THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

NATIONAL STRATEGY FOR TSETSE AND TRYPANOSOMOSIS CONTROL/ERADICATION IN ETHIOPIA

MINISTRY OF AGRICULTURE &

MINISTRY OF SCIENCE AND TECHNOLOGY

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EXECUTIVE SUMMARY

The Ethiopian economy is heavily dependent on the agriculture sector which contributes 41.2% of the total GDP. Over the last eight years the economy is exhibiting encouraging growth rate, averaging 11% annually. The country has the largest livestock population in Africa (38.82 million TLU). Livestock is very crucial as a national resource base and is a chief source of animal protein for domestic consumption and one of the major sources for foreign currency earning. More importantly, animal agriculture is contributing immensely to the production of food and cash crops as major (90%) or the only energy source for ploughing, threshing and transporting farm products and other goods especially in the marginal and raged terrain areas of the country. Human and goods transport is also heavily dependent on draught animals. Animal agriculture contributes 45% to agricultural GDP and 31% of the total agricultural employment. Over 85% and 90% of farm cash and pastoral income, respectively, are generated by or from livestock.

Animal agriculture is not providing benefits proportional to its size and other potentials due to various problems amongst which diseases have great prominence. Tsetse infested but otherwise well rain-fed and virgin vast (est. 220,000 km^2) fertile low-lying areas in the west, southwest, south and northwest are not under sound and sustainable agricultural production and development due to the debilitating and catastrophic effects directly and/or indirectly attributed to trypanosomosis that tsetse flies transmit to livestock.

Trypanosomosis is a disease that affects animals and humans and is transmitted by biting insects mainly tsetse flies. Tsetse flies are probably the most important livestock pests in Africa. The disease impoverishes livestock farmers and threatens food security and livelihoods. Tsetse and trypanosomosis infestation has also a negative impact on wildlife health and tourism and its control/eradication in conservation and adjacent areas are critical. The increasing levels of trypanocidal resistance - due to usage of the limited number of drugs for over a long period of time, improved tsetse control technologies and increasing demand for land has turned more attention on tsetse suppression and eradication to recover the infested land for increased agricultural production.

Tsetse and trypanosomosis control/eradication is a major challenge that requires a clear strategy and wide stakeholder involvement to enable implementation. Trypanosomosis is one of the most economically important diseases of livestock in Africa. Tsetse flies (*Glossina species*) infest 38 African countries and approximately 10 million km^2 of Africa, which is one-third of the continent.

Major economic loses attributed to tsetse and trypanosomosis is through: cost of treatment to treat affected animals, mortality of infected animals, abortion, reduction of production, loss of draught power and inability to plough, debilitation of affected animals, the inability to market livestock, or lower prices obtained for trypanosomosis affected animals and poor body conditions making animals unsuitable for slaughter for meat, and loss of foreign

exchange through imports of drugs and lost opportunity to export livestock and livestock products. Currently tsetse and trypanosomosis control/eradication is being implemented by the two Ministries (Ministry of Agriculture and Ministry of Science & Technology) with supports from development partners such as the African Development Bank, International Atomic Energy Agency and Pan African Tsetse and Trypanosomosis Eradication Campaign. Moreover, the five tsetse infested regional states, Amhara, Oromia, SNNP, Benshangul-Gumuz and Gambella, are making effort to fight against trypanosomosis in their respective territories. However tsetse and trypanosomosis control/eradication activities have experienced a number of challenges and constraints which hamper the control/eradication efforts.

Tsetse and trypanosomosis control in Ethiopia has been operated without a clear and explicit national policy guideline, institutional and legal framework and were lacking of a central coordination framework to harmonize the existing efforts to bring the aspired results. The fragmented efforts made by different actors to control tsetse-transmitted trypanosomosis in the country to the desired state of affairs, therefore, are still remote and enabled them only to suppress the tsetse populations temporarily. Although such extensive activities have made some local reduction of tsetse territories (for instance in Didessa valley), general picture has not altered and to the contrary tsetse fronts are on the increase in many places of the country. The technical, administrative and financial system, therefore, requires restructuring to meet the challenges of tsetse and trypanosomosis control/ eradication in the country.

The areas in the country, where the tsetse fly had actually been suppressed and then became highly re-infested, demonstrate the need for an area-wide approach, targeting the whole infestation of a given area, as well as the need to guard against fly reinvasion from relic fly populations in the control or neighboring areas employing integrated methods. Sustainability in commitment, functional coordination and responsibility/ownership/ leadership issues, therefore, remain to be the major problems to tackle Tsetse and Trypanosomosis in Ethiopia. This needs a comprehensive national strategic plan and efficient dedicated autonomous institution to shoulder the overall responsibility and the two ministries jointly decided to prepare a comprehensive national tsetse and trypanosomosis control/eradication strategy.

This a thirteen years (2012-2025) period tsetse and trypanosomosis control/eradication strategy has been developed in order to effectively achieve tsetse and trypanosomosis control/eradication in Ethiopia as provided for particularly in the National Animal Diseases Prevention/Control Strategy and generally in the "Animal Diseases Prevention and Control Proclamation no. 267/2002". Moreover, the strategy is shaped to be in line with the five years Growth and Transformation Plan and the Millennium Development Goals of poverty reduction/eradication. The strategy is designed to be implemented in three phases, ***Phase I, 2005-2007 EC; Phase II, 2008-2012 EC; and Phase, III 2013-2017 EC.***

The overall objective of the strategy is to enhance mixed crop livestock production system and support the national effort to ensure food security and reduce/eradicate poverty through the control/eradication of tsetse and trypanosomosis.

This strategy has set out intervention measures whose outcomes shall address challenges occasioned by the tsetse fly vector and trypanosomosis disease consequences in Ethiopia. The strategy aims to achieve control and eventually eradication of trypanosomosis through:

1. Establishment of a national T & T control/eradication Institute;
2. Review and formulate legal & policy frameworks necessary for T & T control/eradication;
3. Awareness creation on the importance of tsetse and trypanosomosis control/eradication;
4. Capacity building activities;
5. Harmonization and coordination of T & T Control activities by different actors and regional states;
6. Acquisition of essential equipment and supplies;
7. Baseline data collection on T & T, Socioeconomic, Environmental & Land use situation;
8. Development of data management, communication and information systems;
9. Development of sustainable resource mobilization mechanism;
10. Establishment of structured Monitoring and Evaluation System;
11. Identification of T & T infested Areas and Division in to operational blocks;
12. Conduct T & T Control/eradication activities;
13. Conduct Operational/Programme Monitoring & Evaluation;
14. Establishment of research and development.

The implementation plan indicates a total budget support of ETB **307,450,000** (for the first phase) which has been broken down in to annual budgeting (Annex 3).

ACRONYMS

AAT	African animal trypanosomosis
AfDB	African Development Bank
ADF	African Development Fund
APHRD	Animal and Plant Health Regulatory Directorate
AU	African Union
BoA	Regional Bureau of Agriculture
CSA	Central Statistical Authority
DRM	Disaster Risk Management
EPA	Environmental Protection Authority
ETH	Ethiopia
EU	European Union
FDRE	Federal Democratic Republic of Ethiopia
FAO	Food and Agricultural Organization
FDRE	Federal Democratic Republic of Ethiopia
FITCA	Farming in Tsetse Control Areas
FLDP	Fourth Livestock Development Project
GDP	Gross domestic product
GovET	Government of Ethiopia
GIS	Geographic information system
GPS	Global positioning system
GTP	Growth and Transformation Plan
HAT	Human African trypanosomosis
IAEA	International Atomic Energy Agency
IBAR	Inter-African Bureau for Animal Resources
ICIPE	International Center for Insect Physiology and Ecology
IGAD	Inter Governmental Agricultural Development
ILRI	International Livestock Research Institute
IPM	Integrated pest management
LPI	Livestock Policy Initiative
masl	Meter above sea level
mbsl	Meters below sea level
MDG	Millennium Development Goal
M & E	Monitoring and evaluation
MoA	Ministry of Agriculture
MoFED	Ministry of Finance and Economic Development
MoST	Minister of Science and Technology
NAHDIC	National Animal Health Diagnostic and Investigation Center
NGO	Non-government organization
NTTICC	National Tsetse and Trypanosomosis Investigation and Control Center

OAU	Organization of Africa Union
OVI	Objectively verifiable indicators
PAAT	Program for African Animal Trypanosomosis
PATTEC	Pan-African Tsetse and Trypanosomosis Eradication Campaign
PCV	Packed cell volume
PIF	Paper of Investment Framework
RS	Remote Sensing
SAT	Sequential Aerosol Techniques
SIT	Sterile insect technique
SNNPR	Southern Nations, Nationalities and Peoples Region
spp	Species
STEP	Southern Tsetse Eradication Project
T&T	Tsetse and Trypanosomosis
TBT	Tsetse-borne trypanosomosis
TCP	Technical Cooperation Program
TLU	Tropical Livestock Unit
TMRIC	Tsetse Mass Rearing and Irradiation Centre
UNDP	United Nations Development Program
ULV	Ultra-low Volume
USAID	United States Agency for International Development
WOA	Woreda Office of Agriculture

1. INTRODUCTION & JUSTIFICATION

1.1 Introduction

A country of some 80 million inhabitants, Ethiopia, is also bestowed with a wide wealth of natural resources comprising large and diverse land area, plenty of wildlife and forestry, immense amount of surface and ground water, significant amount of minerals and heavy metals and well documented huge resource of domestic farm animals. It is a disturbing and disgracing paradox that this country of such a potential has been characterized, for some time, as a world's typical example of hunger and famine with deplorable consequences.

The Ethiopian economy is heavily dependent on the agriculture sector which contributes 41.2% of the total GDP. Over the last eight years the economy is exhibiting encouraging growth rate, averaging 11% annually. The country has the largest livestock population in Africa (38.82 million TLU). Livestock is very crucial as a national resource base and is a chief source of animal protein for domestic consumption and one of the major sources for foreign currency earning. More importantly, animal agriculture is contributing immensely to the production of food and cash crops as major (90%) or the only energy source for ploughing, threshing and transporting farm products and other goods especially in the marginal and raged terrain areas of the country. Human and goods transport is also heavily dependent on draught animals. Animal agriculture contributes 45% to agricultural GDP and 31% of the total agricultural employment. Over 85% and 90% of farm cash and pastoral income, respectively, are generated by or from livestock (IGAD-LPI, 2010).

To address poverty and improve food security status of the country the Government has initiated a number of important policy processes including:

- **Growth and Transformation Plan 2010/2011 to 2014/2015:** the Government's main economic policy document which seeks to address poverty and lift Ethiopia to middle-income status by 2025;
- **Agricultural Growth Plan 2010/11 to 2014/15**: The Ministry of Agriculture's main economic policy document to contribute to the GTP;
- **Agricultural Development Led Industrialization:** the Government's main development strategy to achieve the target for middle income status by 2025;
- **Agriculture Sector Policy Investment Program:** the Ministry of Agriculture's main response to the GTP which is centered on 'producing more, selling more, nurturing the environment, eliminating hunger and protecting the vulnerable against shocks' (GoE, 2010);

- **Strategic Investment Framework for Sustainable Land Management: A** component of the Agriculture Sector PIF which focuses on arresting and reversing land degradation in particular in highland Ethiopia;

- **National Policy and Strategy on Disaster Risk Management and DRM Strategic Policy Investment Framework** (both in draft form): the Government's response to the Hyogo Plan for Action seeking to mainstream disaster management in Ethiopia; and

- **Ethiopia's Climate Resilient Economy and associated Nationally Appropriate Mitigatory Actions and Ethiopia's Program of Adaptation to Climate Change:** designed to address climate change and advance a low carbon 'green growth' economy.

According to the GTP, Agricultural value added will double and national income in general will grow 2 folds with an average annual growth rate of 14.9% (8.5%-18.4%) (GTP, 2010). Animal production, as part of agricultural development in Ethiopian economic structure, and contributing 45% of the agricultural GDP, should also undergo transformation and play its parts in economic growth and transformation.

In the livestock sub-sector, particularly regarding the plan for livestock products, the amount of meat production is planned to increase from 613 thousand tons in 2010 to 836 thousand tons at the end of the new economic development plan (2011-2015). In the same manner, skin and hides production will increase from the present 4.1 million to 10.2 million tons in 2015 (GTP, 2010).

In the coming five years plan, animal fattening is planned to increase the number of fattened animals from 1.08 million (in 2010) to 4.29 million by the end of 2015. Similarly, the number of sheep and goats for fattening will increase from 1.20 million in 2010 to 8.61 million at the end of the new Growth and Transformation Plan (2015). The amount of Meat and Live animals for export is planned to increase from 10,498 ton to 111,100 ton and 357,000 to 2,353,847, respectively. The income from export of live animals is expected to increase from USD 125 million in 2010 to USD 1 billion in 2015 (GTP, 2010).

Increasing livestock production and productivity and thereby the incomes and living standards of smallholder farmers through the progressive control of economically important diseases, ensuring progressive improvement in health standards of foods of animal origin and increasing foreign exchange earnings of the country from export of animals and animal products by meeting international animal health standard and requirements are the main focus of the 5 years GTP.

However, the livestock resource base of Ethiopia, which is considered amongst the largest in the world in terms of numbers of livestock, is not benefiting the country in proportion to its size and potential. One of the main causes of this mismatch between population size and production output from livestock in Ethiopia is the widespread occurrence of a multitude of infectious diseases and parasites which drastically reduce the production of the animals through mortality, low fertility, slow growth and limited production leading to less efficient use of feed, and market restriction.

Moreover, the presence of epidemic and endemic diseases deter many farmers from upgrading their stock to higher productive genotypes or even from keeping livestock altogether. The major justification used to set up priorities for interventions in animal health services are therefore the economic losses incurred to the nation and the farming communities. The main economic losses are due to mortality, reduced production of meat, milk, eggs, decreased draught power output, lowered quality of animal products and by-products, risk of zoonoses with possible effect on human health, and implications of trade bans imposed by importing countries.

Endemic livestock diseases in the country include: Trypanosomosis, Contagious Bovine Pleuropneumonia, Contagious Caprine Pleuropneumonia, Anthrax, Black leg, Haemorrhagic septicaemia, internal and external parasitosis. These diseases cause huge mortality and morbidity.

Trypanosomosis is a disease that affects animals and humans and is transmitted by biting insects mainly tsetse flies. Tsetse flies are probably the most important livestock pests in Africa today and new strategies are called for to avert their debilitating effects. The increasing levels of trypanocidal resistance - due to usage of the limited number of drugs for over a long period of time and increasing demand for land has turned more attention on tsetse suppression and eradication to recover the infested land for increased agricultural production.

Tsetse and Trypanosomosis (T&T) control/eradication is a major challenge that requires a clear strategy and wide stakeholder involvement to enable implementation. Trypanosomosis is one of the most economically important diseases of livestock in Africa. Tsetse flies (*Glossina species*) infest 38 African countries and approximately 10 million km^2 of Africa, which is one-third of the continent. In Ethiopia, the coverage is about 220,000 square kilometers which is approximately 20 % of the country.

The major economic loses attributed to tsetse and trypanosomosis are classified in to two categories namely direct and indirect losses. The direct loss is due to mortality, impaired fertility, cost of trypanocidal drugs, and tsetse control while the indirect loss is attributed to reduction or exclusion of livestock from tsetse infested grazing areas and reduced crop production due to decreased number of drought power.

To alleviate this economic loss there should be a comprehensive national strategic plan and efficient institution to shoulder the overall responsibility and the two ministries, MoA and MoST, jointly decided and initiated to prepare a comprehensive national tsetse and trypanosomosis control/eradication strategy.

The overall objective of the strategy is to enhance mixed crop livestock production system and support the national effort to satisfy domestic and export demand for agricultural products through increased livestock production and productivity to ensure food security and reduce/eradicate poverty by controlling/eradicating tsetse and trypanosomosis.

1.2 Background

1.2.1 Geographical and Physical Features

Ethiopia is geographically located between the longitudes 33^0 and 48^0E and latitudes 3^0 and 14.5^0N in the Horn of Africa extending over an area of 1.22 million km^2 and having a human population of nearly 80 million and livestock population comprising 53.4 million cattle, 25.5 million sheep, 22.8 million goats, 8.6 million equine, 2.5 million camels, and some 49 million poultry (tot. 38.82 million TLU) (CSA, 2010). 88% of human and 74% of livestock populations reside in the highlands while the balance occupies the lowlands.

The country's landscape is characterized by the central highlands, which are dissected from northeast to southwest by the Rift Valley and the lowlands in the peripheries. Highlands rise to the altitudes up to 4620 meters above sea level (masl) at Mount Ras Dashen and low lands descend down to 120 meters below sea level (mbsl) at the Danakil Depression. Major rivers rise from the central plateau on either side of the Rift valley to drain into the Rift Valley lakes and other drainage lines in the peripheral areas within and beyond the country's boundaries.

The diverse topographic features have a profound effect on the multitude of agro-ecology rainfall is bi-modal in the south and mono-modal in the north with minimum annual precipitation ranging from about 200 mm in the extreme south to 2400 mm in southwestern central highlands. Large tract of the country from southeast to northeast is barren. Ecological zonations, climatic variability and biodiversity of fauna and flora in the country, rainfall and temperature are influenced mainly by altitude and wind direction and, in general, highlands receive more precipitations. Mean annual average temperature in the *dega* (temperate plateaux) is around 8.9^0C and in the kola (lowland tropical climate) is about 26.1^0C (ONAR, 2003).

1.2.2 Socio-economic Features

The economy of Ethiopia is based on agricultural sector which contributes 41.2% to gross domestic product-GDP (GTP, 2010), over 90% to foreign exchange earnings, about 85-90% of employment opportunities and contributes about 70% of the raw materials for the industrial sector of the country (MoA, Animal Health Year Book, 2009).

Major drivers of poverty in the country are considered to be low levels of agricultural technology, high population growth rate, limited diversification in agricultural production, inefficient marketing system, limited livelihood strategies, limited opportunities for investment and underdeveloped rural infrastructure. Here, it must be emphasized that tsetse-borne trypanosomosis is one of the major roots of poverty in sub-Saharan Africa (ADF,

2003) and causes poverty and perpetuates underdevelopment on African continent (PATTEC/OAU, 2001).

The government agricultural policy is geared towards market-oriented reforms with major focus on food security, supply of local industries with sufficient agricultural raw materials, expansion of agro-industrial manufacturing capacities to supply rural and other local communities and increase foreign exchange earnings.

Strategies expected to assist in achieving government policy goals comprise creation of conducive environment through facilitatory and constructively regulatory public role, giving priority to small holder agriculture, devolution of power to local self-administration, consensus-based overall guidance, coordination and harmonization of public good critical development activities, and diversifying conservation-based agricultural production. Poverty alleviation/reduction and improved standard of living of the rural community is accorded high priority and conceived to be redressed by this government policy and strategy.

1.2.3 Role of Animal Agriculture

Animal agriculture is very crucial as a national resource base and is a chief source of animal protein for domestic consumption and one of the major sources for foreign currency earning in Ethiopia. More importantly, animal agriculture is contributing immensely to the production of food and cash crops as major (90%) or the only energy source for ploughing, threshing and transporting farm products and other goods. Human transport is also heavily dependent on draught animals in rural Ethiopia. Animal agriculture contributes 45% to agricultural GDP and 31% of the total agricultural employment. Over 85% and 90% of farm cash and pastoral income, respectively, are generated by or from livestock.

Animal agriculture is not providing benefits proportional to its size and other potentials due to various problems amongst which diseases, especially T & T, have great prominence. Tsetse transmitted trypanosomosis is widely distributed in, western, southwestern and nortwestern lowlands and the river valleys cutting into the central highlands of Ethiopia. It is a major constraint to the utilization of large land resources diminishing the role of animal agriculture.

1.2.4 Magnitude and Impact of Tsetse-borne Trypanosomosis and Related Problems

The tsetse fly, vector of sleeping sickness (Human African Trypanosomosis, HAT) and Nagana (African Animal Trypanosomosis, AAT), is unique to Africa. Tsetse fly occurs in 38 sub-Saharan countries covering nearly 10 million km^2 of land corresponding to approximately one-third of Africa's total land area. In tsetse-infested countries, half of the population suffers from food insecurity directly or indirectly caused by vector-borne

diseases, mainly by trypanosomosis.

The Food and Agriculture Organization (FAO) of the United Nations has estimated that Africa loses over 3 million cattle and other domestic livestock every year through deaths caused by trypanosomosis. Approximately 35 million doses of trypanocidal drugs (worth about USD 35 million) are bought every year in futile efforts to maintain livestock free of the disease. The annual loss directly attributed to trypanosomosis, in terms of reduced meat and milk production and in terms of cost related to treating the disease or controlling the vector, has been estimated to USD 1.2 billion. This figure rises to over USD 4.5 billion per year, if losses in potential crop and livestock production attributable to the disease are considered. These figures depict, in broad terms, the economic magnitude of the problem posed by the presence of tsetse fly and trypanosomosis to agricultural development. Less discernible, but equally important, are the socio-cultural and food insecurity dimensions in many tsetse infested African countries.

Ethiopia, as part of the sub-Saharan Africa, shares a substantial loss from the disease. At least 10 million cattle, 6.1 million sheep & goats, 1 million camels and 1.2 million equine in the country are under direct exposure to the disease (MoA, 2004).

Tsetse-borne trypanosomosis and related problems have dictated the pace and pattern of economic development in almost the entire country. The western, southern, southwestern and northwestern fertile low land areas and the major river basins in those areas of the country (Figures 1 & 2) are infested by different tsetse species.

Five economically important tsetse species are found in Ethiopia between longitudes 33^0 and 38^0E and latitudes 5^0 and 12^0N (Langridge, 1976; Slingenbergh, 1992; Abebe and Jobre (1996); Msangi, 1999; Simon, 1999; Abebe *et al*., 2004; Abebe (2005); Dagnachew, Sangwan and Abebe (2005); Amede, 2006; Sori, 2006; Degneh, 2007). These are *Glossina morsitans submorsitans* found in river basins of Abay (Blue Nile), Baro/Akobo, and Omo/Ghibe, associated with wooded Savannah and also Savannah woodlands; *G. pallidipes* found in river basins of Baro/Akobo, Omo/Ghibe, and in the southern Rift valley lakes and rivers associated with thickets and nearby Savannah woodland or wooded Savannah; *G. tachinoids* encountered in Abay and Baro/Akobo drainage systems associated with gallery forest and lake-side woody vegetation; *G. fuscipes fuscipes* occupying Omo/Ghibe and Baro/Akobo drainage lines close to riparian vegetation; *G. longipennis* is found in the Omo/Ghibe river basins in more open drier areas covered mainly with thorn trees and also recently detected expanding to new areas (NTTICC, 2007).

The total area infested by tsetse flies was estimated to be roughly 98000 km^2 (Langridge, 1976), but more recent reports put this at between 150,000 – 220,000 km^2 (Slingenbergh, 1992). Most of these areas receive better annual rainfall than the fragile highlands in central, northern and eastern parts of the country and are more fertile and suitable for crop production and livestock rearing. If trypanosomosis could be controlled in Ethiopia, much of the best-watered and most fertile land of the southwest, west, south and northwest could be

utilised. Land suitability studies carried out in areas of low population density in tsetse infested areas of the country revealed that these areas have the best potential of expanded agriculture, provided that trypanosomosis constraint can be overcome.

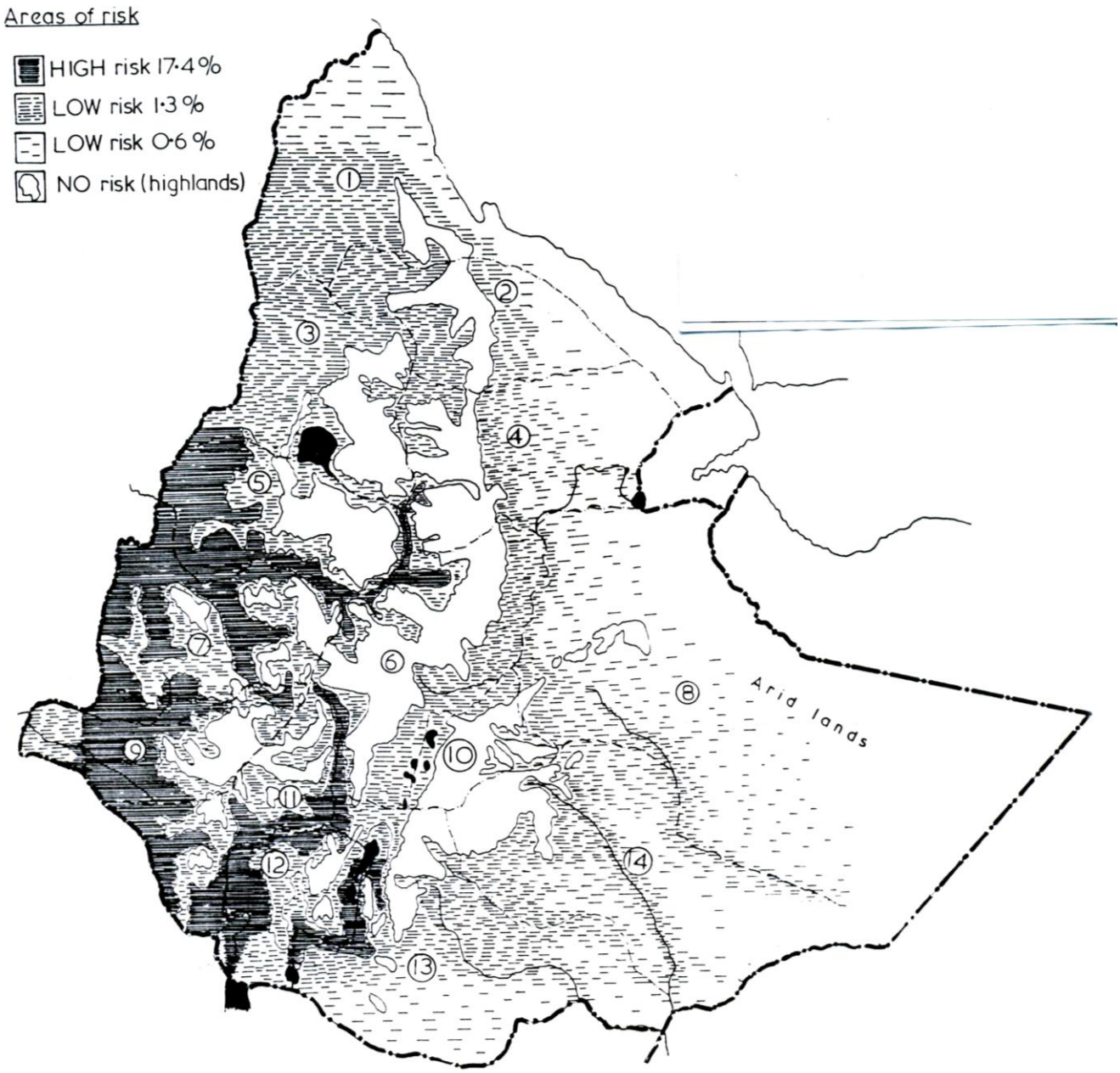

Figure 1: Map showing different risk levels (Langridge, 1976)

According to Langridge (1976), about 6 million cattle were at risk of tsetse-borne trypanosomosis at any time. This figure assumed tsetse infested areas at 98,000 km^2 and the national cattle population at the time was about 30 million. Considering the 220,000 km^2 of land area currently under occupation of the tsetse flies, and the cattle population of 53.4 million heads at present, it is logical to put the size of cattle population risking from tsetse-

borne trypanosomosis at higher than Langridge's estimate. Losses from under-utilization of this fertile tsetse occupied land and from trypanosomosis affected livestock morbidity and mortality cannot be accurately assessed in monetary terms, but would obviously be immense. The disease, through livestock morbidity, mortality and exclusion, denies the farming communities the use of draught animals, the main and, in the majority of cases, the only source of energy for crop production.

Losses from tsetse-borne trypanosomosis are not limited to direct effects of the disease. Indirect losses are also as devastating and are mainly related to unbalanced use of land resource, which the disease imposes on human and livestock distribution in terms of denying access to the fertile and most suitable land for livestock and crop production. Due to fear from the disease in vast areas in the lowlands people and livestock are concentrating on tsetse-free, over-exploited, exhausted and degraded fragile high grounds causing further damage to available and accessible land resource.

Considerable amount of the national budget is also allocated to alleviate the effects of the problem through the establishment of necessary institutions and acquisition of trained manpower, essential equipment and supplies to apply appropriate control measures against trypanosomosis and its vector, the tsetse flies.

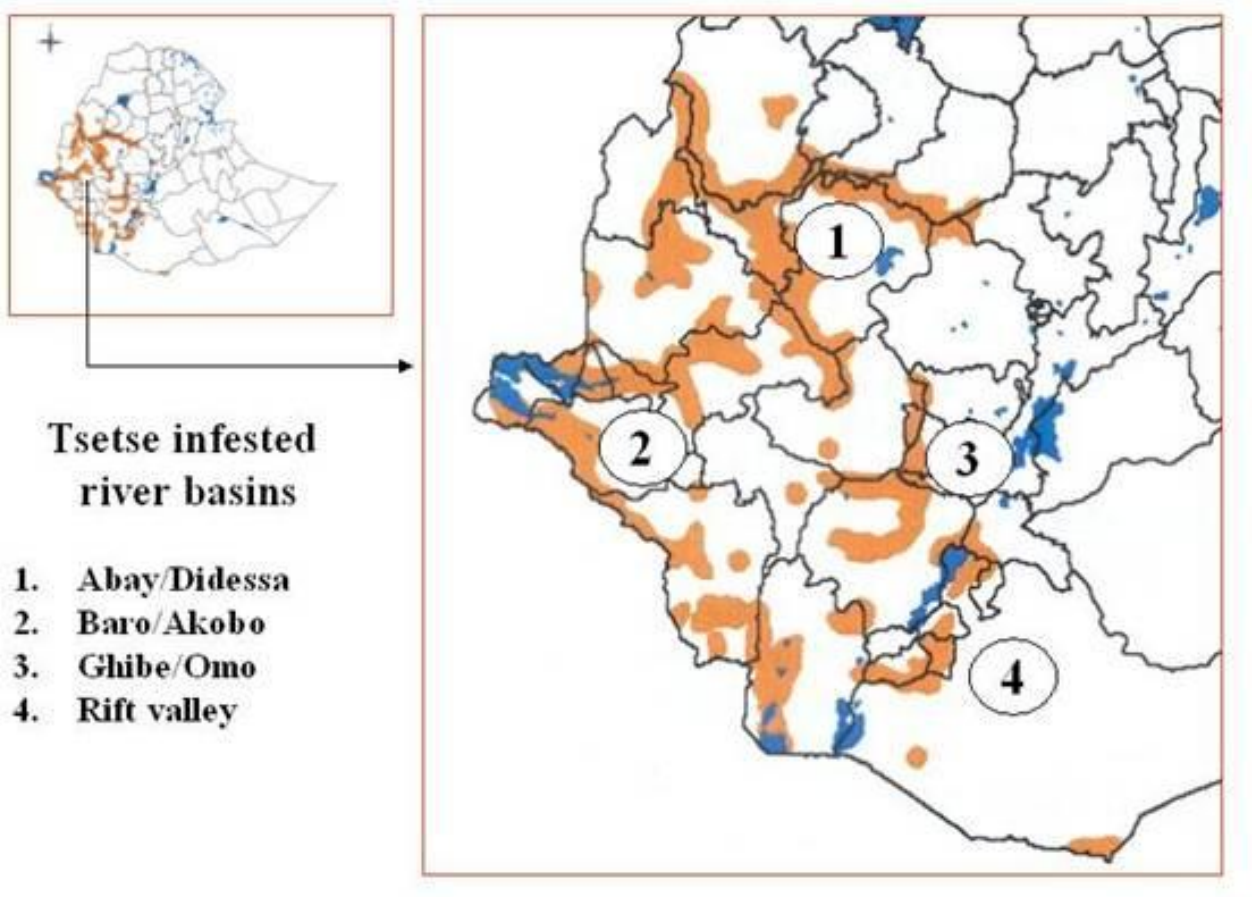

Figure 2. Tsetse infested prediction sites along the river basins (Abebe, 2005)

1.2.5 Tsetse fly in conservation areas

Conservation areas are home to large populations of wildlife which are free ranging and act as source of blood meal to tsetse flies and carriers of pathogenic trypanosome species. Most of the conservation areas in the western and southern parts of the country are tsetse infested but there is no tsetse control or monitoring activities in most of these areas. Trypanosomosis is therefore a threat to livestock production in the areas immediately surrounding those conservation areas. Migratory corridors and common grazing areas of both livestock and wildlife are also challenges in tsetse and trypanosomosis management.

1.2.6 Efforts made so far to tackle tsetse-borne trypanosomosis and related problems

The main approach of dealing with tsetse-borne trypanosomosis has long been the use of trypanocidal drugs for curative and prophylactic purposes and only more recently has vector control come into picture as a means of problem management. Major endeavors towards reducing damages arising from tsetse and trypanosomosis are summarized below.

1.2.6.1 Parasite control

This has served as the chief approach of trypanosomosis control over many years and chemotherapeutic and chemoprophylactic trypanocides have been utilized with variable results. Trypanocidal drugs such as Ethidium, Berenil, Isometamidium and their derivatives have been administered to infected animals and have initially been successful in curing them. Same trypanocidal drugs, except Diminazene, have been in use at higher dose levels to protect animals from being infected by infective bite of the tsetse flies.

With prolonged use of the above mentioned trypanocidal drugs, the efficacy of both curative and prophylactic drugs waned drastically to the point that they started to make no difference on the infection and course of the disease. This has been found to be due to development of resistance by the trypanosome parasites to the drugs in use. At the moment more than 60% of trypanocidal treatments are ineffective in clearing infection and in preventing infection (NTTICC, 1986; Codjia *et al.*, 1993; Mullugeta *et al*., 1997; Afewrek, et al. 2000; Tewelde, 2001; Chaka and Abebe, 2003, Tewolde *et al.,* 2004 MoA, 2004; Assefa, 2008; Terfa, 2008). According to the results revealed during the above studies, trypanosomes have developed variable degree of resistance to all trypanocidal drugs available on the market.

1.2.6.2 Vector Control

Only after the mid 1980s has vector control attracted concerned authorities to be seriously considered for tsetse-borne trypanosomosis control in Ethiopia (Jordan, 1989; Slinenbergh, 1992). Some vector control attempts which have been conducted and others that are still on-going in different localities and at different levels are briefly touched upon in this section.

1.2.6.3 The Upper Didessa Experience

The Ethiopian Government and the Food and Agriculture Organization (FAO) Joint Project by the name "TCP/ETH/4523-Assistance to tsetse and trypanosomosis Control" was initiated and started to be implemented in 1986 with the objective of adapting a low cost vector control technique to Ethiopian conditions through the use of odor-baited, and insecticide-impregnated traps and targets, suitable for use by village communities on a self help basis (Jourdan, 1989; Put, 1990).

Results obtained proved promising and a following-up TCP, TCP/ETH\6765 (E) "Emergency Assistance to Control Tsetse and Trypanosomosis Infestations" was initiated in 1987 in order to field-test the technique along the headwaters of the Didessa river in a trial area of 30 km^2 from which the Savannah fly *G. morsitans submorsitans* was removed confirming the suitability of the technique for use by local communities with minimal technical assistance (Jordan, 1989).

A further UNDP/FAO/GOE Project by the title "UNDP/FAO/ETH/88/U01-Tsetse Control and Related Developments in the Upper Didessa Valley, Western Zone" was initiated in 1988 in order to maintain the impetus of the control operations, to consolidate the areas reclaimed from reinvasion and as the first stage in the development of a national control strategy that would enable the progressive clearance of *G. m. submorsitans* and *G. tachinoides* along the Didessa valley over some 700km^2. Production levels attained following tsetse and trypanosomosis control under these projects was significant (Jordan, 1989). A socio economic study conducted by Regassa and Abebe (2009) in upper Didessa valley indicated that as a result of tsetse control program, significant socio-economic improvement on the livelihood of people was observed, which was associated with a reduction the prevalence trypanososmosis in cattle due to the reduction in tsetse densities.

In pursuit of further consolidation of gains, fine-tuning of techniques and expansion of activities, a new project under the title "Consolidation of Tsetse and Trypanosomosis Control in the Upper Didessa Valley", financed by World Bank, through the Fourth Livestock Development Project (FLDP), started implementation as of November, 1990. Apart from making some adjustments in the application of techniques to reduce cost, a further 500km^2 of infested area was included to the previous project area (Put, 1990; Barrett, 1992). Although serious disruption was encountered in 1991 due to change in government, commendable achievements were recorded.

1.2.6.4 The Farming in Tsetse Control Areas (FITCA) Project-Ethiopia Component

This AU (formerly OAU)/IBAR-coordinated, EU-funded regional project had the objectives, as for Ethiopia, of enhancing national food security and improve the quality of the rural

population through increased production in areas those communities recently affected by tsetse fly encroachment. Although the project document was finalized by March 1995, its implementation was delayed by more than two years. The project made some efforts in training of staff, acquisition of equipment and supplies for the four regional states embraced by the project i.e., Oromia, Amhara, Benishangul-Gumuz and Gambella, and limited actual control operations, particularly, in Oromia region before its termination in 2004. Obviously, this project did not live-up to its expectations.

1.2.6.5 The On-going Southern Tsetse Eradication Project (STEP)

The Southern Tsetse Eradication Project (STEP) was established in 1997 in collaboration with the International Atomic Energy Agency (IAEA) to attain the objectives of building national and regional capacity in the application of area-wide integrated tsetse management including the Sterile Insect Technique (SIT) and eradicate tsetse and trypanosomosis from 25,000km^2 of the southern rift valley of Ethiopia. The project is funded by the Government of Ethiopia (GovET) and the African Development Bank (AFDB) and supported by different development partners.

The project has been conducting tsetse suppression using cattle treated with pour-on, insecticide impregnated targets and ground spray using community participation. In addition, necessary preparatory activities have been completed to use Sequential Aerosol Techniques (SAT) in areas inaccessible to other techniques. The project is also conducting mass production of two species of tsetse flies, *G. pallidipes (G. pallidipes* Arbaminch strain and *G. pallidipes* Torro strain) and *G.fuscipes* at the Kality insectary.

At present the number of *G. fuscipes* colony has reached over 700,000 female flies and the release of sterile males of *G. fuscipes fuscipes* has started in the Deme valley with the technical and financial support of the IAEA. So far, about 500,000 sterile males of *G. fuscipes* were released with 40,000-45,000 sterile males release per week which will continue until eradication is achieved. The fly apparent density and disease prevalence rate in most of the places (excluding wildlife conservation and inaccessible areas) have dropped to 0.35 and 2% respectively.

In general, remarkable achievements were made by the project and quite substantial numbers of communities are benefiting from STEP through expansion of their farm land and livestock keeping. Many places that were under tsetse and trypanosomosis challenge are now widely used for livestock grazing, crop production and human settlement. Significant improvement has been recorded in terms of livestock population, milk and meat production, drought power, cultivated land, household income, and cost of treatment against trypanosomosis, etc.

STEP is a pilot project covering a very small area compared to the total infested area of the country and the government is intending to expand the efforts to other tsetse infested parts

of the country using the experiences gained and lessons learned from the STEP project. At present the project has extended its efforts to additional 35,000km^2 area contiguous to the pilot project area which makes the total area 60,000km^2. Apart from field and tsetse fly mass rearing activities the project has made tremendous efforts in building capacity in terms of staffs, institutional and technological capacity at regional and national levels. This will be intensified through integrated development with proper land use planning and land management. Moreover, the success of the project will have a significant contribution to the realization of the Growth and Transformation Plan (GTP) of the country.

1.2.6.6 Other Related Activities

Various other tsetse control related activities have been conducted by public, NGOs and international organizations. The International Livestock Research Institute (ILRI) has been active in the Ghibe valley since mid 1980s conducting tsetse and trypanosomosis control trials employing integrated methods (targets, traps, pour-ons and trypanocidal drugs) through community participation. Encouraging results were obtained and the trial area has turned into bustling crop and livestock development environment.

The International Center for Insect Physiology and Ecology (ICIPE) in collaboration with different government and regional institutions and NGOs has been engaged in tsetse control trials employing integrated pest management (IPM) procedures through the use of untreated NGU traps.

Though lack of harmonization, tsetse-trypanosomosis affected regional states have been very active in recent years in employing bait and chemotherapeutic techniques for tsetse and trypanosomosis control to assist resettlement schemes. These activities are believed to have stabilized the settlement programs in the majority of cases, but their sustainability requires to be critically evaluated.

1.2.7 Methods of trypanosomosis control/eradication

Approaches used to control trypanosomosis include, parasite control, vector control and the exploitation of trypanotolerant livestock.

1.2.7.1 Parasite control

The most commonly used method for control of bovine trypanosomosis in sub-Saharan Africa is based on trypanocidal drugs (chemotherapy). Cattle are found in many parts of Africa because of the availability of trypanocidal drugs. If trypanocidal drugs were properly used, they could provide a cost effective and sustainable approach to trypanosomosis control. Drugs can be highly effective provided they are continuously available and treatments are given regularly and at appropriate dose rates.

Moreover, drugs can offer the possibility of reducing the disease to a level where infested land can be utilized most economically with minimum risk of contracting trypanosomosis, and the appropriate use of drugs to protect cattle could allow more effective cultivation, which in turn decreases the amount of suitable tsetse habitat.

Chemotherapy of trypanosomosis in domestic animals is at present dependent upon a small number of compounds, namely: homidium, isometamidium, diminazene, quinapyramine and cymelarsan. Most of these compounds have been on the market for about 60 years and there are reports of drug resistance in many parts of Africa, including Ethiopia (NTTICC, 1986; Codjia *et al.*, 1993; Mullugeta *et al*., 1997; Afewrek, et al. 2000; Tewelde, 2001; MoA, 2004; Assefa, 2008; Terfa, 2008). Furthermore, because of the close chemical relationships between the compounds, the development of resistance to one compound often appears to be associated with cross resistance to others.

1.2.7.2 Vector control

There are several tsetse control/eradication methods which include: aerial spraying, ground spraying, traps and insecticide impregnated targets, insecticide treated cattle and the Sterile Insect Technique (SIT). Aerial spraying using residual insecticide formulations have been applied using aircrafts to control/eradicate tsetse flies. Sequential Aerial Technique (SAT) spraying has also been used to treat 10,000km^2 in Botswana and 48,000 Km^2 in Zimbabwe.

The method has also been used in Ethiopia, Kenya, Nigeria, Somalia, Uganda, and Zambia with varying successes. SAT is used to treat large areas rapidly and is particularly appropriate in protected areas and epidemic situations. It is also suitable where ground access is difficult, dangerous or inaccessible. However, SAT using ultra-low volume (ULV) and non-persistent insecticide is expensive and cannot be implemented in areas with ragged topography.

Target and trap techniques are intended to reduce populations of tsetse to levels which reduce the challenge or risks to animals and humans. They are also deployed to prevent re-invasion of the fly from a previously cleared area. Despite successful field trials, livestock farmers in Africa have been slow to adopt traps and targets as a means of tsetse control. Their motivation is seen to diminish after the tsetse population becomes low as to pose threat to livestock health and therefore community based fly suppression efforts have been difficult to sustain.

Insecticide treated cattle offer numerous advantages over odour-baited traps and targets. Cattle are used as moving targets and hence no cost for making artificial baits. In addition, the cattle can be moved to spray races or dips rather than staff trekking widely deploying traps and targets. Further, cattle can move to all possible tsetse breeding and resting sites, therefore, are more efficient in tsetse control. Moreover, the method can be based on existing infrastructure like dips and spray races which can bring about significant savings in

operational costs. Other techniques can be integrated to address areas like hills not accessible to animals.

In the Sterile Insect Technique, male tsetse flies which have been rendered sterile by gamma irradiation are released into the field where they mate wild females, resulting in no viable offspring. Once mated, there is no opportunity for the females to be mated by the fertile males as females mate only once in a lifetime. With the continuous release of sterile males in large numbers, it is possible to eradicate tsetse flies from a particular area.

During the campaign in Zanzibar, a ratio of more than 100 sterile males against one wild one was used to eradicate tsetse on the island. While in the most recent campaign in Ethiopian context the ratio was 50 to one, under the STEP project. The method is very specific and does not pollute the environment. However, the effect on the population only becomes apparent after a period, as opposed to control by instantly killing insecticides. Because of this and to allow the sterile males to be competitive, a substantial fly suppression has to precede the application of SIT, which is reserved for the final "mopping up" of the remaining population. Perhaps the most notable example of the success of the SIT, after tsetse population suppression with targets and pour-on, is the case in Zanzibar where *G. austeni* has been eradicated from the island.

1.2.7.3 Use of trypanotolerant livestock

It is well-known that innate resistance for many diseases, including trypanosomosis, occurs in animal populations which have been subject to natural selection by exposure to disease pressure over many generations. In West Africa the *N'dama* cattle is known to be trypanotolerant. In Ethiopia the *Sheko* breed possesses trypanotolerant traits which can be exploited to improve livestock production in the tsetse infested areas (Lemecha *et al*., 2006). It should however be noted that these animals can act as disease carriers.

1.2.7.4. Environmental Management

Due to land use changes, farming activities may be the greatest threat to biodiversity conservation outside the government protected areas. To mitigate this threat, it is important to advocate the intensification of community based conservation projects. People are willing to conserve as long as it is in their interest and it is essential to ensure that the goals of national conservation efforts would be: - to put a value on biodiversity, providing baseline reports, encouraging the focus on wildlife conservation alongside biodiversity conservation and ensure appropriate policy implementation and law enforcement of the important environmental laws such as the "Environmental Protection Organs Establishment Proclamation no. 295/2002, Environmental Impact Assessment Proclamation no. 299/2002, and Environmental Pollution Control Proclamation no. 300/2002". Biodiversity loss is a

serious matter and needs to be accorded adequate attention which is the basis of conservation efforts.

1.3 The Need for Coordinated and Sustained Tsetse-borne Trypanosomosis Control/Eradication in Ethiopia

The efforts made by different actors to control tsetse-transmitted trypanosomosis in the country to the desired state of affairs are still remote and enabled them only to suppress the tsetse populations temporarily. Although such extensive activities have made some local reduction of tsetse territories (for instance in Didessa valley), the general picture has not altered and to the contrary tsetse fronts are on the increase in many places of the country. The threat to the farming communities and livestock owners remains unabated although some isolated efforts may have improved conditions in limited environs.

The areas in the country, where the tsetse fly had actually been suppressed and then became highly re-infested, demonstrate the need for an area-wide approach, targeting the whole infestation of a given area, as well as the need to guard against fly reinvasion from relic fly populations in the control or neighbouring areas employing integrated methods. Sustainability in commitment, functional coordination and responsibility/ownership/ leadership issues, therefore, remain to be the major problems to tackle T & T in Ethiopia.

This, therefore, needs a comprehensive national strategic plan and efficient institution to shoulder the overall responsibility and the two ministries, MoA and MoST, jointly decided to prepare this comprehensive national tsetse and trypanosomosis control/eradication strategy. Apart from selecting and integrating appropriate control/eradication techniques consistent with each situation at each stage, the main task of this strategy is indicating direction for more practical, realistic, easygoing and conducive organizational and operational conditions and procedures.

The overall objective of the strategy is to enhance mixed crop livestock production system and support the national effort to satisfy domestic and export demand for agricultural products through increased livestock production and productivity to ensure food security and reduce/eradicate poverty by controlling/eradicating tsetse and trypanosomosis.

2. SITUATIONAL ANALYSIS

Over the past 60 years a whole range of control strategies for tsetse and trypanosomosis control have been deployed in Ethiopia. Unfortunately, none of the methods or a combination of them has led to a lasting solution to the problem of the disease in animals. Many areas where tsetse fly populations were considerably reduced have become re-infested. Consequently, gains made are often lost mainly because land use practices cannot cope with rate of reclamation.

Current situation is that the government has put a budget for tsetse control through the two ministries, MoA and MoST, and the tsetse affected regional states. The government has bilateral agreements with development partners to support tsetse and trypanosomosis eradication in the country. The south rift valley tsetse belts were identified and supported by the African Development Bank (AFDB) and International Atomic Energy Agency (IAEA) under the STEP project. This is expected to expand in an area-wide systematic approach of vector control and resource mobilization until the entire country is covered.

So far, tsetse and trypanosomosis control has been operated without a clear and explicit national policy guideline, institutional and legal framework. The fragmented efforts by many actors employed so far were lacking of a central coordination framework to harmonize the existing efforts to bring the aspired result in controlling/eradicating tsetse & trypanosomosis from the affected areas of the country. The technical, administrative and financial system, therefore, requires restructuring to meet the challenges of tsetse and trypanosomosis control/eradication.

2.1. Policy, Legal and Institutional Framework

Currently, tsetse and trypanosomosis control is managed by two ministries (MoA & MoST) and by the regional bureaux of Agriculture/Livestock Agencies of the five tsetse infested regional states. The national disease prevention and control/eradication is guided by the "Animal Diseases Prevention and Control Proclamation no. 267/2002".

2.2. Resources and Capacity Mobilization

Today, tsetse and trypanosomosis control and eradication is funded by the Government of Ethiopia and supported by a loan and grant from the African Development Bank (AFDB) through the STEP project. Capacity is provided by the Government of Ethiopia, the International Atomic Energy Agency, regional states and the communities.

2.3. SWOT and PESTLE Analysis

2.3.1. Strengths

- Presence of a comprehensive animal health legislation, "Animal Diseases Prevention and Control Proclamation no. 267/2002";
- The establishment of the national institution (NTTICC) for the control/eradication of tsetse and trypanosomosis;
- The establishment of the national insect mass rearing center;
- Existence of the Southern Rift Valley Tsetse Eradication Project (STEP);
- Presence of various successful case studies which clearly show the existing situations and able to guide the effort to control/eradication tsetse and trypanosomosis;
- Existence of proven technologies to control/eradicate T & T;
- The existence of on-going T & T control activities in all the tsetse infested regional states;
- The start of collaborative modalities with neighbouring countries (MoU with Sudan) to jointly fight against transboundary and economically important livestock diseases;
- Existence of a considerable human and physical capacity to conduct research and implement T&T control/eradication programmes;
- Eradication of Rinderpest.

2.3.2. Weaknesses

- Lack of a clear national policy and strategy on tsetse and trypanosomosis control and eradication;
- Fragmented nature of efforts being made by various stakeholders to alleviate tsetse and trypanosomosis problem at national/regional level;
- Absence of a strong well structured national institute to harmonize, coordinate and lead campaigns against tsetse and trypanosomosis;
- Lack of updated empowering animal health legislation and inadequacies in the existing policies, strategies and legal framework to effectively prevent/control/eradicate livestock diseases;
- Lack of an enabling animal health chain of command to prevent/control/eradicate livestock diseases in the country;
- Lack of an efficient animal health monitoring and evaluation, information and communication, and regular surveillance systems;
- Lack of updated tsetse distribution map;

- Insufficient budget allocation for the implementation of programmes to tackle tsetse and trypanosomosis;
- Limitations in skill and trained manpower;
- Absence of a clear strategy and enabling system to involve stakeholders such as the Ethiopian Wildlife Protection and Development Authority and Environmental Protection Authority in the T & T control/suppression programmes;
- Lack of roadmap and staff turnover.

2.3.3. Opportunities

- Existence of enabling national policies which favor agricultural development in the country;
- Encouraging commitment of the government to support the livestock development sub-sector;
- Existence of good awareness, on the T & T problem, among the apex governmental structure;
- Existence of good awareness on the problem and a continuous request from the community for sustainable T & T control programmes;
- Encouraging willingness of international organizations to support T & T control/eradication programmes;
- Continuous growth of demand for livestock products and by-products due to various driving factors;
- The existence of provision for tsetse and trypanosomosis control/eradication in the five years Growth and Transformation Plan (GTP) as a strategy for poverty reduction;
- The success of the Southern Rift Valley Tsetse Eradication Project (STEP) which encourages the government and development partners to support tsetse and trypanosomosis control/eradication programmes at area-wide basis;
- Lessons learnt from previous programmes/projects;
- The commitment of the community and local authorities to actively participate in T & T control/eradication programmes;
- Emergence and increment of demands for investment programs by local and foreign investors to establish large scale commercial farms/ranches in tsetse infested areas.

2.3.4. Threats

- Existence of multiple tsetse and trypanosome species which may complex the effort to control/eradicate T & T in the country;
- Unavailability of vaccine against the parasite;

- Lack of efficacious trypanocidal drugs due to development of drug resistance by the trypanosomes;
- The trans-boundary nature of the problem which needs a well organized concerted efforts from the neighbouring countries which may have differing priorities and social conflicts;
- Financial limitation for mobilization of skilled manpower, enabling technologies and logistics to implement the strategy;
- Lack of sustainability and risk of re-infestation of the tsetse cleared areas;
- Existence of potential wildlife reservoirs of trypanosomes in conservation areas which needs a goodwill collaboration with different institutions;
- Inaccessibility of tsetse infested areas which may be a continuous risk for re-infestation of cleared areas;
- Uncontrolled natural phenomena such as climate change which may lead to infestation of new areas by tsetse flies.

2.3.5. Political

Tsetse and trypanosomosis has been ranked as one of the major neglected diseases in the world, mainly due to its confinement to the Sub Sahara Africa. This has resulted in receiving inadequate funding from the international development partners. In recognition of economical importance of this disease, African Heads of State and Government made a commitment in the year 2000 in Lome, Togo to eradicate tsetse and trypanosomosis from Africa. Actualizing the regional and national commitment, the Ethiopian government and all the political leaders of the five tsetse and trypanosomosis infested regional states have encouraging political goodwill in tsetse and trypanosomosis control/eradication in the affected areas.

2.3.6. Economic

Tsetse and trypanosomosis is of a great economic importance considering its damage through direct and indirect impacts on the health and productivity of livestock and prevention optimal utilization of large tracks of land, estimated to 220,000 Km^2. Due to limitation of resources, the government of Ethiopia has generally not put a sufficient amount of financial resources for tsetse and trypanosomosis control/eradication programmes. However, from recent years, the government and development partners, such as the African Development Bank (AfDB) and the International Atomic Energy Agency are showing encouraging commitment to pledge support to T & T control/suppression activities which could be used as a milestone for the implementation of area-wide control/eradication programmes.

2.3.7. Social

Tsetse fly is a depopulating factor which prevents human settlement and animal rearing in the affected areas. Tsetse infested areas are the most fertile and best-watered landmass of the country where if the vector and the disease is controlled, these areas would have the best potential of expanded agriculture. In the tsetse reclaimed areas people can be able to settle and produce livestock. The areas cultivated will increase due to the use of animals as traction power and more food can be produced. People will be able to raise animals as a source of protein and income generation.

2.3.8. Technical

Trypanosomosis have been one of the most extensively researched tropical diseases and various specific and integrated control technologies have been developed in the last 60 years. However, the uptake of the control technologies by the communities in the affected areas is still remained unsatisfactory. In addition, no new drugs for its treatment and prevention have been developed for the last six decades. Moreover, the search for protective vaccine against trypanosomosis has been futile. Nevertheless there are proven technologies in the area of tsetse control such as targets, traps, pour on applications, areal spray, SIT etc where most of them have been introduced and adopted to the Ethiopian situation.

2.3.9. Legal

The Ministry of Agriculture (MoA) through the Animal and Plant Health Regulatory Directorate (APHRD) is responsible for policy formulation, regulation, coordination, and provision of animal health services. The "Animal Diseases Prevention and Control Proclamation no. 267/2002" is the basis for prevention/control/eradication of all trans-boundary and economically important animal diseases, including trypanosomosis. Moreover, both the five years Growth and Transformation Plan and the National Livestock Disease Prevention/Control Strategy recognize tsetse and trypanosomosis control/eradication as a key component of improvement of animal health services to support the development of the livestock sub-sector. However, the legal and policy environment is deficient in clearly focusing on tsetse and trypanosomosis control/eradication.

2.3.10. Environment

The tsetse and trypanosomosis infestation area in Ethiopia, which is estimated to cover about 220,000km^2, comprises various environmental strata that include: wildlife/natural resource conservation areas, forests, religious, cultural and heritage confinements, human settlements and surroundings of water bodies and international boundaries. Therefore, tsetse and trypanosomosis control/eradication requires a multi-sectoral and multi-national

collaboration and integrated approach. The current global concern, climate change is also emerging new challenges by creating favorable environments to tsetse and trypanosomosis expansion to previously free areas.

- Based on SWOT and PESTLE Analysis there is a strong justification to come up with a national tsetse and trypanosmosis control program focusing on the following major strategic issues:Lack of an independent management and operational framework appropriate to the task of coordinating and implementing the control program in close collaboration with the various stakeholders,
- Lack of long term strategy and commitment to remove the burden of tsetse and trypanosomosis related problems from communities through progressive control programs,
- Less emphasis to improve access to tsetse cleared areas for integrated crop livestock production activities through rational and sustainable land resource planning and utilization.

2.4 Approaches to tsetse eradication

2.4.1. Phased, Area-Wide and Sustained Approach

Tsetse control/eradication will be executed through a phased, systematic and sustained approach until all areas of the country are tsetse-free. As previous experiences indicate re-invasion occurs due to the cross boundary nature of tsetse and trypanosomosis problem when the operation is interrupted, or the area is not isolated either naturally or with artificial barriers creating challenge for the sustainability of the cleared areas. This remained a big challenge for most of the tsetse control activities in Ethiopia.

To achieve sustainable tsetse and trypanosomosis control/eradication, the target tsetse species population in a given area should be isolated through a natural or artificial barrier. Each isolated area will be tackled independently, until all tsetse flies in the area are controlled/eradicated, with no possibility of reinvasion or re-establishment from surviving relic populations. Therefore, the strategy involves the identification of zones of infestation which are isolated physically e.g. by mountains, water bodies, etc or by limitations in factors connected with the preference and tolerance limits of the fly, e.g. food availability, temperature, humidity, natural cover, etc or where the fly population can be isolated by artificial means.

Distribution of tsetse flies in Ethiopia is not continuous in the entire belt, but rather patchy in a form of discrete, isolated zones or infestations that can be easily isolated with artificial barriers. This situation is conducive for independently and systematically removing the infestation from isolated areas one by one, ensuring each time that area rendered fly-free

will not be re-infested, until the entire belt is covered, hence phased, area-wide removal of tsetse populations confined in each area, would be systematically undertaken one by one.

When initiating tsetse control with the aim of removal of the fly from the entire belt, it must be based on priority of the area for suitability for crop and livestock production and for ease with which isolation and subsequent operations could be conducted. In situations where the infested area is too large to be tackled in a single operation, which is relevant to much of Ethiopian tsetse belts, it will be necessary to divide it into different strata and suitable operational blocks.

The trans-boundary nature of tsetse fly infestations across national boundaries and the strategic objective of eliminating the tsetse population infesting a common belt make the area-wide approach necessary. And it is only through such an area-wide approach that effective barriers can be established to create progressively fly-free zones and further expand the operation to other infested areas on continuous and sustainable basis. Under Ethiopian conditions tsetse infestations across common boundaries of two or more regional states can better be coordinated by the responsible federal institution in collaboration and cooperation with regional state authorities concerned. Since the success of such area-wide approach, needs the involvement of different countries, there must be an efficient mechanisms of coordination and co-operation between and among the affected countries. The establishment of federal institution will also help in the development of one centrally coordinated regional programmes which will facilitate and enhance the management of area-wide approaches.

2.4.2. Integration of Appropriate Technologies and Approaches

The lessons learned and experiences gained from various tsetse control operations in Ethiopia and other African countries show that there is no single technology that results in tsetse eradication. An integrated approach will, therefore, be followed and use of appropriate combinations of available technologies in the tsetse eradication effort will be exploited.

2.4.3 Scientific and Environment Friendly Approach

An environmentally friendly approach will be followed in tsetse and trypanosomosis control/eradication. The tsetse infested areas in Ethiopia, as is usually the case in similar environs elsewhere, are very rich in biotic and abiotic resources, will be protected by the selected environment friendly or less damaging appropriate technologies and management practices. Proven technologies and procedures of tsetse fly control and eradication will be applied in an integrated manner to exploit any possible synergy and complementarities to speed up the operation process and achieve the desired results in acceptable timeframe. The techniques and procedures will be adjusted to the prevailing conditions in each individual infestation according to topographic, demographic, vegetation type, fly species composition and other related issues. The intervention technologies and methods will be selected based

on considerations of their direct and indirect impact on the environment as well as their cost and efficiency advantages.

By implementing a regular environmental impact assessment and an appropriate land use plans and policies, efforts will be made to avoid the negative environmental impact of tsetse control, eradication, and survey and surveillance activities. Sensitive indicators of adverse environmental changes will also be identified before the monitoring and evaluation. Therefore, it will be ensured that all environmental agencies and other relevant stakeholders are properly consulted on these issues.

2.4.4. Participatory Approaches

A task in the implementation tsetse and trypanosomosis control/eradication operation is huge and multifaceted, will involve all the relevant stakeholders, communities, donors, international organizations. The main stakeholders who will actively support and participate in the operation include the line ministries of the federal government authorities and other relevant national and international organizations, namely Ministry of Agriculture (MoA), Ministry of Science and Technology (MoST), Ministry of Finance and Economic Development (MoFED), Environmental Protection Authority (EPA), Universities, Research centers and Laboratories, Regional governments, International organizations, NGOs, Donors, Private sectors, and the community. Apart from stakeholders, women participation will be highly considered.

The intervention requires high human resource and material input. Public servants and technical staff alone cannot shoulder this task. Local communities who are the main beneficiaries of this intervention are expected to contribute most of field operations under the guidance and limited field support of the public technical and management staff. Community participation will be ensured through awareness creation, training and motivation mechanisms in order to sustain tsetse and trypanosomosis control/eradication programmes.

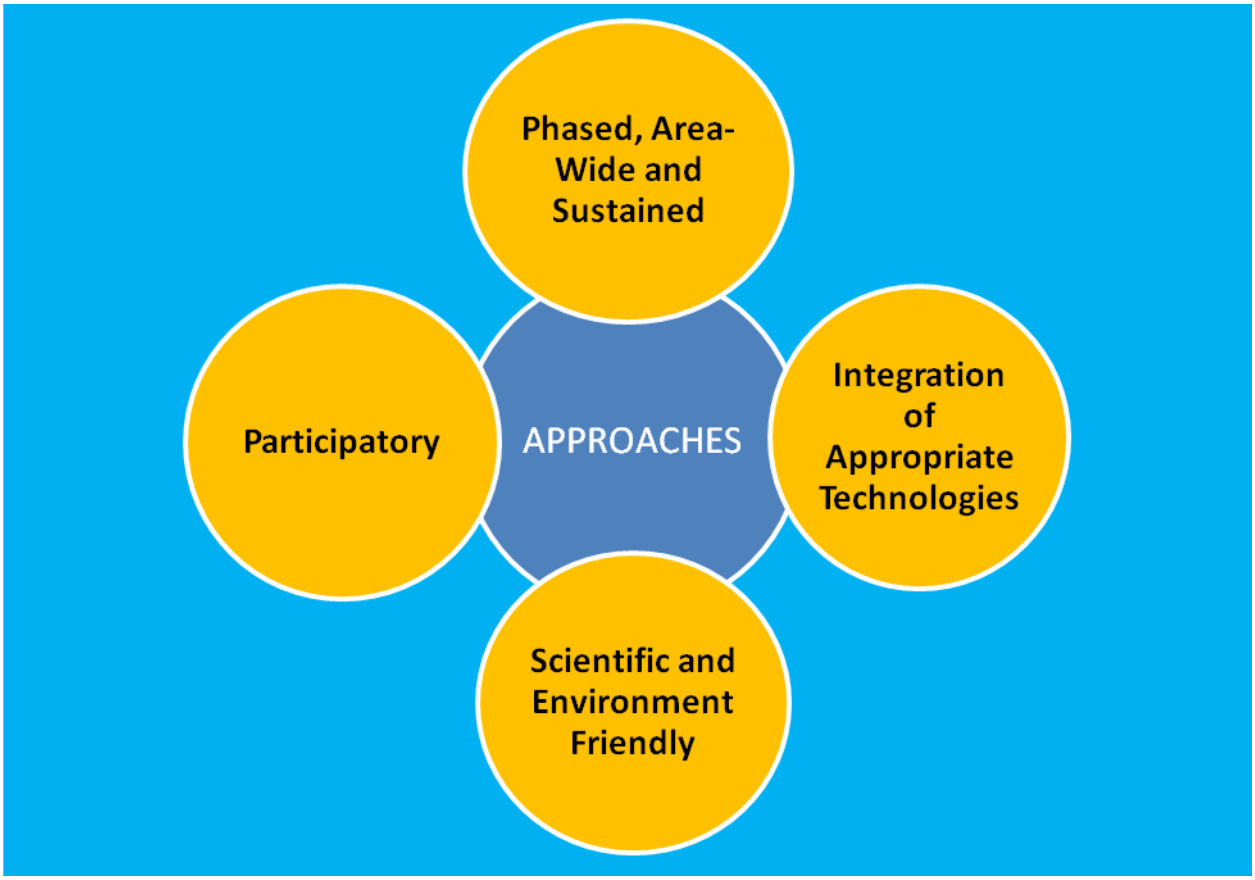

Figure3: Approaches to tseste control/eradication

3. THE STRATEGIC MODEL

3.1 Rationale and Justification

In Ethiopia, even though the scale of the operation is very limited, compared with the overall infested area of the country, governmental and non- governmental organisations as well as other international institutes are involved in tsetse control/eradication activities. However, the efforts are so fragmented and uncoordinated and they lack appropriate land use policies and strategies to bring about any significant impact on tsetse and trypanosomosis problems at all levels. Moreover, there was no much capacity in the country to design, oversee, manage and evaluate wider ranging tsetse and trypanosomosis control/eradication programmes within the context of overall rural development plans of the country.

Therefore, the strategy will help to enhance national capacity on tsetse and trypanosomosis control/eradication and to effectively coordinate and harmonize the intervention efforts of the country at national, regional and global levels; and within the overall rural development plans, assist to optimally use tsetse infested areas through the strategic control/eradication of the problem using an integration of appropriate techniques and multi-disciplinary approaches.

3.2 Vision

Free of tsetse transmitted trypanosomosis and food secured Ethiopia.

3.3 Mission

To increase agricultural and livestock productivity in Ethiopia, through integrated, area-wide, cost effective, sustainable and environmentally acceptable tsetse and trypanosomosis control/eradication.

3.4 OBJECTIVES

3.4.1 Overall Objective

The overall objective of the strategy is to enhance mixed crop livestock production system and support the national effort to satisfy domestic and export demand for agricultural products through increased livestock production and productivity to ensure food security and reduce/eradicate poverty by controlling/eradicating tsetse and trypanosomosis.

3.4.2 Specific Objectives

- Establishing an institute with independent management and operational framework appropriate to the task of coordinating and implementing the control program in close collaboration with the various stakeholders,
- Remove the burden of tsetse and trypanosomosis related problems from communities through progressive control programs,
- Improve access to tsetse cleared areas for integrated crop livestock production activities through rational and sustainable land resource planning and utilization and contribute to the food security status of the country.

4: STRATEGIC INTERVENTIONS

4.1 Establish National Tsetse and Trypanosomosis Control/eradication institute

Trypanosomosis is a tsetse fly transmitted usually chronic, debilitating and often fatal disease affecting all domestic animals but doesn't have a vaccine to prevent, unlike other livestock diseases. The disease highly affects livestock and crop production and productivity, draught power, human settlement and creates overcrowding of people and livestock on the fragile highland areas causing land degradation, erosion, etc. The combined effects of these situations result in a decreased and chronically reduced productive capacity, low incomes and other forms of deprivation leading to poverty. The efforts made by different organizations for over 60 years to alleviate the problem were not successful in controlling the devastating effects of the disease.

Recently alternative strategies have been drawn to sustainably remove the tsetse and trypanosomosis problem and create tsetse free areas for livestock-agricultural development and prevent tsetse from further advancing into tsetse free areas. Currently an area-wide integrated pest management focusing on control and eventual eradication, land use/management, community participation, use of environmentally friendly and technically proven techniques, is considered as most sustainable way to remove tsetse and trypanosomosis problem and improve socio- economic development of the country. However, the efforts were pilot programs limited to small fragmented areas with duplication of efforts and resources instead of area-wide national approach. In addition, the efforts were not coordinated and did not have sustainable impact on tsetse fly density and trypanosomosis prevalence. Therefore, strong and structured institutional framework is required to coordinate tsetse and trypanosomosis control/eradication programmes in Ethiopia.

4.1.1 Strategic interventions for the establishment of a national Institute

The National Tsetse and Trypanosomosis Control/eradication institute shall be autonomous and shall have a full mandate to manage, co-ordinate, mobilize resources and implement tsetse and Trypanosomosis control/eradication and related activities to create sustainable tsetse free areas in Ethiopia. The institute will operate at a national level with functional regional structures and shall be responsible to promote effective coordination, planning, mobilization of resources, budgeting and implementation of tsetse fly and trypanosomosis control/eradication in Ethiopia. The institutional arrangements, organizational structure, and roles and responsibilities and different organs of the institute shall be designed up on the direction given by the apex organ.

4.1.1.1 Justification for the establishment of the Institute

The reasons for the need of autonomous, dedicated, committed and mandated institute for the overall management, coordination and execution of tsetse and trypanosomosis control/eradication programs at a national level are:

(i) Understand specific nature of tsetse and trypanosomosis

Unlike other livestock diseases, tsetse transmitted trypanosomosis permanently occur and affect large fertile and suitable land which could have been used for livestock and crop production causing high economic loss including denied access to the infested areas for livestock-agricultural production and human settlement. The disease has no vaccine, transmitted by tsetse flies and spread over a wider area with continuous advance to tsetse free areas expanding its territory from time to time. In addition, various reports show that trypanosomes in most of the places in Ethiopia have developed resistance to the drugs currently available on the market and there are no new drugs manufactured. Although there is increasing human recourse, the disease has a significant social and economic importance with prominent negative impact on food security, rural development and poverty reduction.

(ii) Institutional linkage and arrangements

Ethiopia has a largest cattle population in Africa and ranks 10th in the world but has no specific national institutional arrangement which particularly deals with livestock sector alone but handled under different ministries. This has limited the attention given to the livestock sub-sector of agriculture and consequently the benefit obtained from the sector. However, considering the socioeconomic impact and seriousness of T&T problem on livestock agricultural development in Ethiopia, apparently high attention was given by the government to control/eradicate T&T through the establishment of fragmented small scale pilot programs.

In addition, various supports have been received from a number of national and international organizations in efforts to control/eradicate tsetse and Trypanosomosis. These include supports obtained from Food and Agricultural Organizations (FAO), International Atomic Energy Agency (IAEA), Programme Against African Trypanosomosis (PAAT)), Pan African Tsetse and Trypanosomosis Campaign (PATTEC), Africa Development Bank (AfDB), European Union (EU), non-governmental organizations (NGOs), etc. Moreover, there is a direct/indirect involvement of relevant institutions, research centers, higher teaching institutions and veterinary laboratories in tsetse and trypanosomosis control and related activities. However, the efforts were not coordinated at a national level.

(iii) Coordination of efforts and resources

Although various governmental and non-governmental organizations are involved in tsetse and trypanosomosis management activities, their efforts were not coordinated and brought unsustainable results. These organizations include Ministry of Agriculture (MOA), Ministry of science and Technology (MoST), International Livestock Research Institute (ILRI), International Center for Insect Physiology and Ecology (ICIPE), Farming in tsetse controlled areas (FITCA), local communities, different non-governmental Organizations (NGOs) and higher teaching institutions particularly schools of veterinary medicine. Although these organizations have made significant contribution to tsetse and trypanosomosis research, capacity building and control, their efforts have not achieved optimum results due to their different mandates and strategic foci which does not allow for harmonized and concerted approaches leading to ineffective tsetse and trypanosomosis control/eradication.

The experiences gained and lessons learned from STEP and many other tsetse and trypanosomosis control programs show that effective T&T control/eradication need fully mandated autonomous and committed institutional arrangement, and cannot be effectively handled under organizations with diversified mandates and responsibilities. So far reliable capacity has been developed in the country in terms of human resource, institution and technology which can be used to establish a national institute that shall be dedicated to coordinate efforts and resources to maximize the benefits and create sustainable results.

(iv) National and trans-boundary significance of the problem

Tsetse and trypanosomosis is a trans-boundary problem in intra district, regionally and continentally. Thus, an area wide approach involving various districts, regions and other countries has to be put in place to achieve the objectives of T&T control/eradication in Ethiopia. The trans-boundary nature of the problem enabled African heads of states who decided, during the OAU summit held in July 2000 in Lome, Togo, to eradicate tsetse and trypanosomosis from Africa through Pan African tsetse and trypanosomosis Eradication Campaign (PATTEC) which was established under the Africa Union. The aim of PATTEC was to bring tsetse infested African countries together to fight the problem in a coordinated and at a continental level.

The same arrangement is required for Ethiopia to achieve sustainable result through sequential, synchronized and nationally coordinated effort. This would be implemented through systematic and strategic approach to reduce chances of re-infestation from adjacent infested areas, once an area is free of tsetse and trypanosomosis. Thus, coordination of efforts under a national institution is of a paramount importance leading to efficient utilization of resources and sustainability of results.

(v) Mobilization and optimum utilization of resources

Tsetse and trypanosomosis control/eradication programs require reliable and sustainable funding. Many tsetse control activities in Ethiopia have been collapsed due to financial constraints and tsetse flies re-established. Although the government is committed to support tsetse and trypanosomosis control/ eradication activities, government funding is limited and often a challenge due to various competing priorities.

Thus, donor funding is curial for sequential, effective and sustainable operation. However, many donors which have been funding tsetse and trypanosomosis control programs in Ethiopia have withdrawn their support leaving the effort of tsetse and trypanosomosis control with little funding which led to the re-invasion of the areas. Since very recently, FAO, IAEA and the AfDB were providing remarkable support for STEP in terms of material, financial, capacity building and experts. However, the support from FAO has been already elapsed and the support from AfDB and IAEA is ending in December 2012.

Therefore, it is essential to establish a national institution to ensure that both legal and institutional frameworks are in place to expand and include other donors for sustained resource mobilization. The presence of a dedicated national institution with a clear mandate would definitely create a convenient situation for various development partners to support the nationally coordinated area-wide tsetse and trypanosomosis control in Ethiopia.

(vi) Government Commitment

The Government shows a positive commitment to support the expanded tsetse and trypanosomosis control/eradication programs in Ethiopia, which requires national strategy and new institutional setup. Thus, the establishment of national tsetse and trypanosomosis control/eradication institute will be a fulfillment of that undertaking. So far the Government has provided remarkable support to various efforts made in different parts of the country and has invested huge resource which needs to be continued to ensure sustainability of the results. Among the effective activities supported by the government, STEP has made notable achievements which should be replicated in other parts of the country that have the same problem. Moreover, the government has clearly stated in the Growth and Transformation Plan (GTP) of the country that tsetse and trypanosomosis problem is one of the most important problems that need urgent solution.

(vii) Institutional frame work arrangements

Tsetse and trypanosomosis control/eradication programs would need to be regulated at a national level, because of its trans-boundary nature. The national tsetse and Trypanosomosis control/Eradication Institute to be established should have a mandate to coordinate,

standardize, capacity build, mobilize resources and harmonize activities with different regions and neighbouring countries to sustainably control/eradicate tsetse and trypanosomosis from Ethiopia. This would enable to create sustainable tsetse free areas to improve livestock and agricultural production and productivity, increase foreign exchange through enhanced livestock and livestock product export, and contribute to the realization of the Growth and Transformation Plan of the country.

4.1.1.2 Proposed National Tsetse and Trypanosomosis Control/eradication Institute

The national tsetse and trypanosomosis control/eradication institute would serve as a focal government institution to coordinate various activities related to tsetse and trypanosomosis control/eradication. Considering the extent of tsetse and trypanosomosis problems and its cross cutting nature, that is as a national, inter-district and an international problem, the government is required to best implement tsetse and trypanosomosis control/eradication programs through an autonomous and legally mandated institute.

(i) Legal context and structure of the institute

The proposed institution known as National Tsetse and Trypanosomosis control/eradication Institute shall be legally established with full mandate and responsibility to control and eradicate tsetse and trypanosomosis in Ethiopia. The Institute shall be headed by a Director General at a national level who will be empowered to determine its staffing needs and recruit its staffs with branch/coordination offices in all tsetse and trypanosomosis infested regions. Although animal disease control in the regional states is a function of the regional governments, it is imperative to establish coordination offices in all relevant regions due to the trans-boundary nature of the problem. The functionality of this structure at the regions will depend on the support of the regions.

(ii) Management and organization of the Institute

A successful and effective implementation of tsetse and trypanosomosis control/eradication according to the proposed institute depends on an efficient management and organizational structure. It is very important that the management at the national and regional level have sufficient autonomy and powers in budgetary property and personnel administration in order to smoothly implement the activities. Competent leadership and the creation of suitable environment are required to achieve the desired objectives. The institute shall have a capacity to perform better management and organizational conditions corresponding with the task and the demanded output.

(iii) Implementation of Tsetse & Trypanosonmosis control/eradication

The institute will focus on substantially removing tsetse and trypanosomosis problem from infested parts of the country. A detailed implementation plan is annexed containing a wide spectrum of activities to be implemented, performance indicators, timeframe and a budget projection. The budget projection in the implementation plan outlines a directive on financial requirement for various activities of the institute. Dedication and commitment of all stakeholders and financial support from public sectors, private sectors, donors and development partners in its implementation plan is required for accelerating a successful implementation.

4.1.2 Review and formulate legal and policy frameworks necessary for tsetse and Trypanosomosis control/eradication.

There is no tsetse and trypanosomosis control/eradication legislation, policy and strategy in Ethiopia except the "Animal Diseases Prevention and Control Proclamation no. 267/2002", which do not clearly describe the T&T control strategy. Therefore, it is imperative to review legal and policy framework that addresses gaps and formulate for amendment of a new which shall be supported by enabling regulations and guidelines.

4.1.2.1 Strategic interventions

The following interventions will be undertaken to address the above stated gaps in legal frameworks:

i. Review and harmonize existing policy to streamline conflicting, deficient and incompatible legal statutes.

ii. Formulate, gazette and promulgate new rules and regulations on the tsetse and trypanosomosis control/eradication schedules within the relevant legal frames e.g. "Animal Diseases Prevention and Control Proclamation no. 267/2002".

iii. Formulate new tsetse and trypanosomosis control/eradication regulation and guidelines to be endorsed.

iv. Develop a Memorandum of Understanding with the regions when required to harmonize tsetse and trypanosomosis control/eradication.

4.2 Remove the burden of tsetse and trypanosomosis related problems from communities through progressive control programs

4.2.1 Use integrated area-wide tsetse and trypanosomosis control/eradication methods and develop appropriate land use systems

Several efforts have been made to control tsetse and trypanosomosis problem in Ethiopia using various techniques. Emphasis was given in the past mainly to disease rather than vector management mainly using trypanocidal drugs, which were directed against the parasite in the animal body. However, it did not have significant impact on the disease and the cycle of transmission. Some recent works show that the effectiveness of all trypanocidal drugs have dangerously declined with the emergence of more and more drug-resistant trypanosome strains and people have lost substantial confidence in depending on drugs to protect their animals. Recently various tsetse control techniques, namely odor-baited traps, insecticide-impregnated targets, insecticide treated cattle, ground spray, Sequential Aerosol Techniques (SAT) and Sterile Insect Technique (SIT) were used to control/eradicate tsetse and trypanosomosis to alleviate the problem.

However, the efforts were fragmented and not coordinated, with a constant threat of re-infestation from adjacent infested areas, and the results were not sustainable. Thus, better coordination of disease and vector control measures between governments, donors, research institutes, affected communities and international organizations, as well as change of focus towards area-wide vector and disease management is needed to ensure sustainability. The strategy requires national approach to tsetse fly and trypanosomosis control with eventual eradication, with the necessary land use, environmental and socioeconomic assessment programmes involving the community at all levels.

4.2.1.1 Strategic interventions

Tsetse and trypanosomosis intervention will be based on an area-wide integrated phased approach considering the fly ecology (e.g. seasonal dynamics of fly population). This approach requires strategic and active participation of various stakeholders, beneficiaries, donors and other partners. They will provide their respective inputs and contributions at different strategic levels of implementation following an agreed and phased implementation plan. The following interventions will be under taken to implement integrated area-wide T & T control/eradication:

i. Collection, compilation, analysis and reporting of base line data and information on tsetse and trypanosomosis infestation, socioeconomic, environment, land use, etc.
ii. Identification, delineation and mapping of tsetse and trypanosomosis infested areas in the country.

iii. Use integrated area-wide tsetse and trypanosomosis control/eradication approach adopted for each defined areas (blocks) based on the diversity and species of tsetse flies and trypanosomes, level of tsetse infestation, extent and severity of the problem, degree of isolation of tsetse fly population(s), ease of eradication of the tsetse fly species, socioeconomic importance of the area(s), environmental considerations, technology availability and preference, feasibility of the areas, available resources and local conditions (pastoral, human settlement, water body, forests and wildlife conservation areas).
iv. Enhance awareness creation and participation of relevant stakeholders, partners, donors, private sectors, and communities at all levels, in tsetse and trypanosomosis control/eradication and related activities.
v. Strengthen national and regional capacity and capability in tsetse and trypanosomosis control and eventual eradication.
vi. Develop data, communication and information management systems at all levels.
vii. Strengthen tsetse flies mass rearing and application of Sterile Insect Technique where appropriate and feasible.
viii. Establish structured monitoring, evaluation and mapping of area-wide integrated vector management operations.
ix. Consider safety procedures and biodiversity conservation in the control/eradication of tsetse and trypanosomosis.
x. Establish proper land use planning and land management system, and social, environmental and cultural factors as a strategic tsetse and trypanosomosis intervention.

4.2.2 Establish sustainable resource mobilization mechanism

4.2.2.1. Financial Capacity

Effective tsetse and trypanosomosis control/eradication efforts require mobilization of funds from all stakeholders, including government, donors, public and private sectors, international organizations and communities. The major part of the budget is expected from the government to avoid budget deficit which could occur any time to ensure smooth and realistic implementation of the operation. The experience gained so far, shows no funding from private sector for tsetse and trypanosomosis control/eradication activities in Ethiopia, which could be enhanced by establishing clear legislation and mechanisms for cost and benefit sharing. Most of the tsetse and trypanosomosis control activities conducted in different parts of the country obtained funds from the Government, AfDB, EU with financial, material capacity building and technical support from other development partners mainly FAO, IAEA, etc. This would provide information on potential donors to be considered during resource mobilization.

4.2.2.2 Physical infrastructure

There are main highways crossing the infested areas at various levels. Numerous all weather and dry weather roads are branching off these highways providing a fairly good network of roads, although some areas are inaccessible with rugged terrains. There are about 4 international airports and 5 air strips in the tsetse infested area. In addition, there is a power supply to all large and small towns in the area, working mainly with the national hydroelectric power. Most of the infested areas are well connected with telephone, where mobile phones make the highest coverage. The main water sources available in the areas are lakes, rivers, springs and hand dug wells. However, clean water is limited to towns. Water shortages occur mainly in the dry season in both towns and villages. There are veterinary clinics in all districts and veterinary health posts and vaccination centers at least one in three peasant associations throughout the areas. Veterinary laboratories are few in number and are mainly based in big towns.

Many national institutions are also available which include; National Animal Health Diagnostic and Investigation Center (NAHDIC), regional veterinary laboratories, National Tsetse and Trypanosomosis Investigation and Control Center (NTTICC), Tsetse Fly Mass Rearing and Irradiation Centre (TMRIC). STEP and NTTICC facilities will provide an important support. In addition ILRI and other institutions directly or indirectly involved in tsetse and trypanosomosis control/eradication and could support the institute in one or the other way. Despite the existing infrastructure more facilities and equipment (laboratory, office and field) should be available.

4.2.2.3 Human resources

Most veterinary clinics have a veterinary doctor, assistant veterinarians, and technicians who will support the operation by directly participating or providing technical assistance when needed. The staffs of different organizations, particularly STEP, NTTICC, and others, who were involved in tsetse and trypanosomosis control and related activities, have the capacity to directly work for the institute. However, more qualified staffs are required both at national and regional level to effectively run implement of the activities at a national level.

4.2.3. Strategic interventions

The institute will undertake the following activities to realize the aspired results:

i. Increase the government budgetary allocation for tsetse and trypanosomosis control/eradication.
ii. Establish and strengthen international and national funding partnerships e.g. IAEA, FAO, AU, AfDB, China, Japan, USAID, EU, etc.
iii. Establish and strengthen community capacity to mobilize funds from other sources e.g. organizing fund raising programs, etc.

iv. Establish mechanisms for private-public partnerships for resource mobilization and benefit sharing e.g. Pharmaceutical companies, regional development authorities and farming and pastoral communities.
v. Continuous human resource development- establishes a centre of excellence for critical mass training to meet the need of human resource for the control/eradication of tsetse and trypanosomosis.
vi. Develop mechanisms to support long-term T&T control/eradication acceptable to all stakeholders.
vii. Develop physical resources at the regional/district level and ensure that relevant facilities are either constructed or the existing ones equipped to deliver the required service.

4.2.4 Perform capacity building and awareness creation

The capacity gap shall be assessed at a national and regional level and the staff capacity, working system, institution and research and development capacity developed. With regard to staff capacity a local training shall be organized. Moreover, a centre of excellence will be established and critical mass training conducted. In addition, scientific visits, foreign trainings and fellowships, meetings and workshops will be organized to obtain knowledge to be transferred to other staffs through locally organized training programs.

Apart from this, continuous awareness creation and community sensitization will be conducted to create better understanding among the farming and pastoral communities, leaders, higher officials, and extension workers to provide the necessary support. The creation of clear understanding among the community and local authorities would enable them to willingly and fully participate in the activities to achieve various strategic objectives. System and institutional capacity will be also developed at national and relevant regions for effective implementation of the T&T control/eradication program.

4.2.4.1 Strategic interventions

i. Strengthen technical capacity building activities;
ii. Strengthen community awareness creation activities;
iii. Strengthen institutional and system capacity building activities;
iv. Develop national and regional capacity and capability.

4.2.5 Establish research and development

Research and development shall be strengthened and research activities related to tsetse suppression/eradication and monitoring technologies, fly species adaptation, mass rearing, handling and release procedures, etc would be performed and refined.

4.2.5.1 Strategic interventions

The following interventions shall be undertaken to achieve research and development activities:

i. Equip and strengthen research centres;
ii. Strengthen research and development activities;
iii. Publish and utilize research outputs.

4.2.6 Establish data management, information and communication systems

Communication is a cross cutting and integral process in the control/eradication of tsetse and trypanosomosis. However, there are inadequate information and communication technology facilities at various levels in Ethiopia. For the purposes of interactive flow of information within and without institutions, stakeholders and partners, a communication strategy shall be developed. The communication strategy shall address issues of public relations in order to raise awareness among all stakeholders including the general public. This will be achieved through printed media, mass media, websites, internet and telephone. Mechanisms for advocacy to governments, donors, independent groups and other stakeholders will be enhanced. The issues of information management will also be addressed. It shall also serve as feedback on the performance of the control/eradication activities. Moreover, there shall be a fully equipped and facilitated data and information management unit at the regions and national level which will be networked to ensure that up to date data and information is available online. The information shall be communicated and reported to all relevant stakeholders and development partners at regular intervals. Midterm and interim reports will be prepared and submitted as scheduled.

4.2.6.1 Strategic interventions

i. Establish information management system to be used for purposes of data management and communication;
ii. Enhance awareness and sense of ownership related to tsetse and trypanosomosis eradication at the local, national, regional and international levels;
iii. Establish communication with all stakeholders on T&T control programmes;
iv. Strengthen networking and partnerships for collaboration and advocacy among stakeholders;
v. Develop communication protocols for cooperation between affected regions and development partners;
vi. Develop GIS and RS data base unit and a website;
vii. Prepare and submit activity and midterm reports at regular intervals to relevant stakeholders and development partners.

4.2.7 Establish Structured Monitoring and Evaluation System

Tsetse and trypanosomosis eradication shall be monitored and evaluated at national and regional levels to ensure that the implementations of various tsetse control/eradication activities were timely and effectively carried out. The established indicators and the day-to-day operational plans of the strategy shall be used as a standard to measure performance during monitoring and evaluation.

4.2.7.1 Strategic intervention

The following interventions will be undertaken to conduct the Monitoring and Evaluation activities:

i. Establish structured monitoring and evaluation system;
ii. Implement integrated M & E system;
iii. Strengthen mechanisms for coordination;
iv. Strengthen systems for data management, information exchange and reporting.

4.3 Improve access to tsetse cleared areas for integrated crop livestock production activities through rational and sustainable land resource planning and utilizationand contribute to the food security status of the country

Tsetse transmitted trypanosomosis remains a significant problem with prominent impact on socioeconomic development involving various sectors including land use/management, socio-economy and environment.

4.3.1 Land use and socioeconomic impact of tsetse and trypanosomosis

Land use will be a very important area to be considered in the operation of T & T control /eradication due to the fact that the land will be over utilized after the removal of the tsetse and trypanosomosis problem and exposed to unnecessary damage if not properly managed. A systematically designed linkage and harmonization should be in place to develop a holistic approach and create synergy and lead the required involvement and participation of relevant organs in tsetse and trypanosomosis control/eradication process in Ethiopia.

4.3.2 Ensure access to the T & T cleared areas for agricultural and other socio-economic uses

Unlike other livestock diseases, tsetse transmitted trypanosomosis permanently occur and affect large fertile and suitable land which could have been used for livestock and crop production causing high economic loss including denied access to the infested areas for livestock-agricultural production and human settlement. Therefore, in collaboration with relevant government and non-governmental organizations, suitable and sustainable conditions should be created to assure access and proper utilization of T & T cleared areas for the adricultural and socio-economic benefits. This would be implemented through systematic and strategic approach to reduce chances of re-infestation from adjacent infested areas, once an area is free of tsetse and trypanosomosis.

4.3.3 Introduce and Maintain Scientific and Environment Friendly Approach

The tsetse infested areas in Ethiopia, as is usually the case in similar environs elsewhere, are very rich in biotic and abiotic resources, shall be protected by the selected environment friendly or less damaging appropriate technologies and management practices. Proven technologies and procedures of tsetse fly control and eradication shall be applied in an integrated manner to exploit any possible synergy and complementarities to speed up the operation process and achieve the desired results in acceptable timeframe.

Therefore, an environmentally friendly approach shall be followed in tsetse and trypanosomosis control/eradication. The techniques and procedures shall be adjusted to the prevailing conditions in each individual infestation according to topographic, demographic, vegetation type, fly species composition and other related issues. Moreover, the intervention technologies and methods shall be selected based on considerations of their direct and indirect impact on the environment as well as their cost and efficiency advantages.

By implementing a regular environmental impact assessment and an appropriate land use plans and policies, efforts shall be made to avoid the negative environmental impact of tsetse survey, surveillance, control and eradication, activities. Sensitive indicators of adverse environmental changes shall also be identified before the monitoring and evaluation. Therefore, it shall be ensured that all environmental agencies and other relevant stakeholders are properly involved during the overall operation of T & T control/eradication and also after removal of the problem.

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6. ANNEXES

ANNEX 1. Logical Framework

	STRATEGIC INTERVENTION ELEMENTS	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
OVERALL OBJECTIVE	The overall objective of the strategy is to enhance mixed crop livestock production system and support the national effort to satisfy domestic and export demand for agricultural products through increased livestock production and productivity to ensure food security and reduce/eradicate poverty by controlling/ eradicating tsetse and trypanosomosis	• Agricultural production increased in currently T & T infested areas • Commodity for export increased • Food security attained • Poverty reduced	• Reports of regional governments and other stakeholders • Impact assessment report • Media broadcast on the positive gains • Development activities taking place in the area	Government is committed to control/eradicate T & T and takes an immediate action to approve the strategy, establish the proposed Institute and sufficient budget allocated to fight against T & T in an area-wide base.
PURPOSE	Make Ethiopia free from the burden of T&T and achieve sustainable land management with meaningful impact on people's livelihood, food security and poverty	• Tsetse infested areas freed from T & T problem • sustainable agricultural development taking place in the areas freed from T&T • Sustainable land management in place	• Reports from regions and stakeholders on socio-economic and land use • Media broadcast	All stakeholders and mainly the community participated actively in the control/eradication of tsetse and trypanosomosis in all affected areas
Output 1	National T & T control/eradication Institute Established	• An autonomous and efficient national T & T control/eradication Institute established	• Approved relevant establishment legislations • Existence and functionality of a recognized institution	All required resources (human, financial, facility, material) fulfilled by the government
Output 2	Legal and policy frameworks necessary for tsetse and trypanosomosis control/eradication reviewed and formulated	• Relevant rules and regulations identified and their weaknesses addressed • New policy frameworks	• Approved animal health/T & T legislations • Functionality of the	Presence of goodwill from the apex organ as well as regional organizations to support formulation and approval of strong and enabling AH/T&T

		formulated • Memorandum of understanding developed with the regions	legislation • Practicality of all the MoU by all parties	control/eradication legislations
Output 3	Integrated area-wide tsetse and trypanosomosis control/eradication and appropriate land use systems implemented	• Apparent densities of target tsetse populations and prevalence of trypanosomosis reduced • Available natural resources utilized in a sustainable manner	• Interim and final reports on area-wide T & T intervention and land use	All required resources (human, financial, material), staff motivated Land use / land cover plans approved and accepted GIS trained staff and the database available, topographic maps available
Output 4	Sustainable resource mobilization mechanism established	• Sufficient resource available for the control/eradication of T & T	• Resource inventory reports and documentations	All required resources (materials, finance) availed by the government
Output 5	Capacity building and awareness creation activities executed	• Number of community leaders and members, extension agents, staff, professionals, and higher officials trained	• Training report • Training certificates • Active participation of trainees • Positive feedbacks	All required resources (materials, human, trainers, finance) availed
Output 6	Research and development programs established	• Number of researches and related development programs conducted	• Research proposals and reports/publications	All required resources (materials, human, finance) availed
Output 7	Data management, communication and information systems established	• Efficient data management, communication and information system in place	• Existence of reliable and efficient database • Quantity and quality of reports and feedbacks	All required resources (materials, human, finance) availed
Output 8	Structured Monitoring and Evaluation System Established	• Structured monitoring and evaluation programs in place	• Quality of Monitoring and Evaluation reports • Taken actions based on the M & E reports	All required resources (materials, human, finance) available
Output 9	Access to the T & T cleared areas for agricultural and other socio-economic uses ensured	• T & T cleared areas utilized for agricultural and socio-economic development	• Increment of land size suitable for agricultural and soci-economic development • Reports of the socio-	All relevant governmental and non-governmental organizations and communities committed for active participation

			economic study	
Output 10	Scientific and environment friendly approach introduced and maintained in the tsetse & trypanosomosis cleared areas	• Scientifically sound and Invironmentally friendly technologies in place	• Reports from environmental impact assessment • Reports and feedbacks from relevant stakeholders	Support and active participation of relevant stakeholders ensured

Output 1	**National Tsetse and Trypanosomosis Control/eradication institute established**			
1.1	Establish national institute	Fully autonomous and operational institute	Legal document, media reports	Accepted and approved by the apex body
Output 2	**Legal and policy frameworks necessary for tsetse and Trypanosomosis control/eradication reviewed and formulated**			
	ACTIVITY	**OVI**	**MOV**	**ASSUMPTIONS**
2.1	Review and harmonize existing policy to streamline conflicting, deficient and incompatible legal statutes.	Rules and regulations updated	Legal documents for T&T control/eradication	Apex body accepted and endorsed T&T policy
2.2	Promulgate new rules and regulations	New T&T policy in place	Proclamation and policy documents	Support from the apex
2.3	Establish Memorandum of Understanding with regions	MOU created with the regions	Signed MOU document	Required Support from the regions
Output 3	**Integrated area-wide tsetse and trypanosomosis control/eradication and appropriate land use systems implemented**			
3.1	Baseline data collection: Tsetse and typanosomosis, Socioeconomic, environmental and land use survey	Fly density and disease prevalence data socioeconomic, environmental and land use data generated	Field data and reports Field and consultant reports	All required resource (equipment, human and finance) available. GIS trained staff and the data base available, Topographic maps available,
3.2	Collection, compilation, analysis and reporting of base line data and information on tsetse and trypanosomosis infestation, socioeconomic, environment, land use, etc	Identified operational blocks	Report with GIS map indicating operational blocks	All required resource (equipment, human) available. GIS trained staff and the data base available, Topographic maps available

3.3	Conduct area-wide integrated tsetse and trypanosomosis control/eradication approach	Area covered with SAT; area covered with ground spray, number of targets placed; number of animals treated with pour–on insecticide formulations, area covered with ground spray, area covered with SIT	Reports on area-wide suppression activities	All necessary permits and the required resources made available
3.4	Provide extension services on agriculture and livestock development to previously T&T affected communities	Number of community members participating	Reports from extension workers, regional, zonal and district agriculture bureaus and offices	Resources to enable communities benefiting from agriculture and livestock development opportunities available
Output 4	**Sustainable resource mobilization mechanism established**			
4.1	Develop financial capacity	Government budget allocation increased Strengthened international funding Organizing fund raising programs	Financial documents	Government approves budget allocation Sufficient fund available for the operation
4.2	Ensure physical infrastructure	Veterinary infrastructure, roads, airports, water, telephone facilities available	Reports of their availability	All required facilities available
4.3	Ensure human resource at a required capacity	Qualified personnel available at all levels	Human resource report	Human resource available at a required quantity and quality
/Output 5	**Capacity building and awareness creation performed**			
5.1	Prepare, duplicate and distribute training manuals and leaflets.	Printed manuals and leaflets in various local languages.	Training reports	All required resource (human, equipment finance) available. Training sessions approved
5.2	Conduct capacity development of project management, project staffs, extension workers and professionals	Number of trained manpower on tsetse control, tsetse mass rearing and SIT application	Training reports, Training certificates	All necessary resources available; training sessions approved
5.3	Strengthen public awareness	Information disseminated in various ways in the creation of awareness among the public;	Newsletter articles; TV and radio broadcasts; Signed contracts with donors	Government priority to address the T&T problem and foster sustainable agriculture and rural development remains unchanged. Interested donors can be found
5.4	Establish and strengthen a centre of excellence	Operational training centre	Technical report	All required resource (human, equipment finance) available.
Output 6	**Research and development programs established**			
6.1	Equip and strengthen research centres;	Adequate research activities taking place	Research papers and reports	Required resources and facilities available

6.2	Strengthen research and development activities;	Number of research activities conducted	Publications and reports	Required resources and facilities available
Output 7	**Data management, communication and information systems established**			
7.1	Establish information management system to be used for purposes of data management and communication	Efficient data management and communication	Stakeholder feedback and reports	All required facilities available
7.2	Develop GIS and RS data base unit and a website	Efficient data management and information communication	Database and reports	GIS and RS data base and trained personnel available
Output 8	**Structured Monitoring and Evaluation System Established**			
8.1	Pursue routine entomological and parasitological monitoring and reporting routines	Number of traps positions and animals screened; fly apparent density and trypanosomosis prevalence	Entomological and veterinary monitoring reports	Resources available Trained staff in the use of data bases and GIS aided data processing
8.2	Conduct socio-economic and environmental monitoring to assess generated benefits and ensure appropriate utilization of available natural resources	Data on generated benefits Information on indicator species	Socio-economic and environmental reports	Resources to generate information available Communities participate
8.3	Introduce and strengthen oversight and monitoring system	No. of meetings held, structured monitoring in place	Reports of the project Oversight, Advisory committee and monitoring	Institute circulates TOR and invites members to participate in meetings, regular monitoring system in place, Necessary resources available
8.4	Conduct overall review and reporting routines	Number of staff familiar with routine data processing	Routine (weekly, monthly, quarterly, etc. reports)	Necessary resources available; Generated information is shared among relevant partners
9	**Access to the T & T cleared areas for agricultural and other socio-economic uses ensured**			
9.1	Select and initiate appropriate agricultural practices	Selected, accepted and implemented agricultural practices	Report of implemented agricultural practices	Good will and initiation of the beneficiaries to accept and implement selected paractices
9.2	Monitoring and socio-economic impact assessement	Number of monitoring missions and socio-economic impact assessments	Reports on monitoring and socio-economic impact assessement	Availability of skilled manpower and logistics
10	**Scientific and environment friendly approach introduced and maintained in the tsetse & trypanosomosis cleared areas**			
10.1	Conduct environmental impact assessment and ensure active participation of relevant organs	Type and Quality of impact assessment and reliable linkage with relevant organs	Report of the impact assessment	Availability of skilled manpower and commitment of relevant organs

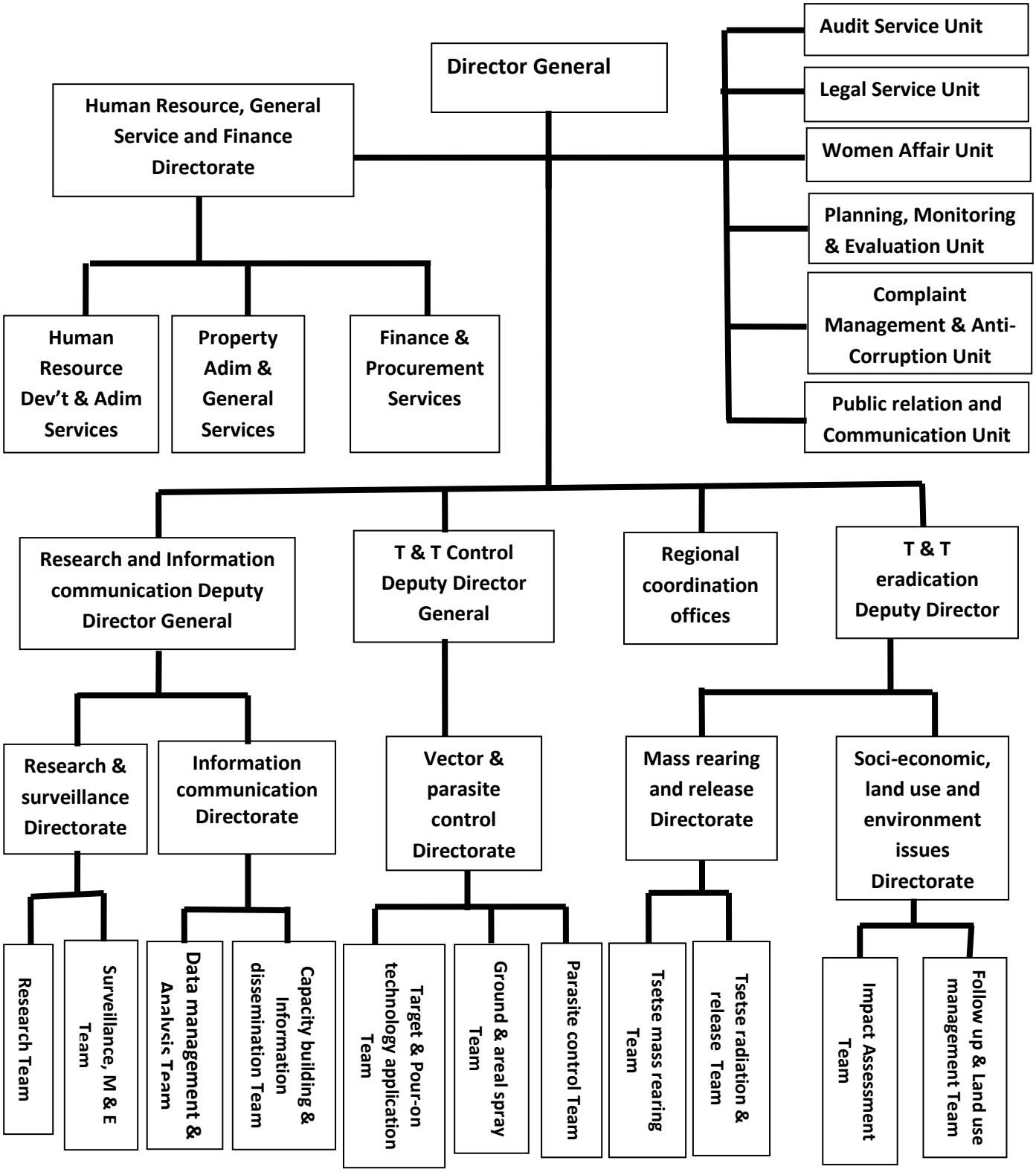
ANNEX 2. Activity plan

S/N	Activities	Phase 1			Phase 2					Phase 3				
		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
1	Awareness creation Prepare, duplicate and distribute training manuals, posters and leaflets.													
2	Harmonization and coordination of T & T control by different actors and regional states													
3	Personnel technical Training etc.													
4	Acquisition of essential Equipment and supplies													
5	Baseline data collection: Tsetse and typanosomosis, Socioeconomic, environmental and land use survey													
6	Identification of tsetse and trypanosomosis infested areas and division into operational blocks													
7	Construction of facilities													
8	Conduct area wide T & T control													
	Progress report													
9	M&E • Operational monitoring													
	• Evaluation and monitoring													
10	Mid-term reviews													
11	Management meetings													
12	Provide extension services on agriculture and livestock development to previously T&T affected communities													
13	Conduct socio-economic and environmental monitoring to assess generated benefits and ensure appropriate utilization of available natural resources													
	Compilation, synthesis and submission of Interim and terminal report of the institute													

ANNEX 3. Indicative budget summary "ETB 000,000" (for the first phase only)

S/N	Activities	Fiscal year (EC)			Total
		2005	2006	2007	
1	**Capital Expenditure**				
1.1	Personnel training, workshops and awareness creation	1	1	1	3
1.2	Equipment	6	6	6	18
1.3	Construction and rehabilitation	10	10	10	30
1.4	Chemicals, drugs and consumables	5	5	5	15
1.5	Purchase of vehicles	20			20
1.6	Operation expenditure	10	10	10	30
1.7	DSA	8	8	8	24
1.8	Travel expenses	1.5	1.5	1.5	4.5
1.9	Technical assistance	1	1	1	3
1.1	Miscellaneous	1	1	1	3
	Capital expenditure-Sub-Total	73.5	43.5	43.5	150.5
2	**Recurrent budget**				
2.1.	Travel expenses	0.5	0.5	0.5	1.5
2.2.	Staff salary	25	25	25	75
2.3.	Repair and maintenance	3	3	3	9
2.4.	Data management, Information & Communication	0.5	0.5	0.5	1.5
2.5	Utilities (power, water, tele, etc.)	2	2	2	6
2.6	Other consumables and supplies	2	2	2	6
2.7	Tsetse mass rearing & Releasing of sterile male tsetse flies	10	10	10	30
	Recurrent expenditure- Sub-Total	53	53	53	129
	Total	**126.5**	**96.5**	**96.5**	**279.5**
	Contingency 10%	12.65	9.65	9.65	27.95
	Grand Total	**139.15**	**106.15**	**106.15**	**307.45**

ANNEX 4. ORGANOGRAMME of the national T & T Control/eradication Institute



ANNEX 5. Responsibilities of the National Tsetse & Trypanosomosis control/eradication Institute

The National Tsetse & Trypanosomosis control/eradication Institute will be accountable to the Ministry of Agriculture and will have the following responsibilities:

a) Establish tsetse and trypanosomosis control/eradication policy and its implementation;
b) Prepare standards and guidelines for tsetse and trypanosomosis control/ eradication and ensure its implementation;
c) Prepare and implement national goals, priorities and strategies for the tsetse and trypanosomosis control/eradication;
d) Coordinate tsetse and trypanosomosis control/eradication activities at all levels and strengthen collaboration between different stakeholders;
e) Lead tsetse and trypanosomosis eradication activities in the country;
f) Mobilize resources for the tsetse and trypanosomosis control/eradication;
g) Ensure effective and efficient use of resources provided by the government and other sources for tsetse and trypanosomosis control/ eradication and related activities;
h) Facilitate, adopt, conduct, guide, research and use of technologies and development of science for the purposes of tsetse and trypanosomosis control/eradication;
i) Establish and maintain appropriate tsetse and trypanosomosis knowledge, information and communication system and data base, based on contemporary science and technology to link knowledge and information with a variety of stakeholders;
j) Update T & T distribution map;
k) Develop a coordinated and efficient system-wide framework for planning, development and management of resources available for Tsetse and Trypanosomosis control/eradication activities;
l) Develop and update tsetse and trypanosomosis control/eradication programmes;
m) Involve all relevant sectors including land use/management, environment and socioeconomic, and promote and facilitate activities to sustain tsetse and trypanosomosis control/eradication in Ethiopia;
n) Promote public and private sector partnership for sustainable tsetse and trypanosomosis eradication;
o) Negotiate and interact with other countries on tsetse and trypanosomosis control/eradication activities;
p) Present annual plan and report accomplishments to relevant stakeholders;
q) Serve as a source of information and existing data;
r) Perform any other function as may be assigned to it by the government.