

Trans-Boundary Animal Disease and Their Impacts on International Trade: A Review

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Abstract: Trans-boundary Animal Diseases (TADs) are highly contagious diseases of livestock in the world and transmissible diseases which have the potential for very serious and rapid spread, irrespective of national borders, which has serious socio-economic or public health consequence and they are importance in the international trade of animals and animal products. With rapidly increasing globalization, an associated risk of movement of trans-boundary diseases is emerging. Trans-boundary animal diseases represent a serious threat. They reduce production and productivity, disrupt local and national economies and also threaten human health (zoonotic). Trans-boundary animal disease is a concern globally; cumulative effort is needed at international level to minimize the spread of infectious diseases across the borders. But for sub-Saharan African countries more particularly, eradication of most TADs is impossible due to a various technical, financial and logistical reasons such as increased outbreaks of transboundary animal diseases (TADs), droughts and market issue. In Ethiopia TADs endemic livestock diseases which cause market limit. This imposes far-reaching challenges for agricultural scientists on the critically important need to improve technologies in animal production and health in order to ensure food security, poverty alleviation and to aid economic growth. Considering that livestock rearing constitutes a significant share in the national economy of a developing country like ours, it is imperative to take up disease control initiatives. Measures are required to safeguard the livestock industry from epidemics of infectious diseases and to uphold safe international trade of livestock and their products. In this regard, it is essential to develop scientific and risk-based standards that facilitate the international trade in animal commodities.

Key words: Ethiopia • International trade • Trans-boundary Animal Diseases • Zoonotic

INTRODUCTION

Trans-boundary Animal Diseases (TADs) are highly contagious diseases of livestock in the world. Moreover, their economic importance is a major constraint in international trade. Their implication on human Health and National food security cannot be over emphasized. Zoonotic diseases among TAD's include diseases like West Nile Virus (WNV), Rift Valley Fever (RVF), Mad Cow disease (BSE), Bovine Tuberculosis and Highly Pathogenic Avian Influenza (HPAI). Other important TADs are Foot and Mouth Disease (FMD), Contagious Bovine Pleuropneumonia (CBPP), Lumpy Skin Disease, African Swine Fever (ASF) and Newcastle Disease (ND). They have the potential for very rapid spread, irrespective of national borders and these diseases can cause serious socio-economic and possibly public health consequences [1]. For a considerable number of countries; which can

spread to other countries and reach epidemic proportions; and where control/management, including exclusion, requires cooperation between several countries [2]. They cause most serious impact on animal and human livelihood as these have the potential to threaten food security, proper livelihood of livestock owners & workers and rural economy which in certain instances could lead to political and social unrest in people. Due to the global distribution and persistence of TADs world animal agriculture, food security and international trade are being very badly affected [3].

Trans-boundary animal disease have a multi casual origin; some factors associated with this process include: Trade and international travel (increased frequency and speed of local and international travel, fostered by the globalization process promotes the spread of microorganisms on a global scale), Changes of agricultural practices (animal domestication was one of the main

promoters of microbial evolution by facilitating the availability of new susceptible hosts at high densities, due to the intensification of livestock systems), Climate change (which causes changes eco-geographical distribution of vectors), Reduction of habitat and increased contact with wild animals and Introduction of naïve wild and domestic animals to new geographic areas where the disease is endemic and immunologically unknown for them (increases zoonotic pool within a geographic region) [4-6].

Trans-boundary and emerging diseases are becoming ever more important since they can spread throughout an entire region, impact trading partners and commerce, tourism, consumer confidence and occur in distinct countries, with devastating economic and livelihood consequences. With the globalization of trade and the increasing movements of people, these major crises will continue to menace the global animal and human which is most of the time in developing countries. Regional and international approaches have to be followed and the FAO OIE GF-TADs initiative provides the appropriate concepts and objectives as well as an organizational framework to link the international and regional organizations at the service of the countries to better prevent and control these diseases. With increasing globalization, the persistence of trans-boundary animal diseases (TADs) anywhere in the world poses a serious risk to the world animal agriculture and food security and jeopardizes international trade [7].

Trans-boundary animal disease has a significant impact on national economies due to its high rates of morbidity and mortality in the susceptible animal populations, costs of control or eradication programmes and restrictions on international trade. These diseases negatively affect livestock or poultry production in the country because they impose heavy economic losses in the form of morbidity and mortality and are thus considered as vital threat to livestock production and livelihood of poor farmers, especially in those areas of the country where such diseases have assumed an endemic role. Livestock enterprises and animal production contribute significantly to the world economy, provide household source of income, food security, source of energy, draft power for crop cultivation, high quality animal proteins and vitamins (meat, milk), manure, raw materials (hides and skins) and bride price [8, 9] and generate a livelihood for 1.0 billion poor people in the world [10].

Therefore, the objectives of this paper are:

- To review the trans-boundary disease of animals.
- To review the impacts of trans-boundary animal disease on international trade.

Transboundary Animal Disease: Trans-boundary animal disease are transmissible diseases which have the potential for very serious and rapid spread, irrespective of national borders, which are of serious socio-economic or public health consequence and which are of major importance in the international trade of animals and animal products' [11]. Food and Agriculture Organization of the United Nations, defines Trans-Boundary Animal Diseases (TADs) as: "Those diseases with an essential impact on the economy, trade and/or food security of a group of countries, which can be easily spread to other countries, reaching epidemic proportions and that require control and eradication cooperation between different nations" [12].

Trans-boundary animal diseases (TADs), includes those that are zoonotic (infective to humans) and continue to cause widespread negative socio-economic impacts in an increasingly globalized world with a huge and increasing volume of regional and international trade in livestock and livestock products and the rapid movement of large numbers of people across continents through air travel. Several infectious zoonotic diseases have recently emerged, causing devastating economic losses in the countries affected. These have a wide ranging impact on the livelihoods of farmers and on regional and international trade, food safety, public health and international travel and tourism. Disease pathogens continue to evolve and adapt themselves to animals and humans alike. Disease investigation indicates that many of these new diseases emerge in response to number of critical factors, such as changes in climate, ecosystems, animal production systems and land use, all of which alter the interactions between pathogens and various hosts. Recently, a number of developed countries have been declared free from these diseases and they prevent introduction of the diseases to their countries by banning imports from infected developing countries due to the unrestricted importation of animals from infected countries and poor veterinary services [13].

Ways of Transmission of Trans-Boundary Animal Disease: Many cases of the Trans-Boundary Animal Diseases (TADs) have been reported in various areas of the world during last decades. Such TADs are easily transmitted from one country to another, due to the rapid globalization including the increase of international trade

in domestic and wild animals and animal products, to the expansion of human population, global climate changes, changes of agricultural production systems and to microbiological adaptation. The common ways of introduction of animal diseases to a new geographical location are through entry of live diseased animals and contaminated animal products. Other introductions result from the importation of contaminated biological products such as vaccines or germplasm or via entry of infected people (in case of zoonotic diseases). Even migration of animals and birds, or natural spreading by insect vectors or wind currents, could also spread diseases across geographical borders. Traditionally, trade, traffic and travel have been instruments of disease spread. Now, changing climate across the globe is adding to the misery [14].

International trade in live animals and animal products offers opportunities for pathogens and vectors to be transported across oceans and continents. However, with the exception of a few documented examples, such as, the multiplicity of routes of introduction, including active and passive dispersal of vectors, infected human hosts, animal movements and migration, transportation of goods and biological invasions such as, introduction, initial dispersal, establishment and spread, the specific contribution of globalization to disease emergence is inherently difficult to quantify [15].

Control of Trans-Boundary Animal Disease: Combating diseases is a necessity for farmers. Though a farmer's decision to control the diseases or not is a private one, the presence of an infectious disease in a farm poses a threat too adjacent and even distant farms and can even affect other animal species and develop into an epidemic. This situation where high stakes are involved demand the intervention and action from public agencies or governments [2].

As TADs are a concern globally, cumulative effort is needed at international level to minimize the spread of infectious diseases across the borders [3, 16]. Reducing man-made disasters that have adverse implications on climate, global warming and climate change either due to natural or anthropogenic influences are likely to predispose the animal population to newer infections [14]. Therefore, collective efforts are needed to minimize adverse climatic changes. Interrupting the human-livestock-wildlife transmission of infections. Diseases at the wildlife-livestock interface must become the focus for surveillance of emerging infectious diseases. Breaking the

cycle of disease transmission would help control the spread of infections [17]. Preventing incidence of trans-boundary animal disease can also be practiced by controlling disease transmitting vectors, minimizing the movement of animals across the borders and prompt practice of quarantine protocol. Geographic information system (GIS) and remote sensing could be utilized as early warning systems and in the surveillance and control of infectious diseases [3].

Establishing regional biosecurity arrangement with capacity for early disease warning system for surveillance, monitoring and diagnosis of emerging disease threats [3]. Undertaking animal breeding strategies to create disease resistant gene pools, enhancing host genetic resistance to disease by selective breeding of resistant animals is a smart strategy to improve natural immunity of animals to counter invading infections [18].

Strengthening government policies to enhance agricultural/animal research and training and technology development [19]. More funds need to be allocated for this purpose to build goal oriented research programs in combating TADs. Ensuring appropriate preparedness and response capacity to any emerging disease. Keeping in view that emerging infectious diseases are a constant threat, detection capacity and then implement a timely response [16].

Challenges in Dealing with Trans-Boundary Animal Disease: Requirement of novel systems having capacity of real-time surveillance of emerging diseases; for this, need driven research and service oriented scientific technology are a necessary at regional levels. Research emphasis has to be on specific detection and identification of the infectious agents. Need for epidemiological methods to assess the dynamics of infections in the self and neighboring countries/regions. These methods should be of real-time utility. Research and development of disease diagnostic reagents those do not need refrigeration is also important. More importantly, they should be readily available as well as affordable, for use in pen-side test format. There are many diseases for which there is inadequate supply of vaccines or there are no vaccines available. Insufficient or lack of vaccine hampers the disease control programmes [16].

Even if a technology is available, it has to be cheaper to adopt at the point of use. Need for ensuring public awareness of epidemic animal diseases. Many farmers are unaware of the emerging diseases. As such, unless reported to concerned regional authority, an emerging disease may go unnoticed. Shortage of government and

private funding for research on emerging animal disease problems. Government as well as industries dealing with animal health should take initiative and appropriate sponsorship in these regard. Inadequate regulatory standards for safe international trade of livestock and livestock products. Otherwise, there would be a compromised situation in disease control strategies [14].

Trans-Boundary Animal Disease in Sub-Saharan: Livestock plays a key role in the agricultural economy of many countries in Sub-Saharan Africa, contributing over a quarter of the total value of agricultural production. In Addition to providing food, income, employment and foreign exchange earnings, livestock serves as a source of wealth and supplier of inputs and services such as draught power, manure and transportation. Despite these important roles, the growth in livestock productivity in Sub-Saharan Africa has been below that of another developing region [20, 2].

The present international approach to management of trans-boundary animal diseases (TADs) is based on the assumption that most can be eradicated; consequently, that is the usual objective adopted by international organizations concerned with animal health [21]. However, for sub-Saharan Africa and southern Africa more particularly, eradication of most TADs is impossible due to a various technical, financial and logistical reasons such as increased outbreaks of trans-boundary animal diseases (TADs), droughts and market issue [22].

Trans-Boundary Animal Disease in Ethiopia Context: With over 43 million head of cattle, Ethiopia has the largest herd in Africa. Livestock is central to the Ethiopian economy, contributing for 20% of the GDP, supporting the livelihoods of 70% of the population and generating about 11% of annual export earnings. However, the livestock sub-sector's contribution to the economy and foreign currency earnings in particular, is very low as per the country expectation and potential of the sectors. Some of the major factors contributing to the poor performance of the livestock sub-sector include the prevalence of highly contagious trans-boundary animal diseases (TADs) such as foot-and-mouth disease (FMD), lumpy skin disease (LSD) and contagious bovine pleuropneumonia (CBPP). These diseases continue to hinder international trade in live cattle and their products seriously in an era of globalization [23]. FMD is one of the major diseases in Ethiopia that hampering export of livestock and livestock products to the Middle East and African countries; the Egyptian trade ban of 2005/2006, in which Ethiopia lost more than US\$14 million [24].

Ethiopia set a target to increase exports of meat products to 30, 000 tons by 2008 and eventually to 80, 000 tons, most of which will need to be derived from cattle. However, Ethiopia has many endemic livestock diseases, including FMD that limit market access. Nonetheless, there is increased discussion in policy circles about developing appropriate certification systems to facilitate meat exports, particularly beef. While proposed certification systems would both comply with the minimal disease risk principles advocated in CBT circles and credibly deliver disease-free products that meet current trading standards, they might also limit competitiveness in international markets by virtue of high feeding costs associated with improving quality. Indeed, with or without certification systems, Ethiopia remains in the “murky middle” from the standpoint of competitiveness in third markets. At present, Ethiopia is neither cost-competitive with low value suppliers to African markets such as India and Brazil nor is it competitive (with an SPS-certified, higher quality product) in higher value markets in the Middle East [25].

Impact of Transboundary Animal Disease on International Trade: Trans-boundary Animal Diseases (TADs) are highly contagious diseases of livestock in the world. Moreover, their economic importance is a major constraint in international trade losses themselves. Therefore, the countries which are free from major diseases will tend to protect their local agriculture by totally excluding the importation of livestock products from areas affected by specific animal diseases. Conversely, benefits of elimination of trans-boundary animal diseases can be very large as it offers the opportunity of gaining access to high-value export markets. Trans-boundary animal disease also has implications on domestic trade as the veterinary authority imposes restriction on animal movement as a part of disease control measure. In evaluating TAD impacts, it is now recognized that poverty implications, technical feasibility and political desirability play a role in disease response program selections in LDCs Furthermore, the cost benefit offset of eradication versus management programs will vary by disease, where high impact diseases do not necessarily carry high benefits from eradication [26, 27].

Trans-boundary animal diseases including those that are zoonotic (infective to humans), continue to cause widespread negative socio-economic impacts in an increasingly globalized world. With a huge and increasing volume of regional and international trade in livestock and livestock products and the rapid movement of large

numbers of people across continents through air travel. Several infectious zoonotic diseases have recently emerged, causing devastating economic losses in the countries affected. These have a wide-ranging impact on the livelihoods of farmers and on regional and international trade, food safety, public health and international travel and tourism. Disease pathogens continue to evolve and adapt themselves to animals and humans alike. Disease investigation indicates that many of these new diseases emerge in response to number critical factors, such as changes in climate, ecosystems, animal production systems and land use, all of which alter the interactions between pathogens and various hosts [26].

Loss of production and productivity is likely to influence the market price of the commodity, determined by the supply and demand effects induced by TADs. Limited supply can result in increase in market price but on the contrary public health concern associated with certain TADs may also decrease the demand. Moreover, relative effects on producers and consumers of the production shortfall will depend on the relative elasticities of demand and supply. Another dimension of the price and market effects is that it is not only the producers but also the traders who are directly affected international trade in livestock and livestock products continues to be seriously hindered by epizootic animal diseases, in particular those categorized as 'transboundary animal diseases' (TADs). There is the danger that informal and illegal trans-border trade in livestock which abound in some countries could derail the revolution [28].

Economic Impacts: Trans-boundary animal diseases (TADs) cause significant economic losses throughout the world. But producers in less developed countries (LDCs) are at particular risk because livestock provide not only income and an asset base, but also food, draught power and various social functions [29]. Trans-boundary diseases threaten food security, affect livelihoods of rural communities and disrupt local and international trade [2].

In general, livestock's products have increased their international trade in 4% only in the last two decades [30]. However, as a result of the emergence and re-emergence of various animal diseases, such as bovine spongiform encephalopathy (BSE), the annual growth of meat products decreased 2% in the late 1990s [31]. Therefore, the cost of trans-boundary animal diseases relates to agricultural products, to the country's economy and international markets are massive. Thus, it is very important to create public policies focused to assure countries' food security (especially in developing

nations) to avoid negative economic impacts caused by TADs, especially on the more susceptible social stratus. The World Bank has estimated that zoonotic disease outbreaks in the past 10 years have cost worldwide more than \$US200 billion due to loss of trade, tourism and tax revenues [32].

Pests and animal diseases cause the loss of more than 40% in the global food supply, being a clear threat to the residual economies of developing countries and food security of its inhabitants [33]. Many economic impacts are difficult to quantify and valuation also may be problematic. Such factors as animal welfare, human health and the environment are of obvious importance, but do not have market values and different people have different perceptions of their value. It is therefore impossible to provide objective assessments of the total cost of most animal diseases, especially the most serious ones that have wide-ranging effects. But the cost of animal disease can be enormous [33].

Public Health Significance: Nearly 75% of infectious human diseases had their origins in animals. Many of them have adapted in humans with efficient human to human transmission, while others still remained zoonotic with frequent transmission from animals to humans. Such zoonotic transmission of diseases has increased in recent years, perhaps due to increasingly intensive livestock production in areas of proximity to human populations and loss of habitats of wildlife. Most of these are considered as emerging pandemic threat. An emerging zoonotic disease may affect humans accidentally and sporadically, but also may adapt sufficiently to human host to cause a deadly epidemic or pandemic in the immature human host population [34].

Apart from public health concern the economic consequence of a human pandemic could be huge. Public health authorities in industrialized countries have been faced with an increasing number of food safety problems. The situation is equally serious in developing countries. In addition to known food-borne diseases, public health communities are being challenged by the emergence of new or newly recognized types of food-borne illnesses, often with serious health and economic consequences [35]. The exports of smuggled wildlife products and derivatives have an alarming effect on the introduction of many trans-boundary diseases, also affecting human beings and the entire ecosystem. Among these, the diseases of viral and prion origins like, SARS, Avian flu, monkey pox are prominent having tremendous zoonotic potential. Trans-boundary animal disease also has an important effect on public health. The disability-adjusted

life years (DALYs) is a measure of overall disease burden, expressed as the number of years lost due to ill-health, disability or early death. Infectious diseases also lead to compromised health and disability, accounting for nearly 30% of all DALYs worldwide [36].

CONCLUSION

Trans-boundary Animal Diseases (TADs) are highly contagious and transmissible diseases of livestock in the world, which have the potential for very serious and rapid spread, irrespective of national borders. Trans-boundary animal disease has serious socio-economic or public health consequence and they are important disease in the international trade of animals and animal products. Trans-boundary animal diseases (TADs), includes those that are zoonotic (infective to humans) such as Rift Valley Fever (RVF), Mad Cow disease (BSE), Bovine Tuberculosis and Highly Pathogenic Avian Influenza (HPAI) and other important disease such as Foot and Mouth Disease (FMD), Contagious Bovine Pleuropneumonia (CBPP), Lumpy Skin Disease, African Swine Fever (ASF) and Newcastle Disease (ND). Those diseases are transmitted easily due to the rapid globalization including the increase of international trade in domestic and wild animals and animal products, to the expansion of human population, global climate changes, changes of agricultural production systems, but commonly they transmitted through entry of live diseased animals and contaminated animal products. Trans-boundary animal disease are challenging disease to dealing with, due to absence of driven oriented research, absence of vaccination programs, lack of farmers awareness about those disease and inadequate regulatory standards for safe international trade of livestock and livestock products.

Based on the above conclusions, the following recommendations are forwarded:

- Controlling disease transmitting vectors, minimizing the movement of animals across the borders and prompt practice of quarantine are necessary to prevent the spread of those diseases.
- Establishing regional biosecurity arrangement with capacity for early disease warning system for surveillance, monitoring and diagnosis of emerging disease.
- Strengthening government policies to enhance agricultural/animal research and training.

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