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Animal Health Service Delivery in Ethiopia: A Review

Mustafe Abdi Ahmed [a,b++*], Ahmed Hasan Hussen [a++], Bashir Mohamed Bashir [a#] and Abdilahi Saleban Ibrahim [a#]

[a] College of Veterinary Medicine, Jigjiga University, P.O. Box 1020, Jigjiga, Ethiopia.
[b] Department of Animal Science, Faculty of Agriculture and Environment, Amoud University, Borama, Awdal Region, Somalia.

Authors' contributions

This work was carried out in collaboration among all authors. Author MAA conceptualization, designing the article, formal analysis, wrote the original draft. Author AHH formatting the article and critically revised its important intellectual content. Authors BMB and ASI conceptualization, writing review and editing and finally validate the submitted version. All authors read and approved the final manuscript.

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Review Article

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ABSTRACT

Ethiopian livestock population has reached about 52 million cattle, 33 million Sheep, 30 million goats and 2.5 million camels. The livestock sub-sector contributes an estimated 12% of the total and over 45% to the agricultural gross domestic product (GDP). However, the benefits derived from livestock are far below the existing potential. While many factors are attributable to the problem, livestock diseases remain the most important constraint to the development of the subsector. This is because livestock diseases are distributed across all agroecological zones of the country. In addition, the Ethiopian Government is building two standard quarantine stations in strategic locations closer to the seaports of Djibouti and Berbera. APHRD is also introducing hazard analysis critical control point (HACCP) systems in two model abattoirs, namely, Mojo Modern and Luna. The two export abattoirs are expected to be accredited for HACCP at international levels.

[++]DVM, MSc Assistant Prof;
[#]DVM;
**Corresponding author: Email: aburaa62@gmail.com;*

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1. INTRODUCTION

"In Ethiopia, the agricultural sector is a corner stone of the economic and social life of the people. The sector employs 80-85 percent of the population and contributes 40 percent to the total GDPs" [1]. "Livestock production, as one component of agriculture, covers 40 percent of agricultural output and it also plays an important role in the national economy as it contributes 13-16 % of the total GDP" [2,3]. "Over 85% and 90% of the farm and pastoral incomes, respectively, are generated by or from livestock" [4].

"Ethiopian livestock population has reached about 52 million cattle, 33 million sheep, 30 million goats and 2.5 million camels and it is the largest in Africa" [5]. "Even though the livestock subsector contributes much to the national economy, its development is hampered by different constraints. These include rampant animal diseases, poor nutrition, poor husbandry, poor infrastructure, and shortage of trained manpower" [6]. "Animal health service delivery has been shown to cover only 30% of the country's population. This low service coverage is attributed to lack of personnel, shortage of drugs and equipment, poor mobility and highland oriented animal health service delivery. Regarding to vet personnel in the public sector, there are 446 vets, 947 animal health assistants, 3436 animal health technicians and 277 other meat inspectors and laboratory technicians" [7]. "Community-based animal health programme has been considered as the only alternative way of delivering animal health service in pastoral and remote areas of the country. Subsequently, government and non-government organizations (NGOs) have developed community-based animal health projects in Ethiopia, particularly in pastoral areas of the country" [8]. "A total of 1512 community-based animal health workers (CAHWs) have been known so far who have been trained by the government and NGOs, of which the share of NGOs is 47%. Services that have been delivered by CAHWs included, vaccination, deworming for internal parasites, spraying for external parasites, close castration, minor surgical treatments and report disease outbreaks. In spite of the fact that CAHWs activity is expanding, the impact assessment of the activities has not been compared with the modern veterinary services" [9].

"Inadequate feed supply, high prevalence of animal diseases, poor animal genetic resources and poor marketing are the main bottlenecks for the development of the livestock sector" [3]. "Nevertheless, animal diseases remain as one of the most important constraints to livestock development since they are distributed across all agro- ecological zones of the country. Some trade limiting diseases occur in Ethiopia. These diseases are disrupting subsistence farming and also hampering the export of animal and animal products. Ethiopia is officially declared free from rinderpest by the International Animal Health Organization (OIE) as of May 2008" [10].

Ethiopian Veterinary Service is organized as Federal APHRD of MoA and Regional services. APHRD has two sections, Epidemiology and Disease Control; and Quarantine, Inspection and Public Health. Recently, the task of controlling and administering veterinary drugs and biological products is transferred from Drug Administration and Control Authority to MoA and APHRD will most probably have a veterinary products control body which will also be responsible for registering animal feed [10]. "The Regional Veterinary Services, which are under Bureaus of Agriculture, are organized as field and laboratory services. NAHDIC is currently under MoA with a mandate primarily for national diagnostic and referral laboratory services. Development of the Federal Veterinary Service from a Team to a level of APHRD and transfer of NAHDIC to MoA are seen as major steps forward for strengthening the country's animal health services. The National Veterinary Institute produces and supplies most of the vaccines needed in the country as well as an occasional surplus for export. The NVI is managed as a government enterprise and operates on a cost-recovery basis" [4].

Legislation for livestock disease control is based mainly on the Animal Diseases Prevention and Control Proclamation of 2002. Detailed regulations that will allow application of the law is being developed [11]. To continue meeting the changing needs of farmers, pastoralists, private operators importing countries and other stakeholders, Ethiopian Veterinary Service is exerting all the required efforts to continually enhance its surveillance, disease detection and reporting and emergency management systems to prevent, control and/or eradicate trans-boundary animal diseases (TADs) [10].

To curb the problem, animal and plant health regulatory directorate (APHRD), national animal

health diagnostic and investigation center (NAHDIC), national veterinary institute (NVI), Regional animal health services, Regional veterinary laboratories (RVL) and national tsetse and trypanosomosis investigation and control center (NTTICC) are carrying out livestock disease surveillance, prevention, control and eradication activities. At national level, disease outbreak reporting rate is still below the minimum requirement of the OIE for expanding international trade for livestock and livestock products. To address the issue, APHRD has prepared a national strategy and also signed memorandum of understanding with all regions to improve disease surveillance and reporting. In order to strengthen livestock disease surveillance, prevention, control and eradication efforts and ensure food safety, APHRD has prepared a total of four proclamations and six subsidiary laws. As regards to export trade of livestock and livestock products, APHRD has developed a certification system based on the concepts of "Compartmentalization" and "Commodity Based Trade".

Therefore, the objectives of this review paper include;

- ❖ To review the systems of animal health service delivery in Ethiopia.
- ❖ To overview the impact of community-based animal health workers' activities on the general livestock diseases.

2. ANIMAL HEALTH SERVICE IN ETHIOPIA

2.1 Development of General Animal Health Services

"Traditional veterinary service is believed to have been in practice in Ethiopia long ago however, it is difficult to indicate the exact date of its beginning. Traditional healers (Wegeshas) used to treat both human and animal patients through drenching of herbal drugs, incising and cauterizing of abscesses and wounds using sharp objects and hot metals, mending fractures and rehabilitating dislocations. Such practices still exist in some parts of the country" [12].

"Modern veterinary services started relatively recently in Ethiopia. A French Veterinary Mission began providing veterinary services in 1908. During its occupation of Eritrea, and later other parts of the country from 1936-41, the Italian army was treating equines used in its cavalry unit. Moreover, it established a laboratory around Kechene Medhanealem, in Addis Ababa, where some vaccines were produced" [12].

"The progress of veterinary services was slowed down for a while after the Italians were forced out of the country. However it was later decided that the Ministry of Agriculture should take over the laboratory. Thus, the first Ethiopian veterinarians took the responsibility for providing animal health services. British experts were invited to the country and Ethiopians professionals were trained at home and some were sent to East Africa to get training in laboratory techniques and vaccine production. In addition to 250 vaccinators were trained by the Point four-aid organization of the USA and were later assigned to serve in the various provinces of the country" [13]. "A considerable leap in vaccine production, research and disease investigation has been manifested after the 1950s. The reasons for these developments include the gradual return back of Ethiopians after acquiring high-level veterinary training abroad and the establishment and functioning of the National Veterinary Institute and the Animal Health Assistants School through financial and technical cooperation of the American and French governments and the food and agricultural organization (FAO)" [14].

"The National Veterinary Institute has been fully engaged in the production of vaccines and provided most of the diagnostic services in the country until the first regional laboratories were constructed in the 1970s and developed in the 1980s. The Institute of Animal Health Assistants also gradually increased the number of sub-professional graduates to a maximum of 80 per year after a two years programme of studies" [15]. "The Faculty of Veterinary Medicine of the University of Addis Ababa has been operating since 1979 and 2530 students graduate each year following a 6-year training cycle. Thus, the modern veterinary service that started in the 1900s showed slow progress in the first fifty years. Following this it has shown progressive improvement and at present fast change is observed in areas of manpower, infrastructure, material and financial build up. Within the past decades over 500 veterinarians, over 1000 Animal Health Assistants and over 4000 Animal Health Technicians have been trained. It is well known that for proper delivery of veterinary services, adequate manpower should be available. 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" [16].

"In 1993, Ethiopia was decentralized into 14 regional states, which also resulted in the decentralization of animal health services except for the nationally sponsored vaccination campaign and disease prevention measures" [17]. "The veterinary service of the country has been organized both in the federal, as well as regional levels. In the federal, it is structured under animal and fisheries resources development and regulatory department and in the region; it is organized under regional states" [7].

According to the workshop organized by [18], "the MoA of Ethiopia has established the following main duties and responsibilities for federal veterinary service".

- Formulation of appropriate national policies, strategies, programmes, and projects for veterinary service and preparation of up to date veterinary proclamations, regulations and directives and their amendments in light of new developments.
- Coordination and implementation of the control of main transboundry diseases targeted for national control/eradication and preparation of national animal disease emergence preparedness and contingency plan and establishment of an epidemic surveillance system.
- Securing an animal budget for the purchase of vaccine against OIE list A diseases and development of various alternative models for national delivery of veterinary services.
- Issuance of certificates of competence for veterinary drug importers before they obtain a business license and insuring the quality, safety and efficacy of veterinary drugs and biological products and responsibility for the issuance of international animal health and zoo-sanitary certificates for animals, animal products and byproducts exported out of the country and
- Responsibility for the quarantine and inspection of animals, animal's products and byproducts imported in to the country, and centre for animal health information and provide technical inputs.

MoA of Ethiopia with collaboration of [18], has identified the main duties and responsibities of the regional veterinary service as follows;

- Designing and implementing regional livestock diseases and executing federal different control/eradication programmes against major transboundry diseases in their respective regions.
- Providing veterinary public health service to insure wholesome meat and livestock products for human consumption and providing a diagnostic service for livestock diseases.
- Establishing effective, passive and active disease surveillance system through the involvement of all relevant actors and training of all zones and woredas animal health staffs in livestock diseases control and in disease reporting.
- Training of CAHWs and AHT and issuance of certificates of competence for those who want open veterinary clinics, animal health posts, drug shops and pharmacy as a requirement for obtaining business licenses.
- Deliver clinical service through a network of clinics and animal health post and improve the quality and coverage of public veterinary service through construction of veterinary clinics and animal health posts, equipping the clinics with basic clinical and field equipment and supplying vaccines and drugs.

The disease situation in Ethiopia is alarming. Out of the first diseases classified as list A by the OIE, seven of them are endemic in Ethiopia. These are Contagious Bovine Pleuropneumonia, Lumpy Skin Disease, Foot and Mouth Disease (FMD), Newcastle Disease, Peste des Petits Ruminants, sheep and goat pox and African Horse Sickness. Furthermore, there are other diseases that are economical important including Contagious Caprine Pleuropneumonia, trypanosomosis, anthrax, blackleg, hemorrhagic septicemia and brucellosis.

"The wide spread prevalence of these diseases in the country has different effects like slow growth, difficult access to markets, reduction of quality of hide and skins. It has been estimated that the direct loss due to mortality is 8-10% for cattle, 14-16% for sheep and 11-13% for goats" [7]. "Veterinary services are provided at clinical

centers by a woreda offices which are managed with veterinarians and sub clinics at locations, managed by animal health assistants and animal health technicians (AHA/AHT)" [6].

2.2 Veterinary Manpower and Infrastructures

"The statistics of the veterinary personnel of Ethiopia has shown that, there are 500 veterinarians, 800 AHAs, and 3000 AHTs in the public sectors. In the private sectors, there are 57 veterinarians, 58 AHAs and 102 AHTs in the private sectors" [7]. "Since 1979, the faculty of veterinary medicine of AAU graduates 16-30 veterinarians per year. The faculty also trains AHAs who are recognized as major workforce in veterinary service delivery in the country. The AHAs are trained for 2 years and annually around 80 AHAs are graduated. AHTs however, are trained 9 months at regional training centers. As far as training uniformity is a concerned, all veterinary professionals are trained on definite national curriculum" [17].

"According to the MoA public veterinary service management, the veterinary structure of the public sector is composed of 937 clinics, 650 animal health posts (AHPs), 10 RVLs, one vaccine production centre (NVI), one tsetse and trpanosomosis investigation centre (NTTICC) and one animal health research and referral centre (NAHDIC). In the private sector, there are 64 clinics, 21 AHPs, 164 drug shops, 127 drug importers, and 70 clinics with drug shops" [7].

"There are three categories of animal health workers, namely, Veterinarians, Animal Health Assistants and Animal Health Technicians. Through selection and further training, veterinarians are upgraded into Research Officers; Animal Health Assistants into Meat Inspectors and Laboratory Technicians; Animal Health Technicians into Assistant Laboratory Technicians, Assistant Meat Inspectors and Artificial Insemination Technicians" [6].

2.3 Animal Health Projects and Service Units

According to [7], a number of animal health projects are functional in Ethiopia today that include; Pan African Renderpest Campaign (PARC), Rift valley Fever Project, National Livestock Development Project, Pan African Programme for the control of Epizootics (PACE), Farming In Tsetse controlled areas and Quality and sanitary aspects of animal products, feasibility study for establishing disease free zone.

The epidemiology unit of the veterinary service is performing disease reporting activities. The unit collects passive and active data. Annual vaccination and treatment are entirely carried out by regional veterinary services, while, a cost of vaccine for list A diseases is covered by the federal government [7].

2.4 Primary Animal Health Care

Primary animal health care activities have been started since 1976 by the World Bank fund project in the Borena region [19]. However, the lack of trained manpower and inadequate operational government funds coupled with lack of infrastructures resulted in poor veterinary services in the remote areas of the country. Thereafter, community-based animal health programme has been accepted in Ethiopia to complement the existing veterinary service because the public service has been plagued by many problems such as inadequate manpower and logistical inputs and poor communication facilities. Moreover, the few public clinics present in the country are located in the major towns and provide services mostly to cattle owners residing in and around these towns [17].

Curatives and preventive services have been documented not to be available to the vast majority livestock owners in pastoral areas of the country. The problem has been more aggravated not only by shortage of staff but also by inadequate operational budget for animal health services compared to the magnitude of the disease problem in the country. Besides, staff mobility has been very limited and only occasionally do staffs venture outside clinics to investigate outbreaks and render services. Therefore, the needs for the community animal health programme increasing rapidly. To date 1494 CAHWs have been trained by different institutions [20].

Table 1. Number of animal health staff in the public veterinary services

No	Region	Professional Category				Total
		DVM	AHAs	AHTs	Others	
1	Tigray	24	34	126	11	195
2	Afar	8	9	120		137
3	Amhara	138	232	773	37	1180
4	Oromiya	140	280	1163	153	1763
5	Somali	18	56	297		386
6	Benshangul G.	7	17	157		181
7	SNNP	75	275	674	16	1040
8	Gambella	5	7	81	6	99
9	Harrari	2	4	5	4	15
10	Dire-Dawa Adm.	9	16	33	19	77
11	Addis Ababa Adm.	13	22	7	24	66
12	Federal/MOA	7			7	14
	Total	446	945	3436	277	5104

Source: [18]

The federal MoA animal policies have recognized CAHWs as primary health providers and much is undertaken by the PACE project. Training of trainers manuals and training curriculum on the community-based animal health workers developed by PACE project [20]. No policy or legislation concerning the use of primary animal health care exists in Ethiopia. Nevertheless, the government veterinary service have been using this approach in many of its projects such as PARC [21], the Afar Pastoralist Development Project, the Third and Fourth Livestock Projects and South Eastern Range land Project [22].

Nowadays, primary animal health care has however become an area of discussion and dispute within the veterinary profession at a number of professional veterinary association meetings and national workshops [17].

In the past years various governmental and non-governmental organizations have been actively involved in the training of “paravets”, to improve a community's access to essential veterinary drugs and services. There was no standard naming for such trainees. The following names were the most commonly used in Ethiopia: Vet Scouts, Paravets, Community Veterinary Agents, Farmers Animal Health Representatives and CAHWs. Both the government and NGOs are involved in the training of CAHWs. The CAHWs trained by government projects are 802 in number and are located in Somali and Benishangul regions and Borana and South Omo zones. The NGOs have so far trained 708 CAHWs from all the pastoralists regions. This makes the total number of recently trained CAHWs to 1510 [23].

Why community-based animal health services delivery in pastoral areas of Ethiopia?

Animal health service provision has always been dominated by the public sector, and is still the case today and, even now; more than 90% of veterinary staff is working in government service. Federal and regional government's veterinary services are responsible to oversee the quality and standard of animal health service. The federal animal health service has retained policy-making and regulatory functions and has relinquished service delivery to the regions. Regional services are provided through clinics and animal health posts. Ministry of Agriculture guidelines direct that clinics should be staffed by veterinarians, AHAs and AHTs and that health posts should be staffed by AHTs. These staffing levels are far from being met. MoA records show that there is almost twice the number of clinics as there are vets and there are severe shortages also in the other staff categories [24].

Curative and preventive services are presently not available to the vast majority livestock owners in pastoral areas of Ethiopia. The few public clinics present are located in major towns and provide services mostly to cattle owners residing around these towns. The animal health staffs in these areas are small in number and cannot cover such a vast area and adequately address the veterinary needs of livestock keepers [25]. Besides, government staffs need

adequate mobile facilities, for which currently the government does not have the capacity to provide. The problem is not only the shortage of staff but also inadequate operational budget for animal health services compared to the magnitude of the disease problems in the country. Staff mobility is very limited; only occasionally do staffs venture outside their clinics to investigate outbreaks and render services. Furthermore service delivery is extremely difficult as the community and the animals are on the move throughout the year. Therefore, the poor public animal health services delivery in the pastoral areas of Ethiopia are related to lack of finance, manpower, cultural and professional biases against pastoralists [26].

2.5 Veterinary Privatization

Currently, participation of the private sector in the delivery of veterinary services is occurring at an increasing rate. However, most of the participants are geared towards operating drugs shops and importation of veterinary pharmaceuticals, while clinical or diagnostic services are very minimal and are operative in and around Addis Ababa where there are commercial livestock farms [23].

2.6 Constraints in Veterinary Services

According to [23], the stumbling blocks that hindered the further development of veterinary services are many. The major ones are indicated below. Since these problems are interrelated, the various aspects of the problems should be studied in trying to find practical solutions.

Lack of a national animal health policy: Service provision has always been dominated by the public sector; however, the country's level of economy didn't allow adequate infrastructure build up, training and employment of qualified staff, allocation of the required equipment and materials as well as operating budgets.

On the other hand, government has failed to formulate a policy encouraging the participation of the private sector to participate in government controlled public animal health services. At present private participation in animal health services has began although the progress is too slow. This has contributed towards the failure in proper utilisation of qualified professionals.

Lack of cost recovery and sanitary mandate: It is to be recalled that proclamation No 104/1941 of 1949 allowed payment by livestock owners for vaccination services. This proclamation has been replaced by proclamation No 147/1948 of 1956, which allowed free vaccination again. As far as curative drugs are concerned the livestock owners are used to pay the cost price of the actual drug while government subsidizes the cost of services. In effect, this has laid down a pressure on government in allocating adequate budget for better distribution of veterinary services.

The lack of advanced legislation incorporating international policies and rules concerning animal health services: is another major problem. The frequent policy changes which sometimes strengthen and then weaken the power and responsibility of the national veterinary services have contributed towards the failure of providing the necessary services as well as eradication and control of major epizootic diseases.

Table 2. Registered and licensed private veterinary practices including importers

Region	Activities				
	Importers	Clinics + drug shops	Clinics alone	AH Posts	Drug Shops
Tigray	2	-	2	-	9
Amhara	1	-	1	-	24
Oromiya	-	13	15	13	63
Benshangul G.	-	2	1	-	-
SNNP	4	1	1	3	21
Gambella	-	1	-	-	-
Dire Dawa	2	-	-	-	4
Addis Ababa	118	47		3	47
Somali	-	7	3	2	1
Afar	-	-	-	-	1
Total	127	71	23	21	170

Source: [6]

Shortage of qualified staff: as already mentioned considering the huge number of livestock population and the distribution and variety of animal diseases there is a shortage of qualified staff. The lack of proper utilization of existing ones should be given the highest consideration. On the other hand, the responsibilities of staff with various qualifications are not clearly indicated.

2.7 Animals Diseases Surveillance and Reporting Systems

A key objective of the livestock disease surveillance is to increase the likelihood of early detection of important changes in livestock health. Any major disease occurrence, such as RVF outbreak that had occurred in Northern Kenya in 1997/8 and 2006/7 can have a major impact on international trade of live animals and meat in Ethiopia. The possibility of the incursion of exotic diseases, the emergence of a new disease, or changes in known disease status are all risks which the country's surveillance system seeks to investigate and mitigate [27,28].

In Ethiopia, disease reporting activities date back as far as 1982. Disease investigations are generally conducted in response to reports of health problems from livestock owners. Upon observing disease outbreaks in their herds, livestock owners report to the nearest extension agents, veterinary post and/or District (Woreda) Administration. Disease outbreak reports are then compiled filled in standard reporting formats and communicated to regional animal health services and Federal Veterinary Epidemiology Unit by Woreda animal health personnel [29].

The disease control and epidemiology team under the veterinary service team of the Ministry of Agriculture serves as a center for animal health information management in the country. The team has the responsibility of collecting all available information on temporal and spatial distribution of livestock diseases and of making data analysis interpretation to enhance appropriate action to be taken by the decision makers [7]. To accomplish these tasks, the team collects the emergency disease outbreak reports whenever new disease occurs or some changes take place in the magnitude and/or severity of any existing disease in the country, monthly disease outbreak occurrences and vaccination reports from all districts of the country using standard formats, monthly disease investigation and diagnostic reports of regional laboratories, monthly meat inspection and quarantine reports and monthly reports of PACE from branch coordination offices on activities, sero-surveillance and monitoring as well as active disease search directed mainly to ascertain the absence of Rinderpest virus circulation [10].

2.8 Animals Diseases Prevention, Control and Eradication Measures

The whole purpose of veterinary services is to prevent, control and eradicate livestock diseases so that the health and productivity of the livestock resource is reliably protected and the socio-economic loss they incur is effectively minimized. The first line of defense against livestock diseases is avoidance of contact of healthy herds with infected ones. Infections may arise from local or from incursion of exotic diseases through live animals, products or other means. Vaccination is considered as the major mode of assuring protection of healthy herds from unforeseeable disease hazards [30].

In Ethiopia, vaccination practices in livestock has a long history which started by the Italians.

In late 1880s and early 1890s, Italians established a veterinary laboratory by the name of Instituto Siero Vaccinogeno in Asmara [15]. The laboratory was producing vaccines to be used against livestock diseases. In 1920, it started producing rabies vaccine to be used in humans and livestock. The Italians also established a veterinary laboratory in 1939 in Addis Ababa, at Gulelle area, in the premises of the former Institute of Pasteur for the production of vaccines and provision of various treatments. A major change in vaccine production started following the establishment, in 1963/4, of the National Veterinary Institute at Debre-Zeit with intensified production of the necessary vaccines at amounts and varieties never recorded in the country. More than 15 bacterial and viral vaccines are currently being produced by the NVI. In some types of vaccines, production has outstripped local demands and is being exported to other countries [10].

2.9 Animal Health Measures Applied for Slaughter and Export Animals

2.9.1 Slaughter animals

Animals for slaughtering in export abattoirs are purchased taking into account current major disease situation in different Agro-Ecological

Zones. Mostly animals for export abattoir consumption come from surplus production pastoralist areas. Disease outbreak suspicion reports from respective areas will automatically enforce the suspension of animal purchase for slaughtering. Under normal conditions apparently healthy animals are purchased from local markets and collected in specific holding areas where they are watered and fed, isolated from other herds. Animals are then transported to abattoirs avoiding any contact with other herds along their route. On arrival at the abattoir, animals are inspected before entering premises. All animals that pass the inspection will enter premises and are kept in lairages in accordance with their arrival. Animal are allowed to rest for a period of 24-72 hours before slaughter. Anti-mortem inspection is performed 24 hours before entering slaughtering chamber [11].

2.9.2 Export live animals

All animals destined for export should originate from areas known to be free from any outbreak of trans-boundary diseases. Animals are purchased from local markets under the supervision of animal health personnel. Purchased animals are collected in holding areas for veterinary inspection. Animals are transferred to a quarantine station where they stay for at about 21-30 days and are: Inspected and screened for relevant diseases given various veterinary care including vaccination, de-ticking, de-worming etc. in accordance with importing countries request. Following the completion the required quarantine period and observation by the official veterinarian, animals that are found clinically healthy and free from OIE listed diseases are certified and transported to the port of exit. Before the departure of animals for export the veterinary authorities of the port, airport or district in which the border post is situated when necessary can carry out a clinical examination of any animal. Accordingly, veterinary authorities shall take relevant measures such as prevention of the shipment of animals affected or suspected of being affected with any OIE listed disease or with any other infectious disease [10].

3. ANIMAL HEALTH INSTITUTIONS IN ETHIOPIA

3.1 National Animal Health Diagnostic and Investigation Center (NAHDIC)

The National Animal Health Diagnostic and investigation Centre (NAHDIC) was established in 1995. It is located at Sebata at about 25 km west of Addis Ababa. In 1997, the centre was moved to the Ethiopian Agricultural Research Organization with a mandate of animal health research. As of 2006, the centre was again transferred back to MoA to serve as a national referral lab. It also coordinates national surveillance programs for TADs such as HPAI, RVF, FMD, etc. Depending on the need, the centre actively collects samples from the field but in most of the cases, it receives samples from the Regional animal health services and Regional veterinary laboratories. Apart from NVI, NAHDIC is the only laboratory in the country which performs serological techniques and is able to confirm viral diseases [10]. According to [11], its responsibilities are: providing referral diagnostic services to regional laboratories and other veterinary institutes in the country, training of regional veterinary laboratory staff and veterinary field personnel in laboratory techniques and disease investigation methodologies, standardizing laboratory procedures, techniques and materials to be applies or used in the different veterinary laboratories and clinics in view to making valid interpretation of results and in conducting fair assessment, evaluation and monitoring of activities by different laboratories, investigating and identifying appropriate vaccinal strains of animal disease agents encountered in the country for improving their protection potential, conducting epidemiological studies on selected animal and/or zoonotic diseases of socioeconomic importance in view to generating alternative intervention strategies for their alleviation or containment, conducting, supervising and supporting disease surveillance and monitoring activities particularly on epidemic diseases, supporting early warning and early reaction attempts for potential emergency conditions (emergency plan for emergency diseases and emergency action) and carry out researches on major economically important diseases.

3.2 The National Veterinary Institute (NVI)

The National Veterinary Institute (NVI) is located in Debre Zeit at about 45 km southeast of Addis Ababa. NVI was established in 1963 with the help of the French Government. Until the year 2000, it was administered by the Ministry of Agriculture. Since then, it got the status of an enterprise and operates on a cost recovery basis. The institute has increased its vaccine production capability from three to sixteen

different types of vaccines. The NVI also hosts the Pan African Vaccine Centre (PANVAC) which was established in 1986 by AU-IBAR. The objectives of PANVAC are to promote the availability of affordable veterinary vaccines, promote veterinary vaccine quality control in Africa and in the standardization of veterinary vaccines in the region, promote the transfer of appropriate vaccine production technologies to Africa and provide training and technical support to vaccine production and quality control laboratories in Africa [10].

3.3 Regional Veterinary Laboratories

According to Ministry of Agriculture [11], there are 10 functional and 5 yet under construction, regional veterinary laboratories in the country. The laboratories have bacteriology and parasitology identification capabilities and basic serology for selected diseases. Samples that require testing beyond the capability of these labs are submitted to NAHDIC or National Veterinary Institute, NVI.

The main responsibilities of regional laboratories are: providing disease outbreak investigation service in the operation area, backing field veterinary staff in disease diagnosis, conducting research on selected disease problems in the operational area, participating in national disease surveillance activities in the operational area of the laboratory, consulting livestock breeders on what they can do for disease prevention and control and related issues, consulting abattoirs and other animal product and by-product processing firms including investors and exporters on how they can improve the quality and hygienic standards of their products and working environments to promote consumer confidence for increased access to domestic and international market, organizing workshops on different animal health problems for all stakeholders for exchange of ideas and experiences for better output from concerned bodies, providing in-service training for relevant staff and distributing working handouts and information leaflets [11].

3.4 National Tsetse and Trypanosomosis Investigation and Control Center (NTTICC)

Before 1960's, trypanosomoses had relatively little impact on the economy of Ethiopia. After 1960's, the magnitude of the problem has increased enormously and still it is increasing due to a number of factors which include mainly, overpopulation and overstocking of the highlands which forces people and their livestock to use the tsetse infested lowlands and brings in to direct contact with tsetse flies, the advance of tsetse flies in to previously un-infested areas, development of a widespread drug resistance by trypanosome parasites over the different types of trypanocidal drugs which are in use in Ethiopia [10].

The NTTICC is located in Bedelle town at a strategic point of tsetse belt of the country which is 480 km west of Addis Ababa. The center hosts considerable trained manpower and have conducted tsetse and trypanosomoses distribution and prevalence studies and have prepared control strategies for implementation in different parts of the country. Moreover, the center provides theoretical and practical training on tsetse and trypanosomoses biology and control [11].

3.5 The Quarantine, Inspection and Veterinary Publc Health Service

There are currently five export abattoirs at Debre Zeit, Mojo and metehara. Others are under construction at Bahir Dar, Jimma and Mekelle. Currently three quarantine stations are operational, i.e Adama, Dire Dawa and Metema. Each quarantine station is staffed with one veterinarian, one animal health assistant, one animal health technician and one laboratory technician while each export abattoir is staffed with two inspector veterinarians, two senior meat inspectors, two assistant meat inspectors and one laboratory technician. Currently three border check posts are operational, i.e. Moyale (one veterinarian, one animal health assistant), Jijiga (one animal health technician), and Bole international airport (one veterinarian, three animal health assistants) [11].

3.6 Animal Health Policies

According to [10], Ethiopia has outdated laws and regulations with regard to animal health and food safety. Disease such as peste des petits ruminants, Marek's disease, Gumboro and Maedi visna were exotic to the country until some 15 years ago. The introduction and spread of these diseases in the country demonstrates the need for additional and updated regulations that can safeguard the country's livestock resources from exotic diseases. Ethiopian legislations are also required to be harmonized with international

standards and consider current levels of advancement in disease prevention, control and eradication. Harmonization of laws and regulations will assist to enhance the country's negotiation power and minimize barriers to trade. In general, availability of up to date and enforceable legislation is a major requirement by trading partners in making import decisions. In order to promote export of animals and animal products, APHRD will exert all possible efforts so that Ethiopian animal health laws and regulations are updated and enacted.

The Ethiopian Government promulgated a proclamation to Provide for the Prevention and Control of Animal Diseases No 267/2002 in January 2002. However, the supporting regulations are still not enacted and it was not possible for APHRD to enforce the proclamation as planned. In 2008/09, APHRD has developed the following proclamations [10]:

A. Meat Hygiene Proclamation,
B. Livestock and Livestock Products Import and Export Control Proclamation,
C. Proclamation for the Establishment of Veterinary Council,
D. Veterinary Drugs, Biological Products and Animal Feed Administration and Control Proclamation.

The above proclamations are awaiting endorsement by the Parliament. In addition, a total of six regulations have been prepared by APHRD in 2009/10. These include:

A. Regulation for Registering Veterinary Drugs, Biological Products and Animal Feed,
B. Regulation for Prevention and Control of Animal Diseases,
C. Meat Hygiene and Safety Regulation,
D. Animal Movement and Traceability Regulation,
E. Livestock and Livestock Products Import and Export Control Regulation.

3.7 Veterinary Education in Ethiopia

3.7.1 Veterinary education in ethiopia

In 1963, an Institute to train Animal Health Assistants was founded in Debre Zeit some 45 km South East of Addis Ababa. Until the foundation of the Faculty of Veterinary Medicine of the Addis Ababa University in Debre Zeit in 1979, veterinary students had to study in foreign countries such as in the former Soviet Union, Cuba, East Germany, Czechoslovakia, France, United Kingdom, USA, Kenya, etc [12]. Since 1979, the FVM-AAU was established and started a six years study program for a DVM degree at Debre Zeit Collage of Agriculture. In 1989, the Institute of Animal Health Assistants was then integrated into the FVM-AAU. In the academic year 2002/2003, the FVM-AAU started a Master Program in Tropical Veterinary Epidemiology and Tropical Veterinary Medicine. The modules include Advanced Parasitology, Advanced Pathology, Epidemiology and Economics, Microbiology, Immunology, Veterinary Public Health followed by a thesis research work in the second year. The faculty has also started a PhD program in Veterinary Parasitology, Veterinary Public

Health, Animal Production and Health and Veterinary Gynaecology and Obstetrics as of 2010 [10].

The quality of services provided by any veterinary services depends on the training, knowledge, experience and professionalism of technical staff. In Ethiopia there are three categories of veterinary workers. They are Veterinarians who have successfully completed a 6- year professional course in veterinary medicine, Animal Health assistants who in the past were grade 12 plus successfully completed 2 years course at Debre Zeit Veterinary Faculty and currently are grade 10 plus successfully completed a 3 years course at Alagae Agricultural Vocational Educational Training College and Animal Health technicians who have a minimum of grade 10 and successfully completed a one year course in animal health. At present there are 6 newly established veterinary faculties in different universities in the country. Enhancing the training of different kinds of veterinary professionals is vital to alleviate the animal health problems in the country. To this end, the Government of Ethiopia is trying to improve animal health training at different levels by opening new animal health programs in various young universities [11,31]

4. CONCLUSIONS

The veterinary service in Ethiopia confronts significant provocations, including a shortage of skilled and disciplined manpower, an insufficient budget, resource issues, and a lack of basic equipment and foundations. Private practitioners are few and are focused on supplying veterinary

drugs. The livestock disease reporting system works on a bottom-up basis, with normal operations reported to higher-level offices and outbreaks to national or regional epidemiological sections. There are strengths such as reporting outbreaks on time and in well-structured formats; drawbacks include a lack of enough trained practitioners, intermittent reporting, low documentation process, and incompetent infrastructure. Veterinary laboratories and clinics are facing a lack of equipment, resources, and logistical challenges. The epidemiological units struggle with data management at lower levels, which leads them to not provide timely feedback. The role of the government in animal health is mass vaccination, but practical application spares control measures after outbreaks arise. The lack of suitable prevention and control strategies, as well as poor adjustment across the country, hinders effectiveness. Ethiopia's animal health policies need to accord with worldwide standards and deal with advancements in disease prevention, control, and elimination. Laws and their regulations are seen as essential for enhancing negotiation power and condensing trade barriers.

ETHICAL APPROVAL

This research was approved by the Research Ethics Review Committee of College of Veterinary Medicine, Jigjiga University. The study was conducted in compliance with the ARRIVE 2.0 guidelines. All methods were carried out in accordance with relevant guidelines and regulations. Before conducting the study, the objectives, expected results, and benefits of the study were explained to the one humped camel owners who participated in the study and written informed consent was obtained from all of them.

CONSENT FOR PUBLICATION

As authors' for this manuscript, we confirm that there are no known conflicts of interest associated with this publication. We confirm that the manuscript has been read and approved by all named authors and that there are no other persons who satisfied the criteria for authorship but are not listed. We further confirm that the order of authors listed in the manuscript has been approved by all authors.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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