

## 1 INTRODUCTION

The human population in sub-Saharan Africa (SSA) has been growing at a rate of 3.1% (the highest in the world) annually and was estimated to have reached 676 million people in the year 2000 (World Bank, 1991). With about 45% of the population living below the international poverty line of US\$ 1 a day, this is the poorest region in the world (World Bank, 2001). Over 70% of the people live in rural areas and depend directly and indirectly on agriculture. Agriculture is an integral part of the economies of SSA contributing 32% of the gross domestic product (GDP). Out of the 32% contribution to GDP by agriculture as a whole, livestock production contributes 25%. If non-monetized contributions (e.g. traction and manure) are included, the livestock contribution to agricultural domestic product would increase to 35% (Winrock International, 1992). In addition, the rapid growth in population, coupled with increasing level of urbanization is raising the demand for foods of animal origin (Winrock International, 1992). If livestock production does not grow faster than it did between 1962 and 1987 (2.6% a year for meat and 3.2% for milk), it is projected that the region will face massive deficits in meat and milk supplies by 2025. It has been observed that already, 11% of the milk consumed in SSA is imported (Winrock International, 1992).

Like the rest of SSA, the growth of Kenya's economy relies heavily on the agricultural sector. This is despite the fact that only 25% of the landmass is suitable for agriculture. Activities related to agriculture account for 50% of the direct or indirect contribution to the GDP of Kenya. These activities are a major economic resource for approximately 80% of Kenya's population (Government of Kenya, 1994). Over the past 15 years, there has been a reduction of budgetary allocations to the ministries in charge of agriculture and rural development to less than 10% of the original amount. Rapidly increasing external and internal debts have forced the national financial resources to continue providing public services since the private sector is just emerging (Government of Kenya, 1997). The main constraints to the growth of the agricultural sector in Kenya include poor rural infrastructure, low budgetary provision, high dependency on rain-fed agriculture, inadequate application of inputs, inaccessibility to credit, low adoption of research

technologies, poor co-ordination of stakeholders and cultural impediments (Government of Kenya, 1997).

There are three distinct cattle livestock production systems in Kenya, namely commercial large scale, pastoralism and smallholder. The bulk of livestock is raised in the arid and semi-arid rangelands which cover approximately 75% of the country's land mass. Livestock production is also an important economic sector in the medium to high potential areas where mixed crop-livestock production system is the main agricultural activity. In total, the livestock sector contributes an estimated 10% of the GDP in Kenya (Government of Kenya, 1997).

The two main categories of commercial large-scale cattle production systems in Kenya are large scale dairy and large scale ranching. Large scale dairy production is practiced in the high agricultural potential central and western highlands and the Rift Valley regions. This production system is characterized by large (>120 head) herds of exotic dairy cattle breeds and a high level of mechanization and management (Stotz, 1979). On the other hand, commercial ranching is characterized by keeping large herds of local or crossbred cattle mainly for beef production (Roderick, 1995). There is low intensity of land use and hence low output per unit area. Encroachment of smallholder farmers into the marginal areas and interaction between livestock and wildlife has led to decline in production from this system (Roderick, 1995).

Pastoralism is also an important livestock production system practiced in the arid and semi-arid areas in Kenya. The system is characterized by nomadism and large herds, mainly intended to spread the risk of disease and other natural calamities like drought. The productivity of cattle kept under pastoral nomadism in Kenya is generally considered to be low (Roderick, 1995). Like other production systems, the more productive territory occupied by the pastoral communities in Kenya has been encroached by smallholder farmers.

Smallholder farms are described as those holdings with less than 20 hectares of land (Gitau *et al.*, 1994a). The production system is characterized by keeping of few animals (2-10), growing of subsistence crops and intensive labour. When well utilized, the smallholder production system offers continuous self employment and provides a sustainable source of proteins (milk and meat)

to the resource-poor farmers. It is the policy of the GoK to increase milk and meat production from the smallholder sector and thus various initiatives and incentives have been incorporated into the agricultural policy towards this goal. These include research (Winrock International, 1992), disease control programmes (Stotz, 1983), liberalization of the marketing infrastructure for dairy products, provision of extension services and initiation of breeding programmes to upgrade local cattle breeds (Government of Kenya, 1997). However, the system is beset by many constraints. While the number of households keeping cattle has been increasing gradually, their productivity is considered to be low. Relatively low milk production per cow, long calving intervals and high mortality rates are manifest in this production system. The major factors impeding productivity include infectious diseases, inadequate feed resources, poor veterinary/extension services, insufficient marketing channels and lack of farm inputs (ILRAD, 1984; Winrock International, 1992).

Farmers in western Kenya, bordering Uganda, fall under the category of smallholder production system. In this region, more than 60% of the rural population lives below the international poverty line of US\$ 1 a day (Ministry of Finance and Planning, GoK, 2002). Due to high population density (about 230 persons per km<sup>2</sup>; Ministry of Finance and Planning, GoK, 1999; FITCA-K, 2001; Muriuki and Ndung'u, 2001), sub-division of farms and subsequent decreased land holding size has substantially reduced areas under pasture cover. Lack of adequate pasture has led to intensive management methods such as tethering and stall-feeding in some cases (Russo *et al.*, 1983). With minimum resources, mixed crop-livestock production systems are barely subsisting. Monitoring of the most important disease constraints and their impact on livestock production is inadequately performed since veterinary services are more or less out of action due to lack of resources. For instance, in the case of tsetse-transmitted trypanosomosis, treatment of cattle is generally carried out without preliminary diagnosis. It is estimated that in Busia District alone, over 50% of all treatments are administered inappropriately, i.e. to cases perceived to be diseases other than trypanosomosis (Machila, *et al.*, 2003).

The situation is further aggravated by differences in prices for veterinary inputs (they are lower in neighbouring Uganda) as well as the registration procedures between the two countries. Veterinary inputs are more often than not purchased in Uganda and then applied in Kenya. In the

case of trypanocidal drugs, it has been observed that their widespread and uncontrolled use will invariably lead to drug resistance, as was for instance confirmed in West Africa in the common border region between Burkina Faso and Mali (Clausen *et al.*, 1992).

A regional project (“Farming in Tsetse Controlled Areas, FITCA”) involving Kenya, Uganda, Ethiopia and Tanzania was therefore conceived in the early ‘90s to address problems associated with rural development using trypanosomosis as an entry point. The project comprises a Regional Coordination Unit and the various National components. It is funded by the European Union and implemented through the African Union/Inter African Bureau for Animal Resources (AU/IBAR), Nairobi, Kenya. The objective of the project is to improve the welfare of the people (in target areas) through sustainable rural development. The purpose is to increase livestock productivity by improving animal health through tsetse/trypanosomosis control, and through integrated crop/livestock production system which is aimed at improving food production.

The FITCA-Kenya component operates in 5 districts of Western Kenya, namely Busia, Teso, Bungoma, Siaya and Bondo districts. At inception of FITCA-Kenya (July 1999), farmers were reporting high losses of animals (over 80%) to an “apparently strange disease”, especially in Teso District. Losses had also been registered in Busia and Bondo districts, albeit at lower levels (FITCA-K, 2000). A survey by the Kenya Trypanosomiasis Research Institute (KETRI) in Teso District revealed populations of *Glossina pallidipes* occurring in peridomestic habitats in densities of up to 1500 flies per trap per day (FTD) (FITCA-K, 2001).

A vigorous tsetse control campaign was therefore initiated by FITCA-K, involving 1086 trained farmers using 2066 targets to cover an area of approximately 500 km<sup>2</sup>. Similarly, in Rarieda Division of Bondo District, 150 farmers using 458 targets were mobilized to deploy targets in an area of approximately 100 km<sup>2</sup>. The targets were deployed at a density of four targets per km<sup>2</sup>. Within a period of 10 months, there was a drastic reduction in apparent tsetse densities to levels of about 1-3 FTD (>99% reduction) in Teso District and up to 1-2 FTD in Rarieda Division (FITCA-K, 2001). However, in order to come up with sustainable disease control strategies, it was imperative for FITCA-K, KETRI, the Veterinary Department and farmers to have baseline data on the level of risk of animal trypanosomosis in all the project districts through well planned

epidemiological surveys. The information collated from these surveys would then be used to formulate rational disease intervention strategies befitting the farmers.

Although trypanosomosis was perceived to be a major constraint to animal production, it was noted that the disease occurs concurrently with other infections like helminthosis and tick-borne diseases. Studies carried out in West Africa (Sharma *et al.*, 2000) indicated that single parasitic infections in a host are not uncommon in nature but mixed infections with various species or with several different types of parasites are the rule. It is this particular situation, which justified a rapid assessment of the present risk of tsetse-transmitted trypanosomosis, helminthosis and tick-borne diseases (anaplasmosis, babesiosis and ECF) in a cross-sectional survey. The survey was conducted within the six divisions (Budalang'i, Funyula, Butula, Nambale, Matayos and Township) of Busia District in November 2002. In order to come up with specific intervention strategies that stand a fair chance of being supported by the rural communities, a longitudinal survey was subsequently designed in two divisions (Budalang'i and Funyula) of Busia District, considered to be at a higher disease risk than the others. The two components of the study were carried out with the following objectives: