- **Limiting the number of indicators:** It is most effective to be selective and use smaller sets of well-chosen indicators. Many macro-level indicators cannot be measured directly. They have to be based on often large numbers of measurable sub-indicators and estimated through aggregation.
- **Clarity in design:** It is important to define indicators clearly in order to avoid confusion in their development and use, and maintain the distinction between input, output and outcome indicators as far as possible.
- **Feasibility**: Indicators should be practical and realistic. They should also be cost effective in terms of data collection
- **Clear identification of causation:** Causal links must be clearly identified
- **Quality and reliability:** Indicators, and the information they provide, are only as good as the data from which they are derived. Ideally an indicator should represent a reliable measure and should have a sound statistical and scientific basis. If the "ideal" indicator to measure a veterinary service program is based on unreliable data, it may be best to use a proxy or alternative instead.
- **Timeframe:** In many cases, there are substantial time lags before the effects of veterinary service activities become clear.

7.3. Disaggregation of indicators

By disaggregating inputs, outputs and outcomes by regions, or comparing data for different demographic groups, indicators can provide information on how benefits are distributed, and highlight areas for improvement. Disaggregation of indicators means checking for change in the value of an indicator for separate sub-groups of beneficiaries, to make sure that all beneficiaries are benefiting from a change. It is often important to measure regional differences in veterinary service provision. In this regards, the access and success of the services may vary with respect to the levels of support or investment from local governments and the community, long standing security situations, emphasis given to livestock resources in the area, etc.

The promotion of a fair share of benefits for women and men should also be an aspect of the outcome and impact of all development policies/projects concerned with impacting on people's lives. However, in most of the developing countries low education, logistical constraints and service schedules may constrain women access to the services compared to men household heads. Examples are women livestock owners' access to veterinary services, and female veterinary professionals, veterinary paraprofessionals and community animal health workers access to capacity building trainings.
Assigning value and making judgments

Assigning value and making judgments regarding the national veterinary seervice on the basis of evidences requires answering the following questions:

- What will be evaluated? (i.e. what is "the service" and in what context does it exist)

- What aspects of the program will be considered when judging program performance? (input/resource allocation, activities/outputs, outcomes/impact)
- What standards must be reached for the program to be considered successful? (national and/or international standards)
- What evidence will be used to indicate how the program has performed?
- What conclusions regarding program performance are justified by comparing the available evidence to the selected standards?
- How will lessons learned from the inquiry be used to improve program effectiveness?

8. NATIONAL INDICATORS TO MEASURE ETHIOPIA'S VETERINARY SERVICE COVERAGE

8.1. Input indicators

Input indicators measure the resources needed for the effective and efficient implementation of the veterinary service. This may involve policies, financial, infrastructure, human resource, stakeholder engagement etc. Therefore the focus areas selected to develop performance indicators relevant to Ethiopia's veterinary services which is in alignment with WOAH recommendations[75] include

- Enabling regulatory frameworks
- Governance/organization of the veterinary service
- Inputs and supplies (infrastructure and facilities, human resource, budget allocation)
- The veterinary profession
- Stakeholder engagement and communication

[75] *OIE (2022). Quality of Veterinary Services: Chapter 3.2.- Terrestrial Animal Health Code - 10/08/2022*

Table 1. Input focus area 1: Enabling regulatory frameworks

Indicator	Description/definition	Purpose	Measurement	Disaggregation	Data source
Indicator 1 Existence of Animal Health policy/strategy	*A framework for guiding and delivering a sustainable animal health system that responds to national and global standards* This indicator measures the presence of national animal health policy, animal health strategy and selected animal disease prevention and control strategies or programs	-to create enabling environment for standardized and effective delivery of the veterinary service -to comply with standard requirements of the World animal health organization	Verify presence of the following (yes/No) -national animal health policy and strategy - animal disease prevention and control programs	Federal and Regional	Ministry of Agriculture, Regional Offices
Indicator 2 Existence of proclamation/regulation governing veterinary service	For effective implementation of national policy and strategies, legal provisions are necessary to regulate essential functions related to the veterinary service delivery.	to ensure that animal health services are delivered as per the legal provisions	The legal framework should include at least the following key components (Yes/No) -animal disease monitoring, surveillance and reporting -veterinary statutory body -privatization of vet services	None	MoA
Indicator 3 Existence of proclamation/regulation governing meat inspection and food hygiene	Animal source food safety is a global public health concern that every country has to integrate in its legal frameworks. In this respect, mandatory inspection of meat production and processing facilities and meat and meat by products should be legally backed. The independence of the regulatory inspectors is also a major concern that is expected in such regulations	To ensure that livestock products are produced and marketed in accordance with international food safety standards	The legal framework should include at least the following key components (Yes/No) -mandatory inspection of meat and meat byproducts -mandatory inspection of abattoir and meat processing and handling facilities -independence of regulatory inspectors	None	MoA
Indicator 4 Existence of proclamation/regulation governing animal disease prevention and control	Prevention and control of animal diseases of economic and public health importance is a major component of the veterinary service. For its effective implementation, legal frameworks are necessary to provide actions necessary such as farm inspection, animal movement control, quarantine, disease free zoning and livestock identification systems	To enable effective disease prevention and control at different levels	The legal framework should include at least the following key components (Yes/No) -animal and animal product movement control and certification -Livestock identification and traceability system and disease free zone establishment - livestock early warning, and emergency response	None	MoA

Indicator 5 Existence of proclamation/regulation governing farm inspection, vaccination and compensation	Animal disease prevention and control also involves measures such as farm inspection, mandatory vaccination during outbreaks and compensation at times of regulatory disposal of diseased animals	To enable effective disease prevention and control at different levels	-farm inspection -Mandatory vaccination -compensation during regulatory disposal of livestock/property	None	MoA
Indicator 6 Existence of proclamation/regulation governing veterinary drug and animal feed quality control, residue monitoring and disposal	It deals with regulation of veterinary drugs, biological and animal feeds registration, import and production. It also covers veterinary drugs and chemicals residue monitoring in animal products and disposal of the same when they are unusable.	To ensure veterinary drugs, biologicals and animal feeds produced or marketed are safe, of good quality and are properly used or disposed	The legal framework should include at least the following key components (Yes/No) -veterinary drugs, animal feeds and feed supplement registration and certification - vet drug and animal feed quality control - veterinary drugs and chemicals residue monitoring	None	MoA
Indicator 7 Existence of proclamation/regulation governing livestock and LS product marketing	Proper market structure complements prevention and control of animal diseases of economic and public health issues and for ensuring welfare of animals traded. In this regards, livestock markets are expected to fulfill basic requirements such as veterinary health inspection and certification, control of import and export of LS and LS products, and welfare management of livestock at markets and during transport	To ensure that marketing of livestock and LS products respect provisions on health and animal welfare at various levels	The legal framework should include at least the following key components (Yes/No) -Domestic livestock market standard requirements -Requirement for vet. Health inspection and certification -Requirement for animal welfare management	Federal, Region	MoA/Ministry of trade regional integration
Indicator 8 Existence of standards/guideline for farm inspection and LS marketing	These are operating standards or guidelines for effective implementation of the proclamation or regulation from which it is derived	To guide and help professionals to deal with specific issues in practice. It presents a good way of applying professional standards	The following minimum basic operating standards/guidelines should be available as appropriate (Yes/No) -For farm inspection -For livestock markets -For LS transport facilities	Federal, Region	MoA/ Regional Vet. Office
Indicator 9 Existence of	Proclamations and regulations governing the inspection of abattoirs, meat processing establishments, meat and meat byproducts and	To guide and help professionals to deal with specific issues in practice. It	The following minimum basic operating standards/guidelines should be available as	Federal, Region	MoA/ Regional Vet. Office

standards/guidelines for abattoir inspection	transport facilities should be translated into operating standards or guidelines for effective implementation	presents a good way of applying professional standards	appropriate (Yes/No) -For abattoir inspection -For meat inspection -For meat transport		
Indicator 10 Existence of standards/guidelines for veterinary clinical services	Proclamations and regulations governing the clinical services should be translated into operating standards or guidelines for their effective implementations. These and other supporting reference materials should be available at work places to support decisions.	To guide and help professionals to deal with specific issues in practice. It presents a good way of applying professional standards	The following minimum basic operating standards/ guidelines/ reference materials should be available as appropriate (Yes/No) -For veterinary clinical service -For proper use of vet drugs, chemicals and biological -standard for professional conduct of VP and VPP	Federal, Regional, service sector	MoA, Regional/district vet offices, universities
Indicator 11 Existence of standards/guidelines for veterinary diagnostic services	Proclamations and regulations governing the diagnostic laboratory services should be translated into operating standards or guidelines for their effective implementations. These and other supporting reference materials should be available at work places to support decisions.	To guide and help professionals to deal with specific issues in practice. It presents a good way of applying professional standards	The following minimum basic operating standards/ guidelines/ reference materials should be available as appropriate (Yes/No) -For veterinary laboratories -For residue monitoring -For vet drug quality control -For feed quality control	Federal, Regional, service sector	MoA, Regional laboratories, universities , research institutes

Table 2. Input focus area 2: Governance of the veterinary service

Indicator	Description/definition	purpose	Measurement	Disaggregation	Data source
Indicator 12 Enabling organizational structure and functional units	This indicator assesses the veterinary structure from federal all the way to the smallest administrative units. The Vet. Services is expected to have functional units such as Epidemiology, Disease Prevention and Control, Veterinary Public Health, Abattoirs Inspection and Certification, Quarantine, Import and Export Inspection and Certification and Livestock Identification, Traceability	To facilitate and implement effective governance of the veterinary services	This indicator measures the presence or absence of (Yes/no) -CVO at national level -Regional level Vet. Service delegate -presence of relevant functional units or divisions within the VS at both federal and regional levels. District	National, Regional District	Federal and Regional vet service offices
Indicator 13 Functional integration of veterinary service	This indicator assesses the vertical and horizontal integration of veterinary services at different levels. This includes clinical, laboratory, disease prevention and control and related functions	To facilitate and implement effective governance of the veterinary services	This indicator measures the presence or absence of (Yes/no) -strong functional integration between federal and regional Vet service -Regular cooperation between regions on disease prevention and control -Strong functional linkage between veterinary clinics and regional veterinary laboratories	National, Regional District level facilities are important	Federal, Regional and District vet service offices Federal and Regional labs

Table 3. Input focus area 3A: Inputs and supplies (infrastructure and facilities)

Indicator	Description/definition	Purpose	Measurement	Disaggregation	Data source
Indicator 14 Availability of functional* public and private veterinary clinics (VC) and animal health posts (AHP)	This indicator deals with infrastructures for veterinary clinical and related services at district and smallest administrative units. Services can be public or private. Access to veterinary services is believed to be dependent, among others, on availability of such infrastructures.	It helps to estimate the coverage of veterinary service provided to a certain livestock population	-Ratio of livestock population expressed as TLU per number of functional VC -Ratio of livestock population expressed as TLU per number of functional AHP -Type of VC and AHP construction material (concrete, wood/mud)	Region, District/Kebele, production system, service provider (public/private),	Regional/federal/ district offices Livestock population data from CSA report
Indicator 15 Availability of functional facilities and equipment	This indicator deals with availability of basic facilities that enable veterinary clinics and AHP deliver their intended functions a functional mini laboratory should have a microscope, allow to conduct at least fecal examination by floatation technique and blood examination by Giemsa staining	To evaluate the functionality of the veterinary service delivering infrastructures (VC, AHP)	-%of vet service stations with properly constructed crushes -% of vet service stations with cold storage facility/equipment -% of vet service stations with appropriate drugs and equipment storage room -% of vet service stations with functional mini laboratory	Region, District, Production system Service station (VC/AHP)	Field observation using a checklist
Indicator 16 Availability of functional utilities and transport	This indicator deals with availability of water and electric supply lines and transport facilities to deliver intended functions of VC and AHP	To evaluate the functionality of the veterinary service delivery infrastructures	- % VC with vehicles for mobility (car/motorbike) -% of VC with electric power supply -% of VC with pipe water supply	Region, district, Production system Service station (VC/AHP)	Field observation using a checklist
Indicator 17 Number of registered abattoirs	This indicator describes the availability establishments. It includes public and private abattoirs serving both domestic and/or export markets	To provide clean, wholesome and safe meat for consumers	-Number of functional abattoirs for export purposes -Number of functional abattoirs for domestic purposes -% of licensed abattoirs for poultry	by region, export/domestic	Federal, regional/district offices
Indicator 18 Abattoir facilities and transport	This indicator intends to describe the quality of animal slaughtering establishments in terms of basic facilities required from a standard abattoir. It includes public and private abattoirs serving both domestic and/or export markets	To provide clean, wholesome and safe meat for consumers	-% of abattoirs with lairage and isolation units -% of abattoirs with cold storage facility -% of abattoirs with carcass and offal separation rooms, -% of abattoirs with proper waste management system -% of abattoirs with access to meat transport facility with cold chain	by region, export/domestic	Abattoir observation

Indicator 19 Availability of input supply chain	Veterinary input suppliers such as drug wholesalers, retailers and veterinary practitioners are important actors in the drug supply chain	To ensure the supply of quality of products to livestock farmers	-Number of veterinary drug, biological and equipment importers and wholesalers - Number of veterinary drug, biological and equipment retailers -Extent of use of vet. drugs from unauthorized sources (Likert scale of 5)	By region, districts Categories of drugs, biologicals, suppliers,	Federal and regional veterinary services, CSA, ministry of trade
Indicator 20 Availability of functional veterinary laboratories	Veterinary laboratories offer multiple services to public and private institutions. These laboratories may be located at federal or regional levels or in research and teaching institutions. They support the veterinary service by providing diagnostic, disease surveillance and monitoring functions as well as engaging in skill development trainings	To identity diseases as a prerequisite for specific and proper treatment, prevention and control	-Number of veterinary laboratories established at national or regional level -Number of other potential labs with diagnostic capacities for animal diseases (in research institutes, universities etc)	By region, institution	Federal and regional veterinary services, Research institutes Universities
Indicator 21 Availability of functional facilities and equipment in Veterinary laboratories (VL)	This indicator intends to assess the availability of basic facilities that enable veterinary laboratories deliver their intended functions	To ensure proper functioning of veterinary laboratories with desired standard	-% of VL capable to perform serological tests (facility, skill) -% of VL capable to perform molecular tests (facility, skill) -% of VL with laboratory animal unit -% of VL with at least biosafety level 2 facility -% of VL equipped with standby generator	By region, institution	Federal and regional veterinary services, Research institutes Universities
Indicator 22 Animal Health Research	This is to assess the distribution of various institutions engaged in animal health research as a proxy to measure the extent of attention given to animal health research	To ensure that animal health services are supported by evidence based research outputs and technologies	-Number of Research Institutes with active animal research unit -Number of universities engaged in animal health related research -Number of veterinary laboratories mandated and engaged in animal health research	By region, institution	Federal and regional veterinary services, Research institutes Universities

Calculation

For yes/no questions, the weight given to an indicator (see annex I) should be equally dived to the number of measurements or sub-indicators. Examples are indicators 1-13.

Indicator 14: Under current situation, a veterinary clinic is expected to have at least one veterinary professional. This roughly means that the clinic serves 20,000 to 30,000TLU. Calculated from CSA livestock population estimate for the District in which the CV is located, if the number of TLU is above this range, then, it is judged as inadequate for that particular indicator or measurement.

Indicator 15 and 16: % Vet clinics with desired facilities= $\frac{\text{No. of VC with specified facility}}{\text{Total number of VC}} \times 100$

Indicator 17: % licenced poultry slaughter houses= $\frac{\text{No. of slaughter houses licenced}}{\text{Total number of poultry slaughter houses}} \times 100$

Indicator 18: % abattoirs with desired facilities= $\frac{\text{No. of abattoirs with specified facility}}{\text{Total number of abattoirs}} \times 100$

Indicator 19: Likert scale: 1) no access, 2) little access, 3) occasional access, 4) frequent access, 5) it is our only source of drugs

Indicator 21: % vet labs with facility for specific tests= $\frac{\text{No. of labs with specified tests/facility}}{\text{Total number of labs}} \times 100$

Table 4. Input focus area 3B: Inputs and supplies (human resource)

Indicator	Description/definition	purpose	Measurement	Disaggregation	Data source
Indicator 23 Adequacy of trained personnel for clinical and diagnostic services	Trained human resource is vital component of the veterinary clinical and diagnostic service delivery. The number and composition of the human resource should be commensurate to the intended service. Therefore, this indicator assesses the veterinary human power deployed to provide clinical, diagnostic and related services at different levels. International standards recommend that one veterinarian should serve a maximum of 20,000 veterinary livestock units (VLU) [76]	To ensure all vital functions of the veterinary clinical and diagnostic services are conducted by adequate number of professionals trained at various levels	-Number of VP, VPP and CAHWs/Extension workers engaged in vet. clinical and extension services/district -Ratio of VLU potentially served per veterinarian (based on CSA data) -Number of professionals per designated veterinary laboratories (by qualification)	Professional qualification Region, zone/district production system by service provider	Regional/district vet service offices
Indicator 24 Adequacy of trained personnel for quarantine and border/port check point service and meat inspection	Animal disease prevention and veterinary public health issues are services often provided by qualified veterinarians. The number and composition of the human resource in these services should be commensurate to the intended service. Therefore, this indicator assesses the veterinary human power deployed at various levels.	To ensure all vital functions of the quarantine/border checkpoints and meat inspection services are conducted by adequate number of professionals trained at various levels	-Number of VP and VPP per functional quarantine station (by qualification) -Number of VP and VPP per border check point or port (by qualification) -Number of meat inspectors and food science professionals per abattoir	level of training, Federal, Region, zone/district	
Indicator 25 Adequacy of trained personnel for animal health research and regulatory services	Animal health research greatly complements disease prevention and control programs. Moreover, all programs in veterinary service at various levels should be administered by qualified VP and VPP. Therefore, this indicator assesses the veterinary human power deployed in research and veterinary service administration.	To ensure governance of all vital functions of the veterinary services. It also ensures that adequate work force is available to complement the services by research outputs.	-Number of VP and VPP employed as research staff per Federal or Regional research institutes/centers -Number of VP and VPP in the regulatory sections per federal or regional offices	level of training, Federal, Region, zone/district Production system	

[76] *Dina L. Umali, Gershon Feder, Cornelis de Haan (1994). Animal health services: Finding the balance between Public and private delivery. The World Bank Research Observer, 9 (1): 71-96*

Table 5. Input focus area 3C: Inputs and supplies (budget allocation)

Indicator	Description/definition	purpose	Measurement	Disaggregation	Data source
Indicator 26 Budget allocation for core vet. services in the last budget year	The amount of financial budget allocated to operate essential functions of the different sections of the veterinary service is the subject of this indicator	to ensure all relevant veterinary services are adequately budgeted	-Amount of annual budget released for clinical functions -Amount of annual budget released for purchase of drugs and other supplies -Amount of annual budget released for laboratory functions	Federal, Regional/district service centers	Federal, Regional/district service centers
Indicator 27 Budget allocation for disease prevention, control and emergency response	This indicator deals with financial budget allocated to operate disease prevention and control activities. This also includes creation of contingency fund for livestock emergency related veterinary services	to ensure adequate fund is available for planned disease prevention/control as well as for quickly responding to emergencies.	-Amount of annual budget released for animal disease control and prevention functions -Amount of contingency fund allocated for vet. Services during livestock emergency	Federal, Regional/district	Federal, Regional/district
Indicator 28 Satisfaction on budget adequacy for essential service delivery in the last budget year	Financial budget allocated should be satisfactory to run essential functions such as purchase of consumables and equipment, filed works, maintenance and utility for units such as regulatory, clinical, laboratory, disease control and emergency preparedness	to ensure all relevant veterinary services are adequately budgeted	-Adequacy of annual budget released for operational functions (measured by Likert scale of 5)	Federal, Regional/district service units	Questionnaire survey respondents from each service unit

Calculation

Indicator 23: Calculated from CSA livestock population estimate for the District in which the CV is located, if the ratio of TLU to veterinarian is above 30,000TLU, then, it is judged as inadequate for that particular indicator or measurement

Indicator 28: Likert scale: 1) not specific budget, 2) not adequate, 3) moderately adequate, 4) adequate, 5) more than adequate

Table 6. Input focus area 4. Professional capacity building

Indicator	Description/definition	purpose	Measurement	Disaggregation	Data source
Indicator 29 Opportunity for capacity building trainings relevant to the specific job	The occurrence and management of animal health situations is dynamic. This requires a system of continuous learning platform that creates equal opportunity for all engaged in this sector.	To allows professionals maintain and evolve their skills, knowledge, experience and understanding	-Opportunity for continuous professional development (CPD) trainings or other career development opportunities (Yes/No) -Opportunity for advanced trainings to upgrade one's professional qualification (Yes/No)	Region gender qualification service sector	questionnaire survey with Service delivery units and professionals
Indicator 30 Capacity building trainings offered in the last 12 months	in the presence of a system of continuous learning systems, it is expected that these opportunities are accessible to members of the professional community. This indicators hence deals with trainings offered to personnel of different occupation (clinicians, laboratory personnel, meat inspectors, quarantine experts, etc)	To allows professionals maintain and evolve their skills, knowledge, experience and understanding	-Proportion of professionals who received CPD training -Proportion of professionals who received advanced trainings (College or University)	Region gender qualification service sector	questionnaire survey with Service delivery units and professionals
Indicator 31 Professional licensing and accreditation system	A national certification framework that enables measuring competency of graduates to get license to practice is essential to ensure quality of veterinary services. Moreover, veterinary education establishments (VEE) are required to be accredited as a testimony for their quality of trainings they provide	To ensure the veterinary services provided are by qualified VP and VPP trained in recognized teaching institutions	Availability of professional registration and certification system (yes/No)		MoA
Indicator 32 Employee satisfaction on career structure, salary and incentives	this indicator intends to assess VP and VPPs' feelings on their career structure, monthly salary and incentive packages available to them	To understand, the motivational status and living conditions of VP and VPP under which they are discharging their duties and responsibilities	Levels of satisfaction of VP, VPP and CAHWs measured on a Likert scale of 5	by region, gender and qualification	survey respondents (VP, VPP, CAHWs)

Indicator 30: Proportion of professionals who received CPD or advanced training = professionals who received CPD or advanced training X100
Total number of professionals interviewed

Indicator 33: Likert scale: 1) not at all, 2) very little, 3) moderately satisfied, 4) adequately satisfied, 5) more than satisfied

Table 7. Input focus area 5. Stakeholder engagement and communication

Indicator	Description/definition	purpose	Measurement	Disaggregation	Data source
Indicator 33 Animal health information system	Designed and implemented to solicit, obtain, compile and manage data from different sources on animal health and disease and on factors that influence the health status of animals and animal population.	provide information to stakeholders with a need, right and obligation to know in order to take action for the maintenance of animal and public health, control and eradication of disease, and for the national and global good	Presence (yes/no) of unified user friendly animal health information system for -disease outbreak reporting -abattoir activity reporting -vet. diagnostic laboratory finding reporting -quarantine activity reporting	region, production system, service sector	farms, VC, AHP Abattoirs National and regional Labs other institutions having vet service related units and labs, quarantines
Indicator 34 Stakeholders' participation in disease reporting, disease control planning and implementation in the last 12 months	Active participation of the community, the local administration, livestock health and production related institutions and NGOs in selected disease (such as FMD, PPR, CBPP, Avian flu, etc) reporting, control planning and implementation campaigns is essential for the success of the planned activities. It alsoThis indicator describes engagement of the local administration, community representatives, NGOs and other relevant stakeholders in planning and implementation of selected disease control programs	To generate information on stakeholders' awareness on the importance of disease reporting and vaccinating animals To ensure that animal disease controls are strongly backed by relevant stakeholders	-Proportion of diseases/outbreaks reported by CAHWs or community representatives among all outbreaks -Number of disease control plans developed and implementation activities performed by involving relevant stakeholders	Region, production system, category of stakeholders	regional/district vet offices
Indicator 35 Investments contributed by donors, NGOs, Community or the local administration in the last 12 months	Participation of stakeholders in supporting infrastructure establishment/renovation, training and finance	To evaluate the level of support as a proxy measure to the need and importance of the services to the community	-Number of vet service stations and crashes constructed or renovated by the stakeholders -Number of professionals trained -Amount of financial support provided in cash or in kind	Region, production system, stakeholder category, type of support	Regional/district vet offices/local administration
Indicator 36 Stakeholder communication and awareness creation in the last 12 months	Presence of consistent tow way communication between stakeholders and the veterinary service providers enables shared understanding of and timely response to situations on the ground	To share information that enables timely and evidence based decision making and coordinated interventions on animal diseases	availability of effective communication networks or platforms (mobile SMS, telegram, established communication groups/team, etc.)	region, type of networks	district animal health offices

Indicator 34: Proportion of outbreaks reported by CAHW/com. representatives= No. outbreaks reported by CAHW/com. representatives X100
Total number of outbreaks reported

8.2. Process/Output indicators

Output indicators measure the immediate results of the veterinary service and tell us if activities are happening as planned.

Documenting outputs consists of counting the number and types of services each beneficiary receives. Measurements include number or percentage of beneficiaries; quantity of products supplied or accessed, timeliness of services, and satisfaction levels of beneficiaries.

Therefore, the focus areas selected to develop performance indicators include

- Basic veterinary clinical services
- Disease prevention and control services
- Veterinary laboratory services
- Regulatory inspection and veterinary public health services
- Quality control and residue monitoring of veterinary medicinal products and vaccine
- Animal welfare
- International trade

Table 8. Output focus area 1. Access to basic veterinary clinical and related services

Indicator	Description/definition	purpose	Measurement	Disaggregation	Data source
Indicator 37 Access to basic veterinary clinical services in the last 12 months	Veterinary clinical service can be provided by public or private service providers. This indicator assesses the accessibility of basic clinical veterinary services to beneficiary communities in a given area. It also allows to document the number of animals that have visited the animal health station or veterinary clinic for any kind of health problems in specified time period	This allows estimate how accessible is the veterinary service to the community and the distribution of VP and VPP in relation to the livestock population	This indicator measures: -Number of TLU with access to BVS/VP or VPP in charge -% of beneficiary respondents who have received at least one type of veterinary services at VC or AHP -Number of animals treated at VC and AHP	Gender, Service provider, Service location, Regional/district	CSA Regional and District vet offices Public /private VC, AHP
Indicator 38 Access to artificial insemination/bull services and pregnancy diagnosis in the last 12 months	AI and pregnancy diagnosis are other basic services required from the VP and VPP.	Such services contribute to enhancement of livestock productivity and satisfaction of the beneficiaries	-Number of improved bull or AI services provided -Number of pregnancy diagnostic services provided	Service provider, Service location, Regional/district	District Vet Service Public /private VC, AHP/ AI inseminators
Indicator 39 Quality of public and private clinical services in the last 12 months	This indicator assesses the quality of veterinary services provided by both public and private clinics/AHP. Quality measures include availability of treatment supplies, timeliness of services and success of services received (health improvement, AI conception rate, etc)	To provide quality clinical services	This indicator measures -beneficiary satisfaction (Likert scale of 5) regarding veterinary clinical services (availability of drugs, treatment success, timeliness) -beneficiary satisfaction (Likert scale of 5) on AI and PD services (availability of services, service success, timeliness)	Regional/District, Gender, Service provider	Questionnaire survey respondents
Indicator 40 Animal Health education and communication services in the last 12 months	Animal Health education and communication services are expected to enlighten animal owners on the importance of using animal health services, AI services, use of veterinary drugs from legal sources, risks of zoonotic diseases, animal welfare and prevention and control of diseases	To increase awareness of the community on the use of animal health services and ways of reducing animal health risks of economic and public health importance	This indicator measures: -% of respondents confirmed to have received at least one animal health education visit Beneficiary satisfaction on a Likert scale on the quality and importance of information received from CAHW or animal health extension workers	Regional/district Gender Production system	Questionnaire survey respondents
Indicator 41 Reduction in animal mortality due to diseases in the last 12 months	This indicator measures effectiveness of the veterinary service, based on testimonies of beneficiaries, in reducing animal mortality caused by major diseases	To ensure that the services provided have observable impact on livestock production	Changes in the number of animal mortality from disease problem	Region/district production system, Animal species	Randomized household survey respondents

Indicator 42 Improvement in recovery of diseased animals in the last 12 months	An effective veterinary service is expected to improve rate of recovery from diseases	To ensure that the veterinary intervention is effective to the satisfaction of animal owners	Proportion of animals recovered from illness after treatment	Region/district production system, Animal species	Randomized household survey respondents
Indicator 43 Reduction in the number of disease outbreaks in the last 5 years	This indicator indirectly measures the effectiveness of disease surveillance, investigation and responses. Hence, opinion on the trend of disease outbreak over time will be assessed	To ensure that preventive and control measures are effective	Judgment of respondents on the trend of number of outbreaks as measured by Likert scale (1-5)	Region/district production system, Animal species Disease type	VC and AHP professionals/VPP
Indicator 44 Increased number of animal welfare advocacy groups	Animal welfare is among major components of the veterinary service and international trade requirements. Adopting animal welfare protocols is a gradual process that grows with increased awareness through efforts of welfare advocacy groups, clubs and related associations	To ensure that awareness for animal welfare is increased among all stakeholders and at all levels	Number of active and functional animal welfare advocacy groups	Region/district Institutions or establishments Animal species	Farms, markets, abattoirs, research units Public and private institutions

Calculation

Indicator 37: % access to basic veterinary clinical services = $\frac{\text{number of respondents who received basic vet clinical service X100}}{\text{Total number of animal owners interviewed}}$

Indicator 39 and 40: Likert scale: 1) not at all, 2) very little, 3) moderately satisfied, 4) adequately satisfied, 5) more than satisfied

Indicator 40: Proportion of beneficiaries who received extension services = $\frac{\text{Number of respondents who received ext. services X100}}{\text{Total number of respondents interviewed}}$

Indicator 41: Changes in animal mortality from diseases = $\frac{\text{No. of animals died this year-No. died the previous year X100}}{\text{Number died the previous year}}$

Indicator 42: % of diseased animals recovered after treatment = $\frac{\text{Number of animals recovered X100}}{\text{Total number of Treated animals}}$

Indicator 43: Likert scale: 1) increasing, 2) no change, 3) slightly decreasing, 4) significantly decreasing, 5) no outbreaks in recent years

Indicator 44: % of establishments having animal welfare protocols = $\frac{\text{Number of establishments with animal welfare protocols X100}}{\text{Total number of establishments visited}}$

Table 9. Output focus area 2. Disease prevention and control services

Indicator	Description/definition	purpose	Measurement	Disaggregation	Data source
Indicator 45 Rate of disease reporting in the last 12 months	Disease reporting is a prerequisite for gathering data on the status of major diseases up on which intervention programs and allocation of resources are based This indicator assess the rate of disease reporting in a given area	To ensure animal disease reporting is regularly done and reaches the desired level of reporting	This indicator measures: Number of monthly disease reports submitted -Proportion of monthly disease reports supported by confirmatory diagnosis	Regional, district production system service provider	MoA, Regional/district vet offices
Indicator 46 Access to vaccination services in the last 12 months	For prevention and control of infectious diseases, vaccination services have major positive role. However, these vaccines must be accessed timely in desired quantities and quality. This indicator attempts to measure vaccine supply coverage for selected diseases (FMD, PPR, NCD, AHS, Anthrax)	To ensure that adequate vaccine coverage is achieved to deter disease outbreaks	Number of vaccine doses supplied to VC/AHP Number of vaccinated animals against a given disease (the value will be converted to % based on CSA livestock data) Number of beneficiaries of vaccination campaigns	Vaccine type, Animal Species, Region, district Service provider	Regional/District Vet Service offices NVI
Indicator 47 Disease outbreak investigation in the last 12 months	All priority disease reported from the field has to be further investigated and confirmed by laboratory tests so that accurate intervention is made	To ensure that control interventions are based on evidence.	This indicator measures: -% of disease outbreaks investigated among those reported -% of investigated reports with feedback to stakeholders	Regional/district production system, type of disease, Animal species.	MoA, Federal and Regional vet. labs
Indicator 48 Quarantine and border security services in the last 12 months	This indicator deals with inspection of live animals exported and imported as well as livestock products imported into Ethiopia. Based on animal and human health priorities, inspections and control activities are done in quarantine stations, airports or entry and exit border check points.	To ensure safe animal and animal products are exported or imported	-Number of livestock that have passed through quarantine centers and got certified for export purposes -Number of animals imported and have passed through quarantine/check points and got certified -quantity of livestock products inspected and certified to enter at port of entry	Animal species, import/export	MoA

Calculation

Indicator 45: Proportion of disease reported supported by lab tests = $\frac{\text{Number of confirmed reports}}{\text{Total number of disease reports}} \times 100$

Indicator 47: Proportion of disease outbreaks investigated = $\frac{\text{Number of investigated outbreaks}}{\text{Total number of outbreaks reported}} \times 100$

Table 10. Output focus area 3**.** Laboratory services

Indicator	Description/definition	purpose	Measurement	Disaggregation	Data source
Indicator 49 Diagnostic service provided in the last 12 months	The provision of fundamental diagnostic services is essential component of national veterinary services. This indicator deals with such services provided at the levels of National and Regional Veterinary laboratories or related institutions.	To ensure the quality of vet. Services provided, and build trust from local and international customers in the livestock value chain	-Number of parasitological and microbiological testes conducted for diagnostic purposes -Number of Serological testes conducted for diagnostic purposes -Number of molecular testes conducted for diagnostic purposes	Laboratory, type of diseases, Diagnostic method	National and Regional labs, District/Private Vet clinic labs, NVI
Indicator 50 Drug , microbial contaminants and chemical residue tests done in the last 12 months	Residues of chemicals and drugs are often considered as risks for public health and hence residue testing is often demanded from importers of livestock products. This indicator evaluates the level of residue testing services provided by legitimate laboratories.	To ensure safe livestock products are marketed	-Number of residue tests conducted -% of feedback given to customers among all sampling sessions/batch	Type of residue commodities tested	Eth. Agri. Authority
Indicator 51 Disease surveillance and monitoring in the last 12 months	Animal health surveillance and monitoring is a tool used to keep track of disease trends, facilitate the prevention and control of infection or infestation. This indicator deals with planned surveillance and monitoring activities conducted for nationally prioritized diseases.	To ensure early detection of diseases and support the national animal disease early warning system so that preventive measures are planned and implemented	-Number of disease for which regular surveillance and monitoring plans are available at federal or regional levels -Number of planed surveillance and monitoring activities conducted - Number of complete reports/risk maps submitted on planned surveillance activities	Region, production system, type of diseases	Relevant Federal and Regional offices
Indicator 52 Quality of veterinary laboratory services	The quality of veterinary diagnostic services is expressed in terms of the facilities they have, the technical capacity of personnel and implementation of good laboratory management system.	To ensure all test results released from a given lab are accurate and reliable	-Proportion of laboratories with accreditation for at least one test procedure -Number of tests for which the Lab is accredited -Proportion of labs implementing good laboratory management system	Laboratory, Test type	Federal and regional Labs

Table 11. Output focus area 4: Regulatory inspection and veterinary public health services

Indicator	Description/definition	purpose	Measurement	Disaggregation	Data source
Indicator 53 Farm inspection and certification services in the last 12 months	Ensuring farm biosecurity and monitor management and welfare of the animals through regular veterinary inspection is important. Farms such as feedlots, dairy, poultry and apiary should be officially registered and inspected	to ensure that animals and products originating from a given farm are healthy and are produced according to established standard	-Number of commercial feedlots, dairy and poultry farms registered by the regulatory body -% of registered commercial farms getting veterinary inspection -Number of farms qualified for veterinary certification	Region farm type (poultry, feedlot, dairy, etc)	Federal and Regional Agriculture offices
Indicator 54 Abattoir inspection and certification services in the last 12 months	Veterinary inspection of all abattoirs is a pre-requisite to producing safe and wholesome meat and meat byproducts. It includes inspection of sanitary conditions, functionality of equipment and utensils, waste management , overall biosecurity situations	To ensure production of safe and wholesome meat and meat byproducts it also ensures personnel and environmental safety	-Proportion of abattoirs inspected among authorized abattoir facilities -Proportion of abattoirs with ISO or HACCP certification	Region public/private domestic/export	MoA, Regional Vet service
Indicator 55 Meat inspection services by designated regulatory body in the last 12 months	Inspection of all animals to be slaughtered and carcasses after slaughter by qualified meat inspectors is a pre-requisite to supplying safe and wholesome meat and meat byproducts to consumers. As the outcome of the inspection can be either favorable or unfavorable, the inspectors should have the full independence to make evidence based professional decisions.	To ensure marketing of safe and wholesome meat and meat byproducts it also helps meet international quality requirements	-Proportion of abattoirs getting antemortem and post-mortem inspection services -volume of carcasses inspected -Satisfaction of meat inspectors on their independence to make professional decisions (Likert scale)	Region Abattoirs (Export and Domestic), species of animals slaughtered	Municipalities MoA, Questionnaire survey response from meat inspectors

Calculation

Indicator 50: % of lab test feedback given to customers= $\frac{\text{Number of sampling sessions/batch with feedback to customers x100}}{\text{Total number of sampling session/batch}}$

Indicator 52: Proportion of laboratories with accreditation = $\frac{\text{Number of labs accredited for at least one test procedure X100}}{\text{Total number of functional laboratories}}$

Indicator 53: Proportion of registered commercial farms = $\frac{\text{Number officially registered commercial farms X100}}{\text{Total number of commercial farms}}$

Indicator 54: Proportion of abattoirs with official vet. Inspection = $\frac{\text{Number of abattoirs inspected X100}}{\text{Total number of registered abattoirs}}$

Indicator 54: Proportion of abattoirs with ISO certification = $\frac{\text{Number of abattoirs with ISO certification X100}}{\text{Total number of registered abattoirs}}$

Indicator 55: Proportion of abattoirs with official meat inspection services = $\frac{\text{Number of abattoirs with meat inspection services X100}}{\text{Total number of registered abattoirs}}$

Indicator 55: Likert scale: 1) not independent, 2) little independence, 3) moderately satisfying, 4) satisfying, 5) more than satisfying (free)

Indicator 56:

- % Suppliers/vendors holding diverse groups of medicinal products= $\frac{\text{No. of suppliers/vendors having at least one product from each category X100}}{\text{Total number of suppliers/vendors studied}}$
- Proportion of medicinal products inspected = $\frac{\text{Number of lots of medicinal products inspected X100}}{\text{Total number of product lots produced or imported}}$

Indicator 57: Proportion of VP and VPP with knowledge of antimicrobial resistance = $\frac{\text{Number of VP/VPP with score of 5 and above X100}}{\text{Total number of VP/VPP interviewed}}$

Indicator 58: Proportion of vet. Clinics with a Pharmacist = $\frac{\text{Number of Vet. Clinics with a pharmacist X100}}{\text{Total number of vet. clinics included in the study}}$

Indicator 59: Proportion of beneficiaries who bought drugs from unauthorized sources = $\frac{\text{Number of beneficiaries with such experience X100}}{\text{Total number of beneficiaries interviewed}}$

Table 12. Output focus area 5. Veterinary medicinal products quality control and residue monitoring

Indicator	Description/definition	purpose	Measurement	Disaggregation	Data source
Indicator 56 Vet. Pharmaceutical supply's quality control services in the last 12 months	Availability and quality of veterinary pharmaceuticals is an integral part of the veterinary service provision. A supplier or drug vendor must have at least one products from each of the following categories: Antibiotics, Anthelmintics, Antiprotozoal, Acaricides, Anesthetics, supportive therapies	to ensure all veterinary drugs produced or imported are incorporate desired classes of products and are of good quality	-% of suppliers/vendors who have at least one drug or therapy from each of the six categories of medicinal products listed at the time of the study -Percentage of lots of medicinal products (locally produced or imported) inspected for quality	Supplier/producer Type/class of drugs	MoA observation on Supplier/producers
Indicator 57 Level of awareness on prudent use of vet. drugs	Once veterinary drugs are put on the market, professionals must apply rational drug use principles to minimize risks of drug resistance and residues in livestock products	To combat irrational use of drugs	-Proportion of animal health professionals aware of antimicrobial resistance, drug and chemical residue (VP, VPP, CAHWs)* Proportion of livestock keepers aware of antimicrobial resistance (AMR), drugs and chemical residue Proportion of consumers of foods of animal origin who are aware of AMR, drugs and chemical residue	professional qualification service provider (public/private)	Questionnaire survey response from VP, VPP, CAHWs
Indicator 58 Dispensing of veterinary drugs by trained personnel	veterinary drugs should be handled and dispensed by trained professional for the purpose	To ensure rational drug use	-% of veterinary clinics dispensing vet. drugs by a vet. Pharmacist	Region Service Provider	Questionnaire survey response from District agri. office
Indicator 59 Use of veterinary drugs from illicit sources in the last 12 months	Unauthorized handling of veterinary drugs is one of the sources of treatment failures and irrational drug use. If drugs are readily accessible from such sources, it may be a proxy indicator for the inadequate access from legal sources.	to indirectly assess how much accessible are veterinary drugs needed by animal owners from authorized sources	-% of beneficiaries who have bought vet drugs from illicit sources at least once	District, region, production system gender	Questionnaire survey response from beneficiaries

I-57* Awareness is measured based on 10 basic questions regarding (a) prudent use of drugs (3Q), (b) causes and impacts of drug resistance and residues (4Q), and (c) how to minimize risks of drug resistance and residues (3Q)

Table 13. Output focus area 6: Animal welfare

Indicator	Description/definition	purpose	Measurement	Disaggregation	Data source
Indicator 60 Animal welfare advocacy	This indicator deals with the promotion of humane treatment of all animals and educates the public about the ways that animals are abused, neglected or mistreated.	To ensure handling and management of animals meets acceptable standards	Presence of functional animal welfare advocacy groups at different levels (yes/No)	National, Regional, district	National, Regional, district
Indicator 61 Implementation of Animal Welfare principles along the livestock value chain	Animal welfare is becoming an integral part of animal production and international trade. Humane handling and proper management of animals is needed all along the value chain including at production, marketing, and transport and slaughtering stages.	To insure, animals under the custody of human beings are managed and handled by respecting animal welfare principles	-Availability of functional watering troughs and, loading and unloading ramps at major market places - Availability of functional feeding and watering troughs, proper housing, loading and unloading ramps at farm level -Availability and use of trucks specifically designed for animal transport -Availability of stunning facilities and procedure at abattoirs	Market Abattoir Animal species	Major LS markets, abattoirs
Indicator 62 Implementation of Animal Welfare principles in research facilities	Humane handling and proper management of animals is needed in research settings to ensure basic animal welfare principles are respected. This can be measured by availability of documents regarding this matter	To insure, animals under the custody of human beings are managed and handled by respecting animal welfare principles	-Availability of documented evidences for respecting animal welfare indicators in research settings (research ethics guideline, etc)	Institutions	Research institutes, Universities, Biomedical laboratories

Table 14. Output focus area 7: International trade

Indicator	Description/definition	purpose	Measurement	Disaggregation	Data source
Indicator 63 Pre-requisite practices for international trade in the last 12 months	Biosecurity practices enabling prevention and control of diseases of economic and food safety concerns are given significant attention. This entails animal movement control, implementation of LITS, establishment of disease free zones/compartments and animal health risk analysis and emergency response.	To ensure strong biosecurity and food safety principles are implemented along the LS value chain to enter and stay in the international markets	-Animal movement control is being practiced and LITS is being implemented (yes/No) -Disease free zone/ compartments are established (yes/No) -Risk analysis and emergency response plan is implemented at least for one major disease (Yes/No)	Federal Region Disease type	MoA Regional Offices Farms

8.3. Outcome/effectiveness indicators

Outcome indicators measure the intermediate changes as a result of the veterinary services provided. Monitoring outcomes tells us if activities are bringing about the intended intermediate changes. In all programmes, there is likely to be a wide variety of outcomes that are expected. Measurements include coverage of the services (the proportion of the target population that has been reached), the perception of beneficiaries on the positive changes that the services have brought about on the health and performance of their animals, and the extent to which the overall veterinary service has led to changes in knowledge, attitudes and practices among the target population.

Focus areas include

- Increased veterinary service coverage
- Improved livestock productivity
- Reduced public health risks of livestock and livestock products
- Increased trust from international trading partners and organizations
- Animal welfare protocols integrated in regulations and institutional documents

Table 15. Outcome 1. Increased veterinary service coverage

Indicator	Description/definition	purpose	Measurement	Disaggregation	Data source
Indicator 64: Area coverage of vet. Service in the last 12 months	This indicator is proposed to evaluate how much the veterinary service in its different forms is accessible throughout the country	To ensure that the service coverage is equitable and to the desired level	Number of kebeles or districts covered by: -basic vet. Services -vaccination services -artificial insemination services -Disease surveillance and outbreak investigation	Kebele, Woreda, zone/region	District/Regional vet. offices
Indicator 65: Animal population coverage of vet. Service in the last 12 months	This indicator is proposed to evaluate the proportion of livestock population getting veterinary service in its different forms	To ensure that the services are addressing all animals needing the service	Number of animals receiving the following services at least once -basic vet. Services -vaccination services -artificial insemination services	Kebele, Woreda, zone/region Service provider	District/Regional vet. Offices
Indicator 66 Increased awareness on basic animal health and welfare services in the last 12 months	It intends to measure the result of extension services given to the community. Awareness of LS owners will be measured by formulating five basic questions on the following issues: Importance of vet. Services, disease prevention and control, vaccination, AI services and zoonosis	To enhance community awareness on the importance of basic animal health services	% of animal owners who have awareness acquired from extension workers on at least one basic animal health and welfare issue	Region/District production system, Gender	Randomized household survey respondents

Calculation

Indicator 66: % respondents with basic animal health/welfare awareness = $\frac{\text{No. of respondents with awareness acquired from extension workers on at}}{\text{Total number of respondents}} \times 100$

Table 16. Outcome 2. Improved livestock productivity

Indicator	Description/definition	purpose	Measurement	Disaggregation	Data source
indicator 67 Increased number of cross-breed livestock in the last 12 months	Artificial insemination is one of the main services to increase number of high producing cross breed animals	To ensure increased production through breed improvement by AI service	Number of crossbreed/improved breed calves born	Region/district, production system Gender	CAHW/ anim. Health Ext. workers
Indicator 68 Increase in the volume of livestock products following vet service intervention	This indicator measures the short term contribution of the veterinary services to the improvement of LS outputs such as milk, meat (body weight change), egg, wool etc. LS in this context also includes poultry	To ensure that the services provided are to the level appreciated by the livestock owners	Satisfaction level of respondent veterinary service receivers as measured by Likert scale of 5	Region/district production system, Gender of respondents	Randomized household survey respondents
Indicator 69 Improved work animal efficiency following vet service intervention	This indicator measures the short term contribution of the veterinary services to the improvement of efficiency of working animals such as oxen, equine and camels	To ensure that the services provided are to the level appreciated by the animal owners	Satisfaction level of respondent veterinary service receivers as measured by Likert scale of 5.	Region/district production system, Gender of respondents	Randomized household survey respondents
Indicator 70 Improved marketability of livestock following vet service intervention	This indicator measures the short term contribution of the veterinary services for improving marketability of livestock including poultry. It is assumed that healthy animals will have good body conformation and better market value	To ensure that the services provided are to the level appreciated by the animal owners	Satisfaction level of respondent veterinary service receivers as measured by Likert scale of 5.	Region/district production system, Gender of respondents	Randomized household survey respondents

Calculation

Indicator 68-70: Likert scale: 1) Not satisfied 2) Rarely satisfied 3) Neutral 4) Satisfied 5) Very much satisfied

Table 17. Outcome 3. Reduced public health risks of livestock and livestock products

Indicator	Description/definition	purpose	Measurement	Disaggregation	Data source
Indicator 71 Reduced incidence of exotic disease introduction into Ethiopia in the last 12 months	veterinary control at port of entry and border check points is expected to reduce entry of exotic diseases of economic and public health significance through import of live animals and livestock products	To ensure that an effective sanitary control system is in place at ports of entry and check points	Number of incidences of exotic disease entry into Ethiopia	Live animal, Meat and meat byproducts	MoA
Indicator 72 Reduced incidence of complaints from importers on safety of LS and LS products exported in the last 12 months	This indicator deals with supply of safe and good quality livestock products by taking all necessary measures from production to marketing. If desired safety and quality standards are met, customer complaints regarding this matter are expected to be reduced.	To ensure customer satisfaction by supplying safe and quality livestock products	Number of incidences of livestock and LS products rejection/recall	Live animal, Meat and meat byproducts	MoA Export abattoirs

Table 18. Outcome 4. Increased trust from international trading partners and organizations

Indicator	Description/definition	Purpose	Measurement	Disaggregation	Data source
Indicator 73 Increased number of laboratories with certified diagnostic capacities	This indicator emphasizes on the need for quality certified diagnostic services.	To ensure that all diagnostic services are conducted by qualified laboratories	Number of labs that has got acceptance by international organizations Number of labs that has got recognition from international customers to conduct a specific test for export of products	Federal and regional labs	Federal and regional labs
Indicator 74 Increased volume of livestock and LS products provided to export markets in the last 12 months	It is believed that, strong veterinary services enable maintenance of health and quality of livestock. This in turn allows to increase the number of livestock and the volume of their products exported	To ensure that export of safe and quality LS and LS products increased in volume	% increase in number of LS legally exported % increase in the volume of meat and meat byproducts exported	LS species type of LS products	MoA
Indicator 75 Reduced number of international trade bans on LS and LS products in the last 5 years	This deals with trade bans due to incidences of disease outbreaks which have the potential to be transmitted through LS and LS products to importing countries.	To enable maintenance of trust from trading partners	Number of trade bans imposed on Ethiopian LS and LS products	Year Type of product	MoA

Calculation

Indicator 74. % Change in number of LS exported= $\frac{\text{No. exported in the year of study-No. exported the previous year}}{\text{Number exported the previous year}} X100$

Indicator 74. % Change in volume of LS product exported= $\frac{\text{Vol. exported in the year of study-No. exported the previous year}}{\text{Vol. exported the previous year}} X100$

Table19. Outcome 5. Animal welfare

Indicator	Description/definition	purpose	Measurement	Disaggregation	Data source
Indicator 76 Increased adoption of animal welfare management plan along the livestock value chain and in relevant units	Animal welfare is among major components of the veterinary service and international trade requirements. Respect for animal welfare has to be integrated in all functions of establishments and institutions dealing with animals Such establishments may include: farms, market places, quarantine centers, animal transport companies, abattoirs, research and teaching institutions	to ensure that animal welfare principles are adopted by all stakeholders	-% of establishments that have integrated animal welfare protocols in their operational guidelines	By animal handling institutions/establishments (Farms, abattoirs, markets, research centers)	Farms, markets, abattoirs, research units

Calculation

Indicator 76: % establishments with animal welfare protocols= $\frac{\text{No. of establishments with approved functional welfare protocol}}{\text{Total number of establishments visited}} x100$

PART FOUR

9. RECOMMENDED DATA COLLECTION AND ANALYSIS METHODS

9.1. Data source

It would take meticulous preparation and execution to gather survey data for the subject of "Methodological Framework (National Indicators) to Measure Veterinary Service Coverage of Ethiopia" in order to guarantee that accurate and representative data is collected and meaningful conclusions are reached. Determining the target population and specific data sources should be done prior to data collection. The target sources of data or information span from relevant federal offices such as the Ministry of Agriculture and the Central Statistical Agency to the front line animal health personnel and animal holding households. After the target population or data source is determined, a survey instrument must be created in accordance with the key performance indicators and measurements outlined in this methodological framework.

9.2. Data collection

Some of the relevant information such as livestock statistics, contents of policies and regulatory frameworks can easily be accessed through document review from the web or pertinent offices. The sampling technique recommended here focuses on household surveys. However, it is equally applicable to specific groups such as professionals, Veterinary clinics and animal Health Posts etc. According to Njuki et al (2011)[77], experience of smallholder farming systems in Africa and Asia indicates that veterinary service coverage may vary based on gender, Region, animal resource, production systems, and etc. factors.

Generally, stratified and cluster sampling techniques are recommended to be used so that the samples are representative and data to be generated are reliable. For example, areas can be first stratified by administrative regions or production systems. Then within the Region, a 2-stage cluster sampling could be employed such that districts are selected at random and then households are selected in the same manner in the second stage. As per the above literature, it is recommended to maximize the number of clusters and minimize the number of households within a cluster, while ensuring that the households will give sufficient precision of variables within the cluster. Sample size calculations using any of these methods are usually based on population data from secondary sources such as a census. To identify actual households to survey, it is recommended to use community population list (from District administrative offices).

[77] *Njuki,J., Poole, J., Johnson, N., Baltenweck, I., Pali,P., Lokman , Z., Mburu, S. (2011). Gender, livestock and livelihood indicators*

Key identification variables should be collected in all surveys. These are used to locate (in time and space) each observational unit and to provide the linkage information needed for data management and analysis of the data. Every household included for data collection should have a unique identifier/code and linked to the location information about the household. Households having animals including pets, livestock, poultry are of prime choice.

9.3. Data Analysis

In order to identify significant trends and discoveries, it is crucial to carefully review the data collected after the survey is finished. This framework combines qualitative and quantitative research methods to address research questions from multiple angles. It involves collecting both numerical data (though surveys) and non-numerical data (through interviews, observations and document analysis). Quantitative data will be analysed using appropriate statistical software. Quantitative measures use numerical summaries such as percentages, rates, or absolute numbers. These measures are commonly used as indicators of inputs/activity and output. Qualitative measures provide a detailed description of complex phenomena based on interviews, documents or other sources of narrative information. This analysis can be carried out using statistical software and other data analysis methods. Qualitative data obtained through interviews, observations, etc. should be analysed using the thematic qualitative data analysis method.

10. CONCLUSION

The development of a methodological framework for measuring veterinary service coverage in Ethiopia is a crucial step towards ensuring the provision of quality animal health services across the country. So far, apart from sporadic attempts to assess veterinary services of the country through a very narrow scope, no organized evaluation of the national veterinary services has been conducted. Such assessments should be in line with the approach widely employed by the world animal health organization. In this regards, this work has drafted SMART performance indicators by approaching the national veterinary service through three major lenses; input, output and outcomes.

A number of relevant inputs needed to discharge veterinary service activities were considered in the input indicator section vis-à-vis the intended measurable outputs and outcomes to be achieved. Disaggregation of measurements is expected to clearly identify areas of strengths and weaknesses especially with regards to regional coverage, production system, gender parity and status of service providers (public/private, veterinary clinics/animal health posts, Veterinary professional/veterinary paraprofessionals/CAHW).

The proposed performance indicators are evidence-based, efficient, and easily implementable by the relevant stakeholders. The successful implementation of the proposed framework will have significant positive impacts on the animal health services by ensuring that the animal health services are accessible, affordable, and of desired quality, thereby improving the health and well-being of both the animals and humans and pave way to boosting international trade of livestock and livestock products.

Annex I: Weighted share of each performance indicator

INDICATORS	% weight
Input indicators	
Indicator 1: Existence of Animal Health policy/strategy	1.50
Indicator 2: Existence of proclamation/regulation governing veterinary service	1.50
Indicator 3: Existence of proclamation/regulation governing meat inspection and food hygiene	1.00
Indicator 4: Existence of proclamation/regulation governing animal disease prevention and control	1.00
Indicator 5: Existence of proclamation/regulation governing farm inspection, vaccination and compensation	1.00
Indicator 6: Existence of proclamation/regulation governing veterinary drug and animal feed quality control and residue monitoring	1.00
Indicator 7: Existence of proclamation/regulation governing livestock and LS product marketing	1.00
Indicator 8: Existence of standards/guideline for farm inspection and LS marketing	1.00
Indicator 9: Existence of standards/guidelines for abattoir and meat inspection	1.00
Indicator 10: Existence of standards/guidelines for veterinary clinical services	1.00
Indicator 11: Existence of standards/guidelines for veterinary diagnostic services	1.00
Indicator 12: Enabling organizational structure and functional units	1.00
Indicator 13: Functional integration of veterinary service	1.00
Indicator 14: Availability of functional* public and private veterinary clinics (VC) and animal health posts (AHP)	2.00
Indicator 15: Availability of functional facilities and equipment	1.50
Indicator 16: Availability of functional utilities and transport	1.00
Indicator 17: Number of registered abattoirs	0.50
Indicator 18: Abattoir facilities and transport	1.50
Indicator 19: Availability of input supply chain	1.00
Indicator 20: Availability of functional veterinary laboratories	1.50
Indicator 21: Availability of functional facilities and equipment in Veterinary laboratories (VL)	1.00
Indicator 22: Animal Health Research	1.00
Indicator 23: Adequacy of trained personnel for clinical and diagnostic services	2.00
Indicator 24: Adequacy of trained personnel for quarantine and border/port check point service and meat inspection	1.00
Indicator 25: Adequacy of trained personnel for animal health research and regulatory services	1.00
Indicator 26: Budget allocation for core vet. services in the last budget year	2.50
Indicator 27: Budget allocation for disease prevention, control and emergency response	2.00
Indicator 28: Budget adequacy for essential service delivery in the last budget year	2.00
Indicator 29: Opportunity for capacity building trainings relevant to the specific job	1.00
Indicator 30: Capacity building trainings offered in the last 12 months	1.00
Indicator 31: Professional licensing and accreditation system	1.00
Indicator 32: Employee satisfaction on career structure, salary and incentives	1.00
Indicator 33: Animal health information system	1.00

Indicator 34: Stakeholders' participation in disease reporting, disease control planning and implementation in the last 12 months	1.00
Indicator 35: Roles taken by donors, NGOs, Community or the local administration in the last 12 months	0.50
Indicator 36: Stakeholder communication and awareness creation in the last 12 months	1.00
	43%
Output indicators	
Indicator 37: Access to basic veterinary clinical services in the last 12 months	2.00
Indicator 38: Access to artificial insemination and pregnancy diagnostic services in the last 12 months	1.00
Indicator 39: Quality of public and private clinical services in the last 12 months	1.50
Indicator 40: Animal Health education and communication services in the last 12 months	1.50
Indicator 41: Reduction in animal mortality due to diseases in the last 12 months	2.00
Indicator 42: Improvement in recovery of diseased animals in the last 12 months	1.50
Indicator 43: Reduction in the number of disease outbreaks in the last 5 years	1.50
Indicator 44: Increased number of animal welfare advocacy groups	1.00
Indicator 45: Rate of disease reporting in the last 12 months	2.00
Indicator 46: Access to vaccination services in the last 12 months	2.00
Indicator 47: Disease outbreak investigation in the last 12 months	1.50
Indicator 48: Quarantine and border security services in the last 12 months	1.00
Indicator 49: Diagnostic service provided in the last 12 months	1.50
Indicator 50: Drug , microbial contaminants and chemical residue tests done in the last 12 months	1.00
Indicator 51: Disease surveillance and monitoring in the last 12 months	1.50
Indicator 52: Quality of veterinary laboratory services	2.00
Indicator 53: Farm inspection and certification services in the last 12 months	1.50
Indicator 54: Abattoir inspection and certification services in the last 12 months	1.50
Indicator 55: Meat inspection services by designated regulatory body in the last 12 months	2.00
Indicator 56: Vet. Pharmaceutical supplies quality control services in the last 12 months	1.00
Indicator 57: Level of awareness on prudent use of vet. drugs	1.00
Indicator 58: Dispensing of veterinary drugs by trained personnel	1.00
Indicator 59: Use of veterinary drugs from illicit sources in the last 12 months	1.50
Indicator 60: Animal welfare advocacy	1.00
Indicator 61: Implementation of Animal Welfare principles along the livestock value chain	1.00
Indicator 62: Implementation of Animal Welfare principles in research facilities	1.00
Indicator 63: Pre-requisite practices for international trade in the last 12 months	2.00
	39%
Outcome indicators	
Indicator 64: Area coverage of vet. Service in the last 12 months	1.5
Indicator 65: Animal population coverage of vet. Service in the last 12 months	1.5
Indicator 66: Increased awareness on basic animal health services in the last 12 months	1.5
Indicator 67: Increased number of cross-breed livestock in the last 12 months	1

Indicator 68: Increase in the volume of livestock products following vet service intervention	2
Indicator 69: Improved work animal efficiency following vet service intervention	2
Indicator 70: Improved marketability of livestock following vet service intervention	2
Indicator 71: Reduced incidence of exotic disease introduction into Ethiopia in the last 12 months	0.5
Indicator 72: Reduced incidence of complaints from importers on safety of LS and LS products exported in the last 12 months	1.5
Indicator 73: Increased number of laboratories with certified diagnostic capacities	1.5
Indicator 74: Increased volume of livestock and LS products provided to export markets in the last 12 months	0.5
Indicator 75: Reduced number of international trade bans on LS and LS products in the last 5 years	1.5
Indicator 76: Increased adoption of animal welfare management plan along the livestock value chain and in relevant units	1
	18%
Total	**100**