

## **A Review on Trans-Boundary Animal Diseases Management: Prevention and Control**

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**Abstract:** Trans-Boundary Animal Diseases (TADs) as defined by the United Nations Food and Agriculture Organization (FAO) and the World Organization for Animal Health (OIE) are those diseases that are of significant economic, trade and/or food security importance for a considerable number of countries which can easily spread to other countries and reach epidemic proportions and where prevention, control/management including exclusion, requires cooperation between several countries. The list of TADs includes render pest, Contagious Bovine Pleuropneumonia (CBPP), Foot-and-Mouth Disease (FMD), African swine fever, newcastle disease, avian influenza, Rift Valley fever and lumpy skin disease. They have a multi-sector impact as they cause disease, suffering and death of animals. They grossly reduce productivity of livestock. Some of the TADs (e.g., Rift Valley fever, the H5N1 strain of avian influenza) may also cause disease, suffering and even death of humans. TADs constitute a major technical barrier to trade in livestock commodities. Foot-and-mouth disease is the most notorious such barrier and the countries where this disease occurs unchecked are excluded from international trade in livestock commodities. So, the persistent occurrence of FMD and other major TADs in many parts of Africa is a poverty entrapment for African livestock farmers.

**Key words:** Trans-boundary animal disease, control management, prevention, poverty entrapment, African livestock farmers, international trade

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### **INTRODUCTION**

Livestock are an integral component of many farming systems of the world. They serve as source of food and food security, nonhuman and human transportation and draft farm power (Breeze, 2006; Halderman, 2005). The agricultural sector provides a living for over 75% of Africa and agricultural productivity has been supported by livestock (Anonymous, 1996a, b). Animal diseases can have a major impact upon public health, national economies and international trade and the food security and livelihoods of households, particularly of the poor. The frequency and impact of animal-origin diseases have increased over past decades and account for approximately 75% of all new human diseases. It is recognized that the number of emerging animal-origin diseases will increase (Anonymous, 2006a, b). The livestock industry is an important component of national economy and play significant role in the agricultural economy. It makes an important contribution to the livelihoods of about 65% of Ethiopian population. The estimated value of livestock production including transport and manure was estimated to be 5117 million birr (Anonymous, 1996; Assegid, 1999). There are numerous constraints facing the development of the livestock sector

and these can be generalized as inadequate animal nutrition, high prevalence of disease, poor breeding, poor management of stock and feed resources, inadequate livestock service and infrastructure, uncoordinated development programs and appropriate policies. 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 (Sein, 1998). In recent decades, the world has been facing devastating economic losses to livestock farmers from major outbreak of TADs such as Foot and Mouth Disease (FMD) in Europe, Classic Swine Fever (CSF) in the Caribbean and Europe (1996-2002), Rinderpest (RP) in Africa in the 1980's. Rweyemamu *et al.* (2000), pest des pet its (PPR) ruminant in India and Bangladesh. By Roeder and Obi Contagious Bovine Pleura Pneumonia (CBPP) in Eastern and Southern Africa (late 1990's) as well as Rift Valley Fever (RVF) in the Arabian Peninsula (2000) (Balkhy and Memish, 2003).

For a sustainable livestock development the country should control and prevent these diseases giving special attention to those diseases which have impact on international market and this control schemes require policy guideline which encompass further adoption of

plans, projects, programmes, rules and regulations, adequate and effective institutional set up, budget, well-trained man power, net working and information exchange among stakeholders (Assegid, 2000). Accordingly, the objectives of this study include.

To summarize socio-economic impact of TADS, to safeguard the livestock industry of developed as well as developing countries from repeated incursions of infectious disease epidemics, to highlight nature and the distribution of trans-boundary animal diseases in world wide, To describe the possible prevention and control strategies of TADs, to identify the main constraints in the control and prevention of TADS.

To propose possible policy implications and policy related recommendation in fighting against these diseases (All animal diseases have the potential to adversely affect human populations by reducing the quantity and quality of food, other livestock products (hides, skins, fibers) and animal power (traction, transport) that can be obtained from a given quantity of resources and by reducing people's assets. Of these, trans-boundary animal diseases tend to have the most serious consequences (FAO and UN., 2006).

#### **Definition and risk of introduction of tads in the country**

**Definition;** Trans-boundary Animal Diseases (TADs) may be defined as those epidemic diseases which are highly contagious or transmissible and have the potential for very rapid spread, irrespective of national borders, causing serious socio-economic and possibly public health consequences. These diseases which cause a high morbidity and mortality in susceptible animal populations, constitute a constant threat to the livelihood of livestock farmers (FAO and UN., 2006).

#### **Risk of introduction**

**Economic risk:** It is widely recognized that diseases in farm animal has a significant economic impact on livestock production and incurs substation cost for the society both in developed and developing countries. Epidemic TADs, due to infectious and rapidly spreading in nature can have particularly large and extensive economic impact, specially in the case Zoonoses. Diseases in livestock has nine main economic impact:

- Loss capital (i.e., animal mortality)
- Reduction in the level of marketable out put
- Reduction in (perceived or actual) output quality
- West (or higher level of use) in puts
- Resource costs associated with disease prevention and control
- Human health costs associated with disease (zoo noses/diseases control

- Negative animal welfare impacts associated with disease
- International trade restrictions due to diseases and its control
- Range of other impacts such as effects on rural economics, tourism, environment (Bennett, 2003)

Furthermore, their potential consequences are of such a magnitude that their occurrence may also have a significant detrimental effect on national economies. The trans-boundary animal diseases can cause substantial economic costs to developed countries but their effects are most severe in developing countries (Randolph *et al.*, 2002).

Trans-boundary animal diseases have the potential to threaten food security through serious loss of animal protein and/or loss of draught animal power for cropping; increase poverty levels particularly in poor communities that have a high incidence dependence on livestock farming for sustenance, cause major production losses for livestock products such as meat, milk and other dairy products; wool and other fibers and skins and hides, thereby reducing farm incomes. They may also restrict opportunities for upgrading the production potential of local livestock industries by making it difficult to utilize exotic high producing breeds which tend to be very susceptible to the trans-boundary disease.

**Public health risk:** Emerging trans-boundary zoonotic diseases are increasingly recognized as global and regional issue with potentially serious human health and economic risks and their current upward trends are likely to continue. History shows that the cascade of events leading to the emergence of a new diseases is different each time, several factors are known to favor such emergence. These include microbiological adaptation, environmental changes, globalization of agriculture, food production and trade and human behavioral factors (Marano and Pappainou, 2004). The majority of the trans-boundary animal disease do not cause epidemic in humans although, humans can become infected and result in death (Otte *et al.*, 2004). Some of them such as RVF and the deadly Avian influenza caused by H5N1, also serious diseases they caused illness and even death in humans (Anonymous, 2006a, b). Recent outbreak of RVF cause 211 deaths out of 601 human cases as of December 2007 in Sudan and 112 deaths out of 411 suspected cases in affected districts of Kenya until 31 January 2007 (Anonymous, 2007). As the result of deadly AI H5N1 strain also had been caused 15 fatalities out of 38 human cases in Egypt until November 2007 were recorded (Anonymous, 2008).

**Livestock production and price risk:** Many TADs have 50-90% mortality rate in susceptible animals. Rift Valley Fever (RVF) normally produces only a mild infection in local, Africa breeds of cattle, sheep, goats while exotic breeds of the same species may experience severe outbreaks of abortion. CSF virus kill less than half of the infected pigs while other, “virulent” strains may kill up to 100%. The first outbreak of Rinder Pest (RP) in East Africa in 1887 was estimated to have killed about 90-% of Ethiopian cattle and more than 10 million cattle on continent as whole wide spread famine resulted.

Improved response to outbreaks and increased access to vaccine has reduced the likelihood of many disease epidemic but this experience is countered by increased trade, smuggling and susceptibility of small poultry and ruminant populations raised in intensive (McLeod and Leslie, 2000).

The only international cost benefit analysis of animal disease control is a study of pan African rinder pest company in Ethiopia, Kenya, Tanzania and Uganda (an economic assessment of the costs and benefits of rinder pest control in East Africa).

High producing animals are usually more severely affected, both in terms of immediate effects on production and long term damage leading to premature culling. The main risk of TADs in term of animal production are the following:

- Production losses such as meat; milk and other dairy products; wool and skin and hides (Otte *et al.*, 2004)
- Abortion, delayed conceptions and delayed reproduction (Geering and Lubroth, 2002)
- Mortality of diseased animals (Seifert, 1996)
- Restriction of opportunities for upgrading the production potential of local livestock industries by making it difficult to utilize exotic high producing breeds which tend to be very susceptible to the trans boundary animal diseases (Seifert, 1996)

**Food security and nutrition risk:** Animal diseases can have major effects on food availability and quality for poor communities and therefore, raise issues of food security as well as having negative effects on poverty alleviation (Caspari *et al.*, 2007). By increasing livestock mortality and morbidity, these diseases will directly result in a reduced supply of high quality protein, e.g., milk, eggs, meat (Scoones and Wolmer, 2006).

Food security and nutrition of the societies that rely wholly on livestock products for their subsistence are threatened by severe epidemics. Livestock also contribute to food security and nutrition by being exchangeable against other goods such as grains, flour, salt, etc. and

hence reduced off take potentially leads to “less balanced diet”. In areas where animals constitute important inputs into agriculture by providing draft power and dung, livestock disease also indirectly affect food security by reducing the land acreage under cultivation and crop yield (Anonymous, 1999).

## MATERIALS AND METHODS

### Tads and reporting system

**Trans-boundary animal diseases:** The world has been facing devastating economic losses from major outbreaks of Trans-Boundary Animal Diseases (TADs) such as foot-and mouth disease, classical swine fever, rinder pest, Peste des Petits Ruminants (PPR) and Rift Valley fever. Lately the Highly Pathogenic Avian Influenza (HPAI) due to H5N1 virus has become an international crisis as all regions around the world can be considered at risk. Among most trans-boundary animal disease some are taken as example as:

**African Swine Fever (ASF):** African swine fever is the most lethal trans-boundary diseases of pigs. It is also a viral diseases which has shown a great propensity for sudden unexpected international spread over great distances. This often associated with transportation of contaminated pig meat products including garbage from ships and aircraft containing food scraps. Presently, there are no vaccines against ASF. ASF is endemic for much of Eastern and Southern Africa. Eradication is not feasible there because of wild life cycles of infection between pigs. The only practical disease control measure for commercial piggeries is denial of access to wild and village pigs through fencing and other sanitary precaution (Otte, 1997).

**Avian influenza; Definition:** A panzootic viral disease of avian species (chickens, turkeys, guinea fowls, ostrich, migratory waterfowl and others) with symptoms ranging from mild or even asymptomatic to acute and fatal. Symptoms include watery diarrhea, loss of appetite, excessive thirst, depression, cessation of egg production and marked increased mortality. HPAI can easily be confused with Newcastle disease in chickens (FAO and UN., 2006).

### Contagious Bovine Pleuro Pneumonia (CBPP)

**Definition:** A highly infectious acute, sub-acute or chronic disease, primarily of cattle, affecting the lungs and occasionally the joints and caused by a bacterium of the Mycoplasma group. Symptoms include fever, loss of appetite and a severe cough. If left unchecked, outbreaks can result in mortality rates of over 50%.

**Foot-and-Mouth Disease (FMD); Definition:** A highly contagious viral infection primarily of cloven-hoofed domestic animals (cattle, goats, sheep, pigs and water buffalo) and cloven-hoofed wild animals. Symptoms are fever and ulcerating blisters in the mouth, hoofs, udder, and teats.

**Rift Valley Fever (RVF):** (Enzootic hepatitis) a disease of sheep, goat, cattle, donkey and man occurring in Africa which are not recorded in North Africa until 1973 (Balkhy and Memish, 2003).

#### Reporting system

**Disease reporting system:** Disease reporting is conducted at deferent level, i.e:

- From livestock owners to nearest veterinary services
- From animal health post, private veterinarian or animal health assistant or NGO veterinarian to wereda veterinarian
- From wereda veterinarian to zonal regional veterinary officers
- From regional veterinary officer to Federal veterinary services and
- From Federal veterinary services to international organization like OIE and AU-IBAR

**Outbreak reporting system:** Key informants indicated that outbreaks reports are done through mobile calls, radio calls (Kenya side) and persons who are going to town of the district at community level in ethio-kenya border. After reported outbreaks have been recorded on prepared formats they are monthly sent to National/Regional Epidemiological Units through mail. The epidemiological units mostly allocated enough money to cover costs of post services. The outbreak reporting formats of both sides were found be well prepared, so as to collect all important epidemiological data. Sometimes, these outbreaks could be immediately reported to high veterinary office if there is no vaccine or budget available to take action and to National Veterinary Laboratories if they are unknown and serious. Fast reporting at community level for some outbreaks, well prepared reporting format and regular allocation budget to costs of post offices were found to be strong sides of the present outbreak reporting system. The fast report is attributed to the consideration of mass vaccination in response to reports as benefits which increases acceptability and sustainability of the reporting of those diseases at community level. In line with this, the improvement of

communications such as mobile services in the area was found to be opportunity for timely reporting outbreaks. However, transport and communication were still found the two limiting factors in reporting system (Anonymous, 2006a, b).

**Control and prevention strategy of tads:** A variety of management options exist when local, national, regional or international authorities face decisions on trans boundary pests and disease. The following section focus on the procedure for choosing action against TADS.

Farmers commonly have to deal with disease incidence in their livestock. Modern disease management does not attempt to eliminate all diseases but tries to create an environment which maintains the disease pressure at low levels. However, most TADs are too virulent or threatening to human's health and trade relationship to tolerate even at low level. Therefore, prevention and subsequent elimination is the key element for the management of TADs (FAO and UN., 2006).

The management of TADs in effective is possible however, highly dependent on national and governance and political support. Technologies for disease control must be complemented by often complex and difficult to implement control measures if they are to work over the long terms (Scoones and Wolmer, 2006). Investing in measures to improve the prevention and control of animal disease is costly and priorities for each country need to be established on a case by case basis depending on their current status, capacity and level of developments (Caspari *et al.*, 2007).

Early warning and early reaction lie at the heart of effective prevention and progressive control of TADs (Anonymous, 1999). In an emergency situation, the rapid distribution of information and an improved coordination between countries is essential to control contagious disease, so, as to protect people against diseases of animal origin and prevent the risk of diseases spread into other countries (King, 2006).

Early warning and response is based on the concept that dealing with a disease epidemic in its early stage is easier and more economical than having to deal with it once it is widespread. From a public health prospective, early warning of outbreaks with a known zoonotic potential will enable control measures that can prevent human morbidity and mortality. Also, new previously unknown human infectious diseases have emerged and will continue to emerge from the animal reservoir (FAO and UN., 2006; Schudel and Lombard, 2004; Anonymous, 2006a, b).

**Description:** Livestock disease management is made up of two key components:

- Prevention or bio security measures in susceptible herds
- Control measures taken once infection occurs

The probability of infection from given disease depends on existing farm practices (prevention) as well as the prevalence in host populations in the relevant area. As the prevalence in the area increases, the probability of infection increase.

#### Control option

**Reducing the probability of entry:** Quarantine is the first line of defense against TADs and countries devote considerable resource to ensure that they implement effective border and import quarantine policies and program's to prevent introduction. Quarantine is seen as a public good and government responsibility since individual farmers and private veterinary services are relatively powerless to avoid or overcome introduction, countries indicate their quarantine policy through list of restricted or permitted organism or article.

The prevention, control and elimination of TADs is more than a national public good because of trans-boundary spread, effective protection is only possible through a concerted and coordinated effort among neighboring countries. The control effort of the individual countries against pests and disease may be continually frustrated by neighboring countries not taking equivalent action. An international approach also allows better advantage to be taken of natural geographic barriers and border biological and epidemiological pattern (FAO and UN., 2006).

**Estimating risk:** A key aspect of effective exclusion and safeguard is accurately estimating risk. Methods used including modeling to predict the ability of organism to survive under the condition of a geographic area that is not yet affected. Tools like Geographic Information System (GIS) make it possible to combine and cross-analyze large amount of visual numerical data such as satellite retrieved images of the earth surface, climatological information, disease and livestock population data and to produce predictions of disease spread. An example of GIS used in this way is the Programme Against African Trypanomiasis (PAAT) information system which is designed to identify the impact of the disease. The risk of TADs such as FMD can

be estimated on ground intelligence analysis of animal movement patterns along the borders (FAO and UN., 2006).

**Response to introduction or outbreak:** The control of animal disease may involve:

- Vaccination
- Movement control
- At a times achieved through the construction of major fence
- Chemoprophylaxis and therapy
- Slaughter of infected and possible in contact animals
- Disinfection and vector control in the case of vector born disease. The latter can be achieved through the application of chemicals by biological means and by changing the natural habitat (Anonymous, 1996)

**Vaccination:** Vaccination has proven its capacity to help prevent, control and eradicate disease as exemplified by smallpox, RP and rabies (Schudel and Lombard, 2004). Vaccination may also serve as a tool for reduction of viral load in the environment, thus decreasing the risk of transmission with in animal population. Veterinary vaccines have historically been produced from attenuated strains, although molecular techniques are facilitating development of safer and more efficacious vaccines that make diagnosis easier. Vaccination of a particular host protects not only key target populations but can also serve as barrier to protect human and veterinary health (Haydon *et al.*, 2006).

**Zoning:** Zoning is the proclamation of geographical areas in which specific disease control actions are to be carried out. These areas are usually in the form of concentric "circles" around known suspected foci of infection with the most intensive disease control activities in the inner zones (EMPRES., 2001). As Kitching (2000) indicated OIE accept for the establishment of free and infected zones with in a country for the former list a diseases, other than for VS, RVF and LSD.

The actual size and shape of the zones may be determined by administrative boundaries, geographic barrier. Or be driven by epidemiological of resource imperatives (Geering and Lubroyh, 2002). Because the many ways of spreading of these diseases it is very important not to lose sight of the fact that transmission can occur over hundreds or thousands of kilometers by road or air overnight (EMPRES., 2001) (Table 1).

Table 1: Geographic barrier of administrative boundries

Sequence of control measures	Reduce risk of entry	Verification or compliance	Control or mitigation	Adaptation or mitigation
When to make measures	Request to import new commodity or from new country	Entry and distribution points for commodities and live animals	Out break and incursion detected and control option exist Natural pathway led to introduction and control deemed appropriate	Impact found to be less than predicted Improved ability to adapt Ineffective control ended Disease not controllable with existing technology Cost of control exceeds benefits
Examples of measures aimed at preventing introduction of the disease	Training technical assistance and survey in country of origin Network with official and expert area of risk Development of restricted list in accordance with sps guidelines Inspection in country of origin Restrict import to designated free area in a country with disease Require advanced treatment for high risk commodities Analysis to find pathway for preventive action	Inspection Visual Random sampling Target by risk Detector dogs Isolation for observation period Limited post of entry according to type cargo or risk Limit target destination Public education	Detection and delineation of infected zone Monitoring of surrounding zone Suppression, containment or eradication using: Quarantine station Vaccines Stamping out Pesticide application treatment of animals living in the area to avoid spread Emergency reporting system	New research control option for producers Registration of new vaccine that is effective in control Create diseases free stock supply and certification Control program keeps disease at tolerable level Addition of water treatment for water born disease
Reasons for failure of control measures Note: All measures may fail with in adequate funding or political will to carry them out	Non-existent or misleading information Inadequate data-host yet not recognized	Inspection fails due to volume of entry or poor sampling Smuggling of high risk items Natural pathway not regulated	Detection technologies not successful or disease not detected Insufficient monitoring In available vaccines cause outbreaks of non indigenous breed	Control measures are not used by all Agent may become resistant New population or strains
Problem from relying on the above measures	Requirements to reduce risk become onerous Trade dispute results from imbalance between risk reduction and free trade values Consumers in importing country losses benefit of new supply	Delay in release of cargo and passenger delays Civil rights should be violated-smuggling may increase	More severe environmental impact from control and prevention Repeated introduction lead to high costs when original pathway is not closed	Secondary impact from the disease may not be recognized initially Existence of disease is accepted, ending control effort

(Quinlan, 2000)

## RESULTS AND DISCUSSION

### Constraints for the control of TADS

**Globalization:** More and faster trade (more host material/more packaging/more opportunity for long distance “hitchhiking”), Trade in fresh horticulture, floriculture, live animal, fresh animal products (FAO and UN., 2006; Schudel and Lombard, 2004; Anonymous, 2006a, b). New travel/trade route (e.g., South Africa to South-East Asia; South East Asia to South and central America) and increased in livestock and livestock products thus put large numbers of animal and humans at the risk of TADs in general and trans-boundary zoo noses. These new routes highlight the great susceptibility in livestock to exotic pathogen when they have not co-evolved (Otte *et al.*, 2004).

**Changes in livestock production system:** The rising demand for meat due to rising incomes, population in developing countries has also lead to intensification of production resulting in more animal in one place. The higher concentration of animals often under sub optimal husbandry condition provides greater opportunity for TADs to move very rapidly and for greater economic losses to occur (Otte *et al.*, 2004).

**Privatization deregulation and decentralization of animal health services in a large number of countries:** Some countries and geographic area are more vulnerable than others to invasions of trans-boundary animal diseases. International cooperation is one way to reduce the disparity of control or resources between neighboring region or countries. It is important to recognize the vulnerable regions, probable pathways and existing

limitations when establishing international approaches to trans-boundary animal diseases control. Country and region differences drive from: perceived economic impact, political condition and civil unrest, regulatory regime, including resources for prevention and enforcement and attitudes and views on risk; as well as from biological and physical condition (FAO and UN., 2006).

**Conflict and civil unrest which has led to:**

- Difficulty in enforcement of quarantine in many area, militaries and refugee movement
- Breakdown of institutional support for quarantine and loss of supply line for material
- Increased smuggling
- Inflow of food aid which may be contaminated
- Difficulty in getting access to border areas because of landmine and other dangers making it difficult to survey (McLeod and Leslie, 2000)

**Economic factor:** The poorest regions of the world are greatly affected due to financial problem to limit spread of TADs, however, there is not necessary a direct correlation between country income level and the ability of animal to keep out of threats (Otte *et al.*, 2004). Also in many countries public funding of veterinary services is poor and even declining, resulting in uncontrolled livestock movements, poor diagnostic capacity and the inability to react quickly and effectively to disease outbreak. Farmers are usually not compensated for disease losses and thus often tend to sell still healthy-looking livestock to reduce their financial losses when a disease problem is occurring on their farm. As a proportion of these apparently healthy animals may be in early stages of infection where clinical signs are not yet apparent this behavior of farmers may significantly contribute to the spread of disease (Anonymous, 1999).

**Prevention of TADS:** Livestock disease contributes to an important set of problems with in livestock production system. These include animal welfare, productivity losses, uncertain food security, loss of income and negative impact on human health. Livestock disease management can reduce disease through improved animal husbandry practices. These include controlled breeding, controlling entry to the farm lots and quarantining sick animals and through developing and improving antibiotics, vaccines and diagnostic tools, evaluation of ethno therapeutic option and vector controlling techniques.

**Preventive measures:** Preventing diseases entering and spreading in livestock populations while many approaches to disease management are disease specific, improved regulation of movements of livestock can

provide broader protection. A standard disease prevention program that can apply in all contexts does not exist. But there are some basic principles that should always be observed. The following practices aid in disease prevention: Elaboration of animal health program, select a well known, reliable source from which to purchase animals, one that can supply healthy stock, inherently vigorous and developed for specific purpose. New animals should be monitored for disease before being introduced into the main flock, good hygiene including clean water and feed supplies, precise vaccination schedule for each herd or flocks, observe animals frequently for signs of disease and if the disease develops, obtain an early, reliable diagnosis and apply the best treatment, control and eradication, dispose of all dead animals by burning, deep burying or disposal pits, maintain good record relative to flock or herd health. These should include vaccination history, disease problem and medications.

**Prevention strategies:** The term quarantine is used to cover all restrictions on the movement of infected or suspect animals or prevent the spread of disease (Anonymous, 1999) and introduction of exotic disease (Geering and Lubroth, 2002). An effective national animal quarantine system should always be the first line of defense against the entry and establishment of TADs (Anonymous, 1999). Prevention of livestock exotic disease emergency requires both a power full and effective system of quarantine to minimize the risk of introduction of a disease agent and a rapid and efficient system of disease surveillance, so that, suspected exotic disease outbreaks are quickly identified and accurately diagnosed, allowing an urgent response. Quarantine establishment should be near a seaport or airport or other facilities used for loading or unloading animals for export or import. They should not be adjacent to other livestock facilities such as farm, abattoir, livestock markets or stock routs (Anonymous, 1996). Quarantine should also be established on the boarder to control movements of animal across national borders for different reasons (Geering and Lubroth, 2002). These may include pre export testing and quarantine, animal health certification and any necessary post-arrival inspection, testing and quarantine according to international rules. However, even the most sophisticated quarantine service cannot provide an absolute barrier (Anonymous, 1999).

## CONCLUSION

Trans-Boundary animal 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 distant 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 populations, the FAO philosophy-shared by the OIE-is a need to prevent and control them at the source which is most of the time in developing countries. Regional and international approach 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. The world has been facing devastating economic losses from major outbreaks of Trans-Boundary Animal Diseases (TADs) such as foot-and mouth disease, classical swine fever, render pest, Peste des Petits Ruminants (PPR) and Rift Valley fever. Lately the Highly Pathogenic Avian Influenza (HPAI) due to H5N1 virus has become an international crisis as all regions around the world can be considered at risk. These disease are caused for high mortality and morbidity in susceptible animal populations constitute constant threat to the livelihood of livestock farmers.

## RECOMMENDATIONS

Depend on these conclusion the following recommendation are for worded:

- It is recommended to be linked to OIE and FAO, specially the monitoring system, mainly the flash board part
- All the countries should be aware of the disease in others. They need to know
- The country must be establish disease control policy to utilize livestock effectively and reliably
- GIS and central data base should be established to enhance information exchange among stakeholders
- More attention must be given to the livestock subsector in general and the veterinary practice in particular for sustainable development of agriculture economy
- The veterinary sector must be strengthened in term of competent administrative, structure budget trained manpower, etc. to control TADs

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