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Review

Strategies for animal disease control in Ethiopia: A review of policies, regulations and actors

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Ethiopia has the largest livestock population in Africa, making a considerable contribution to the livelihood of Ethiopian people and to the wider economy. However, zoonotic diseases threaten the performance and potential benefits of this vast livestock sector. Emerging zoonotic diseases, such as bovine tuberculosis, brucellosis and anthrax that have acquired global significance seriously affect the livestock sector in the country. A number of policies and regulations have been designed in order to prevent and control the transmission of animal and zoonotic diseases in Ethiopia. This paper documents the key policy provisions and institutions involved in these initiatives and identifies entry points for the design of specific implementable strategies for the control of bovine tuberculosis (bTB): a disease that is endemic among cattle in Ethiopia and particularly highly prevalent in its dairy sector. The analysis of this study is based on a review of existing documentation carried out in 2017. The results indicate: (i) the existence of various policy provisions for disease prevention and control but with limited recognition of different disease transmission pathways including 'animal to animal', 'animal to human', and 'human to animal'; (ii) that these policies and regulations only provide a general framework without specifying the interventions related to specific disease types such as bTB; (iii) that different institutions are given similar tasks and that there is no strong coordination mechanism among the institutions in terms of fulfilling these tasks and avoiding the duplication of effort; and (iv) that more attention has been given to policies on human health, especially relating to selected priority diseases. These trends imply the need to design and implement strategic interventions in the prevention and control of bTB transmission both within the animal population and from the animal to the human population.

Key words: Bovine tuberculosis, Ethiopia, policy, zoonoses.

INTRODUCTION

Ethiopia has the largest livestock resource in Africa and is a repository of considerable animal genetic diversity. A

report by the Central Statistical Agency (CSA, 2017) indicated that the country is home to 183 million

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livestock animals, including 56.7 million cattle, 58.4 million sheep and goats, 11.0 million equines (horses, donkeys, mules, camels) and 56.9 million poultry, housed on 16.5 million holdings. Livestock contribute considerably to Ethiopians' livelihoods and to the national economy. These contributions largely take the forms of food and nutrition, draft power, farmyard manure/fertilization, income-security, and foreign currency (CSA, 2017). Cattle are the most important animals in the national livestock herd, fulfilling a large proportion of the human population's demands for meat and milk in the country. The total milk production (cow and camel) in Ethiopia was estimated at 3.3 billion litres with an average milk production per cow per day of 1.37 litres during a lactation period of six months (CSA, 2017). In 2015, the milk consumption per capita in Ethiopia was approximately 19 litres per year (Shapiro et al. 2015), compared to nearly 50 litres per year across East Africa and over 200 litres per year in Europe (FAO, 2018).

Despite, or perhaps because of, the scale of livestock industries in Ethiopia, endemic diseases threatens its performance and potential, posing a risk to the nation's agricultural development. Exports of livestock and livestock products face challenges in meeting stringent animal health requirements at the border, due to the prevalence of trade-limiting, trans-boundary livestock diseases. The impact of animal diseases stems from direct loss of livestock due to animal mortality, as well as from more indirect effects of morbidity such as slower growth, lower fertility rates and lower productivity (resulting in less milk and less draught power) (MoA and ILRI, 2013). Some of these diseases are zoonotic and so have considerable impact on human health.

The World Health Organisation (WHO) estimates that 61% of all human diseases originate from vertebrate animals estimates it, including 75% of new diseases discovered in the last decade (WHO, 2018). Emerging and re-emerging zoonotic diseases, such as listeriosis, melioidosis, salmonellosis, bovine tuberculosis, brucellosis, and anthrax (Alemayehu, 2012; Feed the Future, 2016) have acquired global significance. Other endemic and exotic diseases occurring in the country include east coast fever (ECF), rift valley fever (RVF), blue tongue (BT), African horse sickness (AHS) and trypanosomiasis transmitted by tsetse flies. Despite the various policy engagement of different animal disease prevention and control institutions, the animal health extension services are generally poor. The huge potential of the Ethiopian livestock sector and the significance of its role in the country's economic development call for the design of appropriate courses of action to deal with livestock diseases in the country.

In an effort to pinpoint potential entry points in the design of the control strategy for bTB in Ethiopia, this paper documents existing policies, strategies and regulations in the control of animal diseases, along with the structure of the institutions which design and uphold

them. Accordingly, the paper is organized as follows: the first section documents the animal health situation in Ethiopia and its place in the development plans for the livestock sector in particular and the economy in general. The second describes the different public institutions and their responsibilities, while the third section discusses the linkages between these institutions established within the administrative setup of the country. This is followed by the fourth section, which reviews the existing proclamations, regulations and directives in animal health. Finally, a conclusion that also provides recommendations for the design of bTB control strategies in Ethiopia.

This paper forms part of the work undertaken by the Ethiopian Control of Bovine Tuberculosis Strategies (EthiCoBoTS) project; a collaboration between research institutions in Ethiopia, the UK and Switzerland, working to investigate, map and propose control strategies that reduce the prevalence and, transmission of Bovine Tuberculosis (bTB) in the Ethiopian dairy cattle population which has been shown to be highly infected with bTB (Firdessa et al. 2012; Sibhat et al. 2017). The project focuses on the situation in urban and peri-urban farms in a number of locations: Addis Ababa and surrounding urban centres, Mekele, Gonder and Hawassa and one of its key aims is to be able to present feasible disease control policies for bTB in the country.

The EthiCoBoTS project is particularly concerned with the risk of zoonotic transmission of bTB from infected cattle to humans, which can occur in a number of ways, including aerosol and cutaneous transmission and through the consumption of contaminated dairy products (Olea-Papelka et al., 2017). Many known bTB transmission risks are exacerbated by the conditions experienced by farmers in Ethiopia, including lack of space, water shortages, and an extremely limited market for pasteurised dairy products. As well as current risks of zoonotic transmission, the project is also concerned with the spread of the disease among animals, as increased prevalence in animals will lead to even greater risk of human infection, and it could have enormous financial implications for farmers and the economy at large in the future.

ANIMAL HEALTH AND ITS PLACE IN THE LIVESTOCK SECTOR AND THE OVERALL ECONOMIC DEVELOPMENT PLANS

In Ethiopia, development efforts are guided by different national strategic and development plans. Among these documents are the Agriculture Sector Policy and Investment Framework (ASPIF 2010-2020), the Growth and Transformation Plan (GTP II 2015-2020), and the Livestock sector development Master Plan (LMP 2015), all of which are crucial to our topic. This section presents the main thrust of these documents in relation to animal

health, along with their implications for the design of bTB control and prevention strategies.

The ASPIF is a public document, intended to guide public investment from 2010 to 2020. Among other issues, it recognizes the need for public investment in the livestock sector. The specific suggested areas of investment in the livestock sector, which are clearly related to animal disease, are: (i) improving laboratory information management systems; (ii) upgrading veterinary services, and (iii) upgrading in-country vaccine production centres to enhance disease prevention (MoARD, 2010).

In the GTP II plan (2015–2020), one of the five goals for ensuring improved livestock production and productivity is set as ‘improving the coverage, quality and regulatory aspects of animal health services’ (MoA and ILRI, 2013; NPC, 2016). It is hoped that this goal will be achieved through five objectives (MoA and ILRI, 2013, 2015). First, establishing an all-encompassing animal health information system, capable of generating real-time epidemiological information, which will aid investigation, control, early warning and early reaction to disease outbreak. Second, strengthening and introducing a quality assurance system for the diagnostic and investigative capacities of the federal and regional veterinary laboratories. Third, prioritizing animal diseases based on their potential economic and social impacts, and designing and implementing progressive control strategies for those priority diseases. Fourth, devising and implementing herd and flock health management and improved bio-security systems in areas where intensive livestock production using improved genotypes is practised. Five, strengthening the control and prevention of major zoonotic diseases by building the capacity of veterinary drug and feed inspectors as well as quality control centres by providing trainings and ensuring food safety.

The LMP (Shapiro et al 2015) has been developed to provide guidance to the government of Ethiopia on future priorities for livestock research and development activities over the period of 2015-2020. Among the key priority areas of the master plan is animal health. Accordingly, the master plan has set seven major objectives for animal health. These are: (i) establishment of a robust animal health information system; (ii) reduction of the impact of livestock diseases; (iii) strengthening the quarantine, inspection and certification system; (iv) reduction of the impact of zoonotic diseases on human health; (v) improvement of animal welfare by raising public awareness and introducing good practices; (vi) improving the implementation capacities of Ethiopia’s animal health services through preparation, endorsement and implementation of various legal frameworks, and (vii) building an advanced animal health system by restructuring veterinary services in line with the 2011 World Organisation for Animal Health (OIE) evaluation of regional animal health services. In the area of cattle

disease, the master plan indicates different priorities for different actors. Overall, foot-and-mouth disease (FMD), contagious bovine pleuropneumonia (CBPP) and brucellosis appear to be considered the three most important diseases in the document. For market actors, FMD, lumpy skin disease (LSD), and brucellosis were identified as the top three priorities, but for farm households, the ranking was FMD, CBPP and bTB. In the case of intensive farming, brucellosis, FMD and bTB were the top three diseases (MoA and ILRI, 2015).

The above overview of three strategic public documents indicates that animal health has received considerable attention and that key animal health related challenges and associated goals have been clearly set in Ethiopia. However, in most instances, these documents fall short of designing disease specific intervention options and implementation strategies. They provide outcomes and aims without designing a path via which they might be approached. Even where ostensibly smaller-scale objectives have been laid out as steps towards larger goals, as in the GTP II Plan, these objectives are very ambitious in themselves and clear indications of how they will be achieved and/or financed seem to be lacking. No specific strategies are in place to control the most important diseases, including bTB.

INSTITUTIONS AND THEIR ROLE IN THE SETUP OF PUBLIC ANIMAL HEALTH SERVICES

In general, both public and private actors are involved in animal health service provision. The regulatory aspect is the mandate of the public sector. Publicly funded animal health services are found at federal, regional, zonal, *Woreda* (district), and *Kebele* (village) level, in line with the public administrative setup in the country.

Federal level

At the Federal level, following the upgrade of Livestock Resources Development Sector under the former Ministry of Agriculture (MoA) to an independent Ministry of Livestock and Fisheries (MoLF) in 2015, a new organizational setup was designed (GoE, 2015). As part of recent changes in Ethiopia’s administrative structure, the MoLF was reabsorbed into the renamed Ministry of Agriculture and Livestock Resources (MoAL), under which there is a State Minister for Animal Health. While it remains to be seen whether the structure and policy directives of the ‘Animal Disease and Feed Quality Control Sector’, previously under the MoLF, will be directly transferred to the responsibility of the new minister and their staff, detailing those mandates should provide a useful picture of the government’s thinking surrounding animal health policy.

The ‘Animal Disease and Feed Quality Control Sector’

comprised six directorates that dealt mainly with inspection and certification: (i) the Epidemiology Directorate; (ii) the Disease Prevention and Control Directorate; (iii) the Export Abattoirs Inspection and Certification Directorate; (iv) the Quarantine, Import and Export Inspection and Certification Directorate; (v) the Veterinary Public Health Directorate, and (vi) the Livestock Identification and Traceability Control Directorate. Each of these six directorates was provided with a list of mandates, which it was expected to perform (GoE, 2015).

In addition, five semiautonomous institutes dealing with animal health are accountable to the federal government. These are: (i) the Veterinary Drug and Feed Administration and Control Authority (VDFACA); (ii) the National Animal Health Institute; (iii) the National Tsetse fly and Trypanosomiasis Investigation and Control Centre; (iv) the National Animal Health Diagnostic and Investigation Centre (NAHDIC), and (v) the National Artificial Insemination Centre. As the names of the respective institutes indicate, their responsibilities are specialised. While responsibility for animal health in Ethiopia's livestock sector has fallen within the remit of the Agriculture and Livestock ministries within the federal government, risks posed to the human population by the zoonotic transmission of animal diseases tend to be considered the responsibility of those working in human health. For example, the Federal Ministry of Health (MoH) is responsible for ensuring the safety and quality of food, with the aim of better protecting the public from health risks emerging out of unsafe and poor-quality food. The Ethiopian Food, Medicine and Health Care Administration and Control Authority is responsible for implementing the Food, Medicine and Health Care Administration and Control Proclamation (GoE, 2013) for regulating the safety and quality of food and medicine. The Quality and Standards Authority of Ethiopia (QSAE) is also empowered by proclamation no. 102/1998 (GoE, 1998) to set food standards. The VDFACA may issue directives and guidelines on the use and disposal of any veterinary drugs or feed.

Regional level

The organizational setup of institutions providing animal health services is quite different across the nine regions and two chartered cities (Addis Ababa and Dire Dawa) of Ethiopia. In some regions, where the livestock population is very large, such as Amhara, Oromia and Southern Nations Nationalities and Peoples Region (SNNPR), regional Livestock Sector Development Agencies are responsible for the livestock sector and related public services; including the prevention and management of animal diseases. These regional agencies are accountable to Regional Bureaus of Agriculture and Rural Development. In emerging regions like Afar, Harari and Somali, there are Bureaus of Pastoral and Agro-pastoral

Development, and in the remaining regions, Tigray, Beneshangul-Gumuz, and Gambella, the issues of livestock are addressed by the Livestock Development Sectors under the Bureaus of Agriculture and Rural Development.

Zonal and *Woreda* level

In Ethiopia, there are 87 zones constituting 670 rural and 100 urban districts known as *Woredas*. At zonal and *Woreda* level in Amhara, Oromia and SNNPR, aligned representatives of the regional livestock agencies are accountable to zonal and *Woreda* Offices of Agriculture. At *Woreda* level, two departments within the Office of Agriculture play a crucial role: First, the 'livestock extension', which provides extension services related to livestock, including animal health and artificial insemination services; and second, the 'animal health desk' which provides services relating to vaccination, animal health services, and capacity building. To ensure better service coverage and quality, there is one public veterinary clinic in most *Woreda* across regions with the basic human resources and facilities required to provide this. However, there may be *Woredas* that do not have a veterinary clinic due to a small number of livestock, while in some regions, like Amhara and Tigray, there is a move toward shaving several government veterinary clinics at *Woreda* level, and even one in each *Kebele* (see 3.4). Following the ambitious service provision target (MOA and ILRI, 2013) set by the government. In most cases, these veterinary clinics have an office space with an animal health technician, a cashier, and a stock of veterinary drugs. In some regions, like Amhara, there is a gradual reduction in the financing of these clinics from public (government allocated) budget, which encourage reduced dependence on availability of public funding.

Kebele level

Animal health related a veterinarian who is often based at the *Woreda* Office of Agriculture provides services at *Kebele* (subdivision of *Woreda*) level. At *Kebele* level, livestock production and health services are related to the Livestock Extension. The frontline public livestock related a Livestock Development Agent with vocational training in livestock sciences provides services at *Kebele* level. For every three *Kebeles* there is one Artificial Insemination (AI) technician. However, animal health services are provided by the nearby veterinary clinics, setup by regional governments.

Urban livestock systems

The organizational setup of the agriculture sector is different in urban areas, as the offices are under the jurisdiction of the Bureau of Trade and Industry. This

Table 1. Existing policies and key provisions for animal disease in Ethiopia.

Disease intervention areas	Key policy provisions	Policy, proclamations, regulation
Household/farm management level	(i) Establishment of a national animal health information system (ii) Declaration of a previously infected area free from animal disease (iii) Measures for the prevention and control of the spread of animal disease	(i) Food, Medicine and healthcare administration and control (GoE, 2013) and authority (GoE, 2009) (ii) Veterinary drug and feed administration and control (GoE, 2011) and authority (GoE, 2012)
Animal movement (breed exchange, trade etc)	(i) Establishment and supervision of quarantine stations (ii) Establishment of entrance and exit posts (iii) Export of animals, animal products and by-products (iv) Importation of animals, animal products and by-products; (v) Provisions applying to areas infected by animal disease including animal movement (vi) Animals movement permit	(i) Regulation for Registering Veterinary Drugs, Biological Products and Animal Feed (ii) Guidelines for import and export of animal and animal genetic material (MoA, 2011) (iii) Live animals marketing (GoE, 2014) (iv) Animal Movement and Traceability Regulation
Measures in cases of disease incidence	(i) Notification of outbreak of animal disease (ii) Declaration of areas infected with animal disease	Animal Diseases Prevention and Control Proclamation (GoE, 2002)

bureau is entitled to issue investment permits and licenses to service providers and producers. Until 2014, the MoA facilitated the dissemination and supply of improved technologies, including semen by the National Artificial Insemination Centre (Gebremichael et al., 2014).

Live animal market centres

As per the 'Proclamation of Live Animal Marketing', there are first-level (local) and second-level (specialized) live animal market centres to be designated by the appropriate organ in Ethiopia (GoE, 2014). These market centers are designated for the marketing of health-certified live animals. The proclamation states that the local market should be carried out among and between breeders as sellers. The specialised market however, should be carried out between breeders, feedlot operators and cooperative societies as sellers. All other market participants are categorized as buyers at each market centre. Live animals marketed at local market centres should be checked for livestock disease and other movement regulation requirements on the spot by a veterinarian based at the market centre and should be given identification tags. However live animals, fattened for slaughter and supplied to a second-level market centre need to be accompanied by documentation of ownership, a health certificate and identification tags upon conclusion of sales. The first-level market centre can be used to sell all types of live animals, whereas the second-level market should be supplied with fattened live animals. Owners are to provide the afore-mentioned

documents when an individual animal is delivered to the buyer. This second group of centres are established in a number of locations across the different regions but the coverage remains small and many animals are traded informally without documentation or regulation. These regulations can only be applied when cattle are taken to market and not when animals are sold through informal networks, as is common in the trade of cross-bred and exotic breed dairy cows in Ethiopia.

PROCLAMATIONS, RULES AND REGULATIONS IN ANIMAL HEALTH

Linked with the established public organizations at different administrative levels for animal health service provision, there are also proclamations, rules and regulations that are designed to set the framework for the provision of animal health services in the country (Appendix Table 1). These are described below.

Policies and key provisions in animal disease

The policies and regulations put in place to prevent and control the spread of animal diseases can be looked at on three levels: 1) Those addressing disease prevention and control at household or farm level; 2) those applied during animal movement, and 3) measures to be undertaken when cases of disease arise. The key provisions of the different policies, proclamations and regulations are summarized in Table 1.

Policies and key provisions in preventing disease transmission from animals to humans

Here, policies and regulations that are issued to prevent and control disease transmission from animals to humans at farm level through animal-human contact and consumption of livestock products by humans are examined. The prevention and control of disease transmission through human consumption of livestock products is governed by various regulations of the 'Ethiopian food, medicine and healthcare administration and control proclamation' (GoE, 2009, 2013). These are largely related to the licensing of operators, including breeders, feedlot operators, exporters, abattoirs, butchers, cooperative societies and consumers participating in live animals marketing, and product certification. The 'proclamation to provide for veterinary drug and feed administration and control' (GoE, 2011) focuses on ensuring safety, efficacy and quality of products (drugs and feed) and on the public health measures surrounding them, thereby enhancing the productivity and health of the livestock population. The regulation of the import and export of livestock and livestock products also plays a crucial role in the prevention and control of disease transmission within the import and export process. The 'national extension package for food hygiene and safety measures' developed by the Ministry of Health also provides the national guide for preventing and controlling disease transmission through livestock products (MoH, 2004). The reduction of the impact of zoonotic diseases (such as rabies and tuberculosis) on human (consumers) health is one of the strategic objectives of the GTP-II plan (Shapiro et al., 2015).

Policies and key provisions in disease transmission from humans to humans

The National Health Policy, first drawn up in 1993 and later revised in 1997, envisages a comprehensive health service delivery system to address mainly communicable diseases and malnutrition, as well as improving maternal and child health. Institutionally, the Health Promotion and Disease Prevention General Directorate (HPDP-GD) under the Ministry of Health is responsible for the implementation of four human health programme areas. First, communicable disease prevention and control, which seeks to control and eliminate communicable diseases, wherever possible, by utilising the full potential of the Health Extension Programme (HEP); accelerating the training of model families, as well as delivering proven interventions and services to the community. Second, hygiene and sanitation. Third, maternal and child health, and (iv) information, education, communication (IEC) and advocacy.

The HPDP-GD health programmes are further organised into three Directorates, providing communities with client-oriented services. The first is the Agrarian

Health Promotion and Disease Prevention Directorate (AHPDPD), which is responsible for coordinating health promotion and disease prevention packages in four regions: Tigray, Amhara, Oromia and SNNPR. The second is the Urban Health Promotion and Disease Prevention Directorate (UHPDPD), responsible for Addis Ababa, Dire Dawa and Harari and the third is the Pastoralist Health Promotion and Disease Prevention Directorate (PHPDPD), which targets the four emerging regions: Afar, Somali, Gambela and Beneshangul-Gumuz.

In general, the core tool of the HPDP-GD is the HEP, which aims at improving equitable access to preventative essential health services through community (*Kebele*) based health services with a strong focus on sustained preventive health actions and increased health awareness. The implementation of the HEP involves the deployment in each *Kebele* of two salaried Health Extension Workers (HEWs), (predominantly women, except in pastoralist areas, where the workers tend to be men) (FMOH, 2007), who are trained for a year at an Agricultural Technical and Vocational Education and Training Centre.

The status of policy implementation: Challenges and opportunities

The different animal health related policies and guidelines described above are designed to be implemented by different institutions and organizations without due emphasis on the interconnectedness of human beings, animal and the environment as far as animal disease and the health of each element is concerned. In recognition of the current lack of response to this challenge and the importance of synergy across different government organizations and stakeholders, a national One-Health Steering Committee has been established.

A recent study (Abebe et al., 2016) indicates that despite the different animal and human health related policies and regulations described here, there is still no specific livestock marketing policy that harmonizes the production, animal health and marketing systems in Ethiopia as a whole. This might be due to different ministries being mandated to support different aspects of the production-marketing chain, and the specific mandates of each ministry being subject to frequent changes. For instance, there is an overlap of responsibilities between the MoH, the MoAL, and the Quality and Standards Authority (QSA) but there is not much close cooperation and co-ordination between the three institutions. These institutional issues have resulted in the duplication of work and consequent wastage of the meagre human and financial resources available to these public bodies (Jabbar and Grace, 2012). There is also a general lack of coordination between government, stakeholders and researchers.

While livestock breeding policies exist in Ethiopia, their

implementation is falling short. For example, regulations and policies surrounding meat and live animal export and operations such as raising breeds and reproduction operations have not been fully implemented. Poor management of heifers and cow herds has also resulted in a failure to achieve optimum reproductive performance in beef cow herds (Abebe, et.al. 2016). Poor interface between farmers and veterinary services and inadequate processing capacity at both regional and federal levels have also constrained the implementation of disease reporting systems (APHRD, 2012; MoARD, 2007a, b). Other issues reported as major challenges to the animal trade in Ethiopia include: the absence of a well-organized market system; inadequate livestock policy development and implementation; inadequate permanent animal movement routes and facilities such as water and holding grounds; lack and/or inaccessibility of animal transportation. Also included are ineffective, inadequate and often poorly organized live animal and animal product marketing infrastructure and institutions; prevalence of diseases; the difficulties of tracing animals; and illegal animal trade (Solomon et al., 2003). The persistence of these issues highlights the need to utilise interdisciplinary academic research methods, as well as integrated multi-agency policy design to tackle the problems posed by zoonotic and animal disease transmission, as well as the more general challenges of livestock management.

CONCLUSIONS AND IMPLICATIONS FOR THE CONTROL OF BTB

The ever-growing livestock population in Ethiopia, coupled with the accelerating intensification of cattle farming for both beef and dairy as encouraged in Ethiopia's livestock development master plan is highly likely to enhance the risk of disease transmission and spread amongst cattle, as well as from cattle to humans. If this phenomenon is not to be devastating to the Ethiopian livestock sector and those whose livelihoods depend on it, an improved animal health environment and more effective implementation of appropriate tools for disease control are required.

The policies and regulations enacted in Ethiopia do not make clear distinctions between 'animal to animal', 'animal to human' and 'human to animal' modes of disease transmission, with policies and regulations only providing a general framework for control without specifying the interventions to the disease type e.g. to bTB. Moreover, different institutions are given similar tasks with no strong coordination mechanism operating across the institutions to ensure the fulfilment of these tasks while avoiding the duplication of effort. The poor interface between farmers and veterinary services, as well as inadequate processing capacity at both regional and federal levels are both areas in which targeted

interventions could be made to improve the capacity of the different administrative units to both deliver their services and inform farmers about disease control.

While there are clearly some issues with Ethiopia's animal health policy structure and its ability to prevent and manage outbreaks of potentially zoonotic diseases. However, the attention given to human and animal health in different strategic development documents devised by the government, in addition to the various institutions established and the policies and regulations put in place, discussed in this paper, provides opportunities for addressing the challenges posed by a zoonotic disease such as bTB. Successful integration of the different disciplines and institutions using a One Health approach (Zinsstag, 2011) is likely to be the most effective strategy for achieving this goal.

In recent years, specific interventions for specific communicable animal diseases are becoming more common; especially in the context of the growing export market, where external standards of marketability focus internal policy priorities. In the area of human health, due attention is given to selected priority diseases. For instance, the focus areas of the four human health programmes under the 'Health Promotion and Disease Prevention Initiative' of the MoH are Malaria, TB, HIV and Non-Communicable Diseases including Cancer, Cardiovascular Disease, Diabetes, Asthma, Mental Illnesses, and Neglected Tropical Diseases. The exercise of such human health initiatives to address specific important diseases in Ethiopia could serve as a useful model when considering the issue of controlling bTB.

Ethiopia is endemic to zoonotic diseases, which continue to deter livestock development through the direct loss mainly due to mortality. The annual loss of cattle due to mortality ranges from 10-12% (ILRI and MoA, 2013). Animal diseases also have important impact on human health. In the effort to ensure the consideration of bTB in different initiatives, it is crucial to first document the impact of bTB in Ethiopia so that the disease will be considered a cogent focus area for disease prevention and control strategies. To achieve the aim of advocating for an effective, evidence-based and holistic policy to prevent and control the spread of bTB and other zoonotic diseases, some main tasks should be carried out. First, to demonstrate evidence for the need to design prevention and control strategies. Second, to identify operational institutional linkages (inter-institutional collaboration) and alignments that are necessary for effective implementation of strategies. Third, to ensure that strategies are feasible and can be implemented using existing human and physical resources with the addition of required, yet realistic, improvements where needed. The specific strategic areas, which must be addressed in order to face the challenges posed by bTB in Ethiopia, are documented in Table 2.

In any context where health policy is being designed and debated, there should be both recognition and

Table 2. Strategic issues and institutional roles and responsibilities.

Strategic issue at policy and institutions level	Relevant public organizations* to engage with
Document the importance of policies to tackle bTB	MoAL, MoH, MoT
Design farm management practises for bTB prevention and control at small-scale and commercial livestock farm levels that are feasible in terms of cost and applicability; i.e. to engage all stakeholders	MoAL, MoT
Design bTB prevention and control mechanisms that can be incorporated within existing animal movement and traceability regulations	MoAL, MoT
Design bTB prevention and control mechanisms into which livestock product quality assurance regulation can be incorporated	MoAL, MoT
Design bTB prevention and control mechanisms which can be incorporated into the livestock production and health extension packages	MoAL
Design bTB prevention and control mechanisms which can be incorporated into the National Human Health Extension packages	MoH

* MoH, Ministry of Health; MoAL, Ministry of Agriculture and Livestock Resources; MoT, Ministry of Trade.

implementation of One Health principles in policies and strategies. Such policies and strategies should involve the human, animal and environmental health sectors, and this involvement and collaboration must be adopted as a fundamental principle of public health and zoonotic disease transmission control and prevention. This is particularly pertinent in a country like Ethiopia, where contact between humans and livestock is so common and where the marketing of livestock and livestock products is relatively unregulated.

Adopting such One Health approaches should help to harness the efforts of the Government, stakeholders and research in a practical and efficient manner. In conclusion, the fact that the majority of Ethiopian farming households (80%) have direct contact with livestock (Endalew and Ayalew, 2016) creates a climate of regular and considerable risk of zoonotic disease transmission from animal to human. This climate demands the implementation of appropriate strategies founded in the One Health approach, which could provide better opportunities for controlling disease (World Bank, 2010) and facilitating strong coordination between human and animal health sectors. It is therefore encouraging to know that the Ethiopian government has now established a national One Health steering committee and announced the launch of a five-year One Health strategic plan in October 2018 (Ethiopian News Agency, 2018). Implementing a coordinated approach to zoonotic disease is notoriously challenging, but it is hoped that these new initiatives will lead progress in drawing together the different institutions, regulations and policies discussed above.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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Appendix Table 1. Summary of existing proclamations and guidelines on animal health

S/N	Proclamation	Key components/provisions	Organizational responsibilities
1	Proclamation on the prevention and control of animal diseases (Proc. No. 267/2002)	Prevention and control of animal diseases Movement of animals, animal products and by-products Animal health professionals and delivery of services Miscellaneous provisions	(i) The Council of Ministers (ii) Ministry of Agriculture (Ministry of Livestock and Fisheries) (iii) Animal health officers (iv) Animal health representative and the administrative officers (v) Custodian of the animal information channel (vi) Animal health professional information channel
2	Proclamations/regulations on food, medicine and health care administration and control		
	(1) Ethiopian Food, Medicine and Healthcare Administration and Control Authority (Proc. No. 661/2009)	Food safety assurance	(i) Ministry of Health (ii) Inspectorate (iii) Regional Administration or City Administration (iv) The Quality and Standards Authority of Ethiopia (QSAE). proc. No. 102/1998
	(2) Ethiopian Food, Medicine and Healthcare Administration and Control Authority Establishment (Regul. No. 189/2010)	Food safety and quality; Safety, efficacy, quality and proper use of medicines; Competence and ethics of health professionals, Standard of health institutions; Hygiene and environmental health protection suitability Food safety	Food, Medicine and Healthcare Administration and Control Authority (GoE, 2009)
	(3) Food, Medicine and Healthcare Administration and Control (proc. No. 299/2013)	Manufacturing, administration and control of medicines Post-marketing surveillance, food and medicine seizure and disposal. Hygiene, environmental health and communicable disease control, Healthcare	(i) The Ethiopian Food, Medicine and Health Care Administration and Control Authority (ii) The Ministry of Health
3	Proclamation to provide for veterinary drug and feed administration and control (Procl. no. 728/2011)	Veterinary drug administration and control Feed administration and control	(i) Veterinary Drug and Feed Administration and Control Authority (ii) The Ethiopian Standards Authority (iii) Regional state regulatory bodies
4	Guidelines for import and export of animal and animal genetic material (MoA, 2011)	General guideline for import and export of animal and animal genetic material (AAGM) Criteria and standards for livestock and other animals	(i) MoA (MoLF) (ii) Appropriate regional offices
5	Proclamation of live animals marketing (Proc. No. 819/2014)	Live animals market structure Rights and obligations of market actors Provisions on powers and duties of the appropriate organisations in the system	(i) Ministry of Trade (ii) Ministry of Agriculture (MoLF) (iii) Regional organisations (iv) National Bank
6	Proclamation of definition of powers and duties (Proc. No. 916/2015)	defining powers and duties of the executive organs of the Federal Democratic Republic of Ethiopia	(i) Ministry of Livestock and Fisheries (MoLF)