PAAT TECHNICAL AND SCIENTIFIC SERIES
10
ISSN 1020-7163

Linking sustainable human and animal African trypanosomosis control with rural development strategies

PAAT INFORMATION SERVICE PUBLICATIONS

PAAT
TECHNICAL
AND
SCIENTIFIC
SERIES

10

Linking sustainable human and animal African trypanosomosis control with rural development strategies

For the human health aspect:

Pierre Cattand
Association against Trypanosomiasis in Africa
Lavans-St Lupicin, France

Pere Simarro
World Health Organization
Geneva, Switzerland

Jean Jannin
World Health Organization
Geneva, Switzerland

For the livestock and agriculture aspect:

Cheikh Ly
École Inter-États des Sciences et Médecine Vétérinaires
University of Dakar
Dakar, Senegal

Abdou Fall
International Trypanotolerance Centre
Banjul, The Gambia

Alexandra Shaw
AP Consultants
Andover, United Kingdom

Raffaele Mattioli
Food and Agriculture Organization
Rome, Italy

WORLD HEALTH ORGANIZATION
Geneva
and
FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Rome, 2010

ISBN 978-92-5-106670-6

Acknowledgements

The authors would like to thank FAO for commissioning this work and the members of the PAAT programme committee and advisory group for their support and editorial inputs during the long gestation of this multidisciplinary paper. Particular thanks are due Dr Burkhard Bauer for his comments and Drs Temesgen Alemu, Charles Mahama, Martin Abavana and Issa Sidibé for their diligence in providing background information on the land-use plans, projects and organizations in Ethiopia, Ghana and Burkina Faso.

Abstract

This document analyses best practices for the strategic planning of mixed agricultural development in areas affected by trypanosomosis in people and livestock. Along with the other papers in the Programme Against African Trypanosomosis (PAAT) series, this paper has been produced to fulfil PAAT's remit to provide normative guidelines for dealing with tsetse and trypanosomosis (T&T).

The T&T problem lies at the heart of Africa's poverty. Estimates of gross national per capita income show that 20 of the world's 25 poorest countries are affected by T&T. Some 60 million rural Africans and 50 million of their cattle live in tsetse-infested areas. Trypanosomosis thus affects three key sectors: human health, livestock health and rural development. This paper places the T&T problem within the context of current thinking on how best to secure sustainable agricultural and rural development by providing an enabling environment and engaging in participatory processes within a sustainable livelihoods framework. Following a logical sequence, it takes the reader through four steps in the planning and implementation process while drawing on recent examples of T&T control (T&TC) programmes.

The first step involves setting priorities and making plans based on an appropriate analytical framework. Useful historical perspectives can be found in structural adjustment programmes that have embedded health, agriculture and rural development objectives in strategies for reducing poverty. In the health field, for example, the Alma-Ata and Bamako initiatives, which were designed to revitalize primary health care and increase equity of access, identified these multifactorial characteristics of poverty: 1) low levels of income, particularly among women and young people; 2) inadequate access to basic infrastructure and social/productive services; and 3) weak institutional capacities of community-based organizations (CBOs) and/or local organizations managed by the poor themselves. The key requirements for alleviating this poverty were found to be empowerment, economic opportunity, basic social services and infrastructure.

T&TC intervention was not included in the remediation list, nor is it mentioned explicitly in most current national Poverty Reduction Strategy Papers (PRSPs). Similarly absent are explicit strategies for livestock development, despite the essential contribution that livestock makes to the economies of many sub-Saharan countries and the important role it can play in poverty reduction. Given this context, the inclusion of T&TC interventions in national and regional planning is essential to reducing poverty in these areas. Such planning can also benefit from the use of geographic information systems (GIS) to help set priorities. Once suitable areas for intervention have been identified, ongoing projects and programmes in health and rural development can be considered alongside land-use plans. Additional insights can be obtained at the community level from community development plans, frameworks involving local councils and other local governing bodies, farmers' organizations, public and private extension/advisory agencies, research organizations and other relevant stakeholders such as line departments (health, forestry, livestock, land management, tourism and conservation).

The second step in formulating an effective T&TC intervention is identifying and then consulting the stakeholders who will be involved in implementing the programme. These stakeholders range from the farmers, livestock keepers and other rural inhabitants who are the ultimate beneficiaries of better human and livestock health to all of the people involved in the delivery, implementation, administration and funding of the programme. This work requires the alliance and coordination of many groups, including the community, the private and public sectors (together with research and development), non-governmental organizations (NGOs) and civil society organizations (CSOs). It also requires coordination across sectors – especially human health, livestock, wildlife, tourism and rural development. This paper discusses the importance of participatory processes, such as sustainable local participation and institutional instruments and arrangements, in furthering effective coordination. The importance of institutions – that is, the relationships, customs, policies and laws that govern everyday social and economic interactions – is a recurring theme in this paper.

The participatory paradigm depends on an understanding of the social relations and power dynamics/structure present in a particular poverty setting. Important factors that must be understood include social fragmentation, economic differentiation, power utilization and distribution and the other structures and mechanisms that lead to poverty or wealth. Such a framework implies the involvement of all stakeholders from the initial identification and monitoring phase through to the final evaluation. In this way, the programme can be underpinned by learning-by-doing and observational processes. The involvement and informed participation of local stakeholders can also be reinforced by building local-level capacity in T&TC techniques.

The third step in creating effective T&TC is analysing the requirements for implementation and delivery, especially within the context of approaches used over the past 50 years. For a T&TC intervention to be effective, it must connect the health and extension services that act as facilitators for rural populations and their organizations to research and training activities as well as to service providers. In recent years, public-private partnerships (PPPs) have been especially useful in controlling resurgent human African trypanosomosis (HAT), while government agencies have been primarily involved in policy planning and funding. Funding issues remain important, however. For example, in both human and veterinary medicine, there exist trade-offs between "horizontal" delivery (that is, through primary health care and veterinary services) and the need for specialized units to deal with a particular disease such as HAT. The degree to which communities mobilize labour and funds to support T&TC programmes depends a great deal on the extent to which these activities are perceived as public or private goods. Therefore, this paper looks at the public/private nature of the various components of T&TC interventions.

The fourth and final step in securing the benefits of T&TC intervention is the creation of an appropriate and enabling institutional environment. An example of a programme that faced the difficult challenge of linking T&TC with an integrated approach to health and livestock development is the Farming in Tsetse Controlled Areas (FITCA) project. In this context, the sustainable livelihoods framework offers particularly useful insights for analysing the effects of T&TC interventions on the

poor. The framework provides a checklist of important issues, highlights key elements and processes and emphasizes the interactions among factors that affect the livelihoods of poor people. By helping identify appropriate and efficient links among T&TC, human health delivery and livestock development strategies, the sustainable livelihoods framework also focuses attention on processes and structures that need to be reformed (as determined by assets identification and a diagnosis of the vulnerability context). Using a synthesis of macroeconomic, mesoeconomic and microeconomic perspectives, this paper highlights the structural and institutional factors mediating the effects of such policy reforms. Specifically, it discusses the mesoinstitutional forces at the interface between government and the private sector that urgently need to be reinforced. For example, for livestock development initiatives to reach poor rural households through an efficient policy chain, transaction costs and other mesoeconomic and intermediate-level constraints must first be reduced or mitigated.

Finally, the practical measures needed to reinforce and sustain T&TC have to be planned, budgeted for and implemented. These measures include, in general terms, support from the human and livestock health services, extension advice, market reinforcement and regulation. More specifically, they consist of technical activities required for the protection of gains already made by T&TC, such as surveillance for HAT and the creation and maintenance of barriers to prevent the reinvasion of zones previously freed of tsetse.

Acronyms

AAT	animal African trypanosomosis
CAADP	Comprehensive Africa Agriculture Development Programme (a programme of NEPAD)
CBO	community-based organization
CIRAD	Centre de coopération internationale en recherche agronomique pour le développement
CIRDES	Centre International de Recherche-Développement sur l'Elevage en zone Subhumide
CSO	civil society organization
DFID	Department for International Development (UK)
ECOWAS	Economic Community of West African States
EISMV	École Inter-États des Sciences et Médecine Vétérinaires
FAO	Food and Agriculture Organization of the United Nations
FITCA	Farming in Tsetse Controlled Areas
GIS	geographic information system(s)
HAT	human African trypanosomosis
IAEA	International Atomic Energy Agency
IGAD	Intergovernmental Authority on Development
ICIPE	African Insect Science for Food and Health (formerly International Centre for Insect Physiology and Ecology)
ILRI	International Livestock Research Institute
ITC	International Trypanotolerance Centre
MDG	Millennium Development Goal
NEPAD	New Partnership for Africa's Development
NGO	non-governmental organization
OIE	Organisation mondiale de la santé animale (formerly Office International des Epizooties)
NSSCP	National Sleeping Sickness Control Programme
PAAT	Programme Against African Trypanosomosis
PATTEC	Pan-African Tsetse and Trypanosomosis Eradication Campaign
PPLPI	Pro-Poor Livestock Policy Initiative (an FAO programme)
PPP	public-private partnership
PRSP	Poverty Reduction Strategy Paper
SADC	Southern African Development Community
SARD	sustainable agricultural and rural development
SSA	sub-Saharan Africa
T&T	tsetse and trypanosomosis
T&TC	tsetse and trypanosomosis control (general term referring to all measures used to deal with T&T)
TBD	tick-borne disease
UEMOA	Union Économique et Monétaire Ouest Africaine
WHO	World Health Organization of the United Nations

Contents

Prologue

On a trouvé, en bonne politique, le secret de faire mourir de faim ceux qui, en cultivant la terre font vivre les autres.
(In its wisdom politics has discovered the secret of starving to death the very people who, by tilling the soil, enable the others to live.)

Voltaire

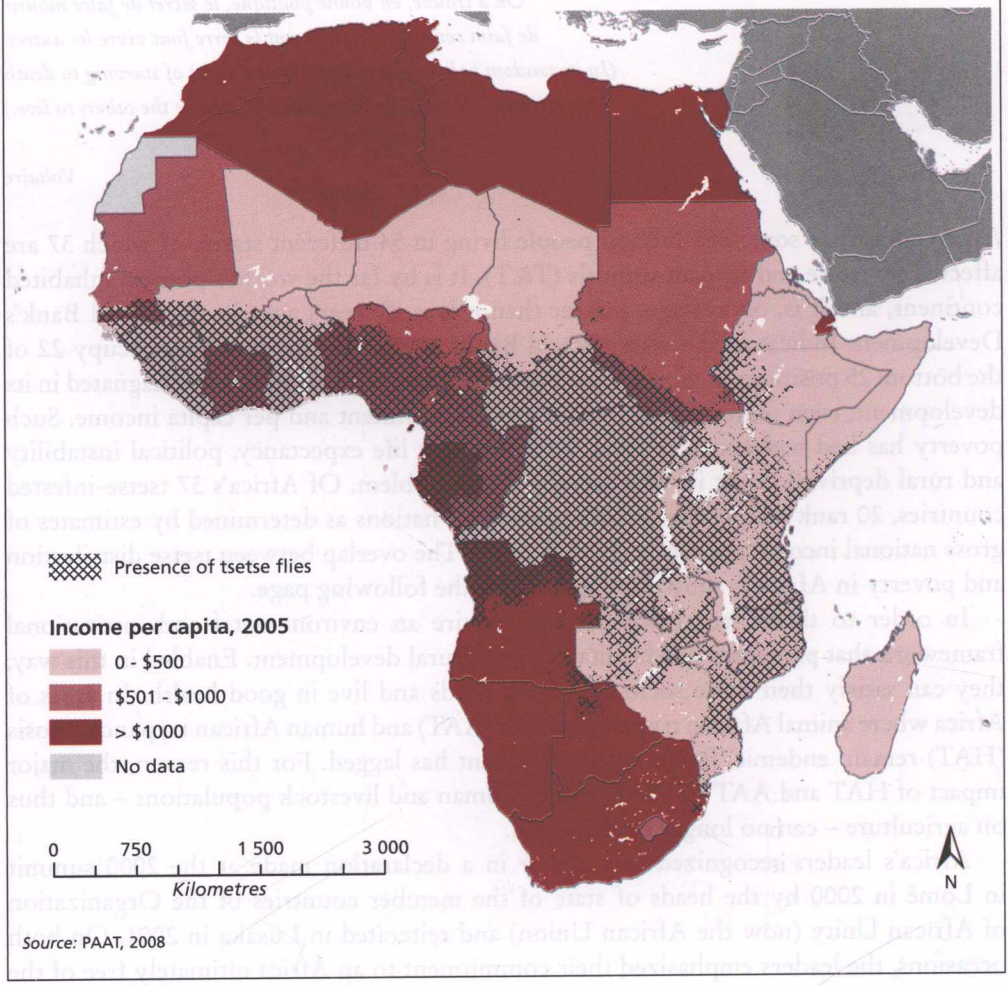
Africa comprises some 888 million people living in 54 different states, of which 37 are affected by tsetse and trypanosomosis (T&T). It is by far the world's poorest inhabited continent, and it is, on average, poorer than it was 25 years ago. In the World Bank's Development Indicators database (World Bank, 2008), African countries occupy 22 of the bottom 25 positions in terms of per capita income. Overall, Africa has stagnated in its development, even regressing in foreign trade, investment and per capita income. Such poverty has had widespread effects, including low life expectancy, political instability and rural deprivation. At its core lies the T&T problem. Of Africa's 37 tsetse-infested countries, 20 rank among the world's poorest 25 nations as determined by estimates of gross national income per capita (PAAT, 2008). The overlap between tsetse distribution and poverty in Africa is shown in Figure 1 on the following page.

In order to thrive, rural populations require an environmental and institutional framework that promotes and facilitates agricultural development. Enabled in this way, they can satisfy their basic socio-economic needs and live in good health. In areas of Africa where animal African trypanosomosis (AAT) and human African trypanosomosis (HAT) remain endemic, however, development has lagged. For this reason, the major impact of HAT and AAT on the health of human and livestock populations – and thus on agriculture – can no longer be neglected.

Africa's leaders recognized this reality in a declaration made at the 2000 summit in Lomé in 2000 by the heads of state of the member countries of the Organization of African Unity (now the African Union) and reiterated in Lusaka in 2001. On both occasions, the leaders emphasized their commitment to an Africa ultimately free of the threats of HAT and AAT. Indeed, during the last decade, great strides have been made in dealing with HAT through the implementation of a highly successful public-private partnership (PPP) that funded screening and treatment and also provided essential drugs for curing the disease. Meanwhile, under the aegis of the Pan-African Tsetse and Trypanosomosis Eradication Campaign (PATTEC), new programmes have been launched to create tsetse-free zones in six African nations. The success and sustainability of these programmes will depend on how well they mesh with an enabling institutional environment and with existing rural development strategies and projects. The outcome will also depend on whether farmers can be encouraged to adopt tsetse control technologies, some of which have become cheaper and more accessible in recent years. This paper specifically addresses the ways and means by which T&T programmes can support and consolidate these rural development efforts.

FIGURE 1

The interface between tsetse distribution and poverty in Africa



Source: PAAT, 2008

Chapter 1
The current situation

Aid per person in sub-Saharan Africa, expressed in constant 2002 dollars, fell from $32 per African in 1980 to just $22 per African in 2001, during a period in which Africa's pandemic diseases ran rampant and the needs for public spending were stark.

Jeffrey Sachs (2005)

World Health Organization (WHO) estimates indicate that some 50–60 million people are living in areas where they are exposed to the bite of the tsetse fly. Some of these people reside in presently active foci where they are at risk of contracting HAT, also known as sleeping sickness. During the late 1990s, according to the WHO (1998), about 300 000 new cases of HAT developed each year, yet only 30 000–40 000 were diagnosed and treated. Such low levels of surveillance are explained by the weaknesses of control programmes, the inherent difficulty in diagnosing the disease and the inaccessibility of some affected areas. Although these figures may appear relatively small when compared to other tropical diseases, they become more significant when one considers that a key characteristic of HAT is its tendency to switch from a situation of low endemicity into a rampant epidemic if uncontrolled, thus making it a major public health hazard. HAT flare-ups affect not only infected individuals but also the members of their families and the communities in which they live. In certain epidemic situations, more than 50 percent of a village's population can become infected. Because HAT mortality rates are high, such situations breed conflict, tension and panic. In such cases, survivors often flee, abandoning their homes and the surrounding arable land rather than risk further exposure to the disease. As a result, sleeping sickness has caused entire villages to disappear (WHO, 1998). According to recent epidemiological work (Odiit *et al.*, 2005; Fèvre *et al.*, 2008), deaths in Uganda from the *Trypanosoma brucei rhodesiense* form of sleeping sickness were under-reported on the order of 12 to 1, with only 59 percent of cases reported. Another study (Lutumba *et al.*, 2005) showed that even during active surveillance, only 56 percent of patients suffering from *Trypanosoma brucei gambiense* were found and treated during a single screening exercise. These figures have serious implications for human welfare and disease control. In southern Sudan, recurring flare-ups of *T. b. gambiense* have been observed (Pagey, 2003), suggesting a similar situation may be developing there. This concern, however, has yet to be substantiated by extensive research.

Meanwhile, some 46 million cattle in sub-Saharan Africa (SSA) are estimated to be at risk of contracting AAT (Kristjanson *et al.*, 1999; PAAT, 2000). Occurrence of the disease is admitted in 37 countries covering some 8.7 million km^2, about a third of Africa's land area (Rogers and Robinson, 2004). A recent review of the status of trypanotolerant livestock by Agyemang (PAAT, 2005) indicated that most of the countries in West and

Central Africa consider tsetse-transmitted trypanosomosis a serious health threat to domestic livestock and a major impediment to agricultural development.

The detailed and significant work done over the last several decades on trypanosomosis in livestock has greatly enhanced our understanding of its spatial distribution (through the use of geographic information systems [GIS]), its socio-economic impact on farmers in many parts of Africa and alternative control measures (Jahnke, 1974; Camus, 1981; Jordan, 1986; African Trypanotolerant Livestock Network, 1988; Budd, 1999; PAAT, 2000, 2003a, 2003b, 2004, 2005; Kristjanson *et al.*, 1999; Shaw, 2004).

AAT is known to constrain livestock production in areas of great potential. As described in PAAT (2000) and updated in Shaw (2004), the presence of trypanosomosis has been shown to reduce calving rates by 1–12 percentage points in tolerant cattle breeds and by 11–20 percentage points in susceptible breeds and to increase calf mortality by 0–10 percentage points in tolerant cattle breeds and by 10–20 percentage points in susceptible breeds. The presence of trypanosomosis can also reduce offtake by 10–26 percent in trypanotolerant cattle and lambing and kidding rates by 4–38 percentage points. At the herd level, cattle offtake for sale or slaughter is likely to be reduced by 5–30 percentage points and the work performance of oxen can drop by 38 percent. Faced with these impacts, farmers have difficult choices to make concerning livestock purchases and sales. Often, they compensate with precautionary overstocking. In areas at high risk for trypanosomosis, herd sizes can run 25–60 percent larger than in low-risk areas. In general, the impact of trypanosomosis varies greatly depending upon the management system used by the farmer and the livestock's level of susceptibility.

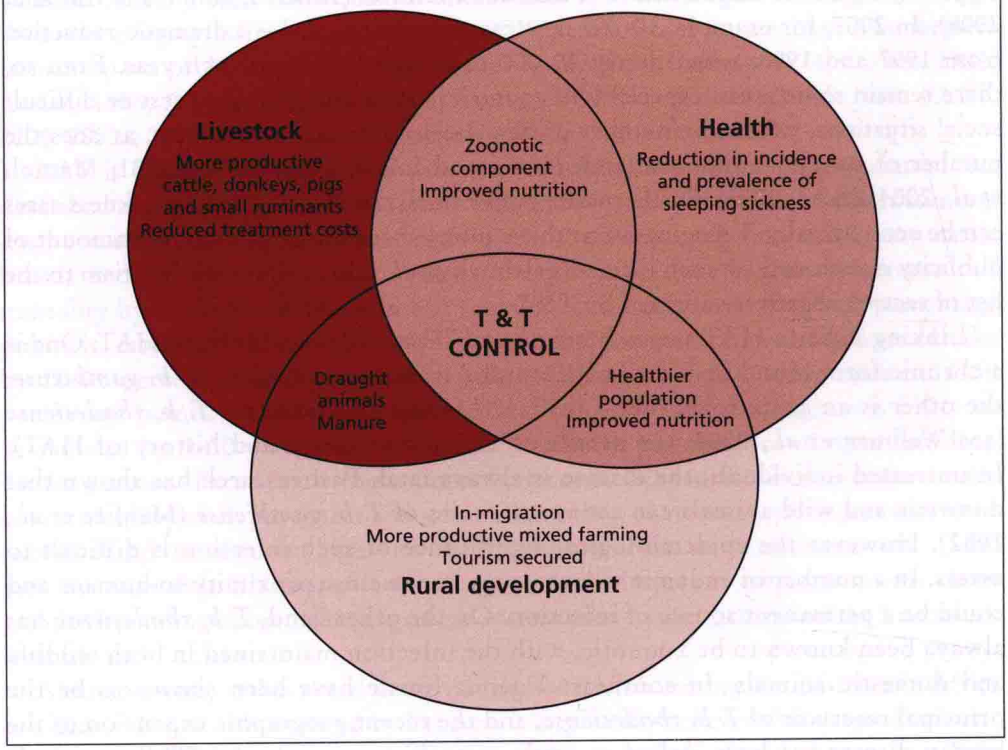
Although some scribes noted as early as the fourteenth century the existence in Africa of a deadly disease characterized by lethargy, it is generally believed that sleeping sickness did not overspread the African continent until the period of colonial penetration. Only then did major flare-ups begin to occur, devastating vast regions. In 1901, working in The Gambia, Forde discovered a parasite in the blood of a man infected with sleeping sickness (Forde, 1902). Following confirmation of his find by Dutton (1902), an enormous amount of work was undertaken on both the parasite and the vector. During the late 1920s and early 1930s, extensive programmes were established to combat the disease; and by the 1960s, trypanosomosis was almost controlled throughout the continent. This success led to complacency, and thereafter the control of sleeping sickness declined, largely because of a lack of interest on the part of many national health authorities. Only slowly and with great difficulty were control programmes reinstated following the recrudescence of trypanosomosis that occurred during the 1970s and 1980s (Cattand, 1988). At first, researchers focused on technical requirements such as the development of the new tools badly needed for surveillance and control work. Only later did they turn their attention to creating strategies that might be better adapted to the new primary health care structures set up following the Alma-Ata declaration (WHO, 1978) and the Bamako initiative (WHO, 1987). Meanwhile, in the absence of appropriate tools and resources to integrate sleeping sickness into these new structures, many endemic countries continued to deploy mobile control teams, operating in much the same way as they had during the first half of the twentieth century.

In recent years, however, the WHO programme on the elimination of sleeping sickness, working in coordination with non-governmental organizations (NGOs) and bilateral agencies, has substantially improved the control and surveillance of trypanosomosis in a large number of endemic countries (Simarro, Jannin and Cattand, 2008). In 2007, for example, 10 769 new cases were reported – a dramatic reduction from 1997 and 1998, when nearly 40 000 cases were reported each year. Even so, there remain some areas, especially in countries experiencing civil unrest or difficult social situations, where the number of new cases continues to fluctuate, as does the number of people at risk (Cattand, Jannin and Lucas, 2001; DFID, 2001; Mattioli *et al.*, 2004; PAAT, 2005). Furthermore, even a small number of sleeping sickness cases can be economically damaging when those infected are tourists. The large amount of publicity occasioned by such incidents (Jelinek *et al.*, 2002) often adds tourism to the list of sectors negatively affected by T&T.

Linking AAT to HAT seems fundamental. There are two forms of HAT: One is a chronic form found in West and Central Africa and caused by *T. b. gambiense*; the other is an acute form found in East Africa and caused by *T. b. rhodesiense* (see Welburn *et al.*, 2004, for details of the epidemiology and history of HAT). In untreated individuals, the disease is always fatal. Past research has shown that domestic and wild animals can act as reservoirs of *T. b. gambiense* (Mehlitz *et al.*, 1982). However the epidemiological significance of such infection is difficult to assess. In a number of endemic villages, pigs live in close proximity to humans and could be a permanent source of infection. On the other hand, *T. b. rhodesiense* has always been known to be zoonotic, with the infection maintained in both wildlife and domestic animals. In southeast Uganda, cattle have been shown to be the principal reservoir of *T. b. rhodesiense*, and the recent geographic expansion of the human disease has been linked to cattle restocking programmes (Welburn *et al.*, 2001). Between 1998 and 2006, for example, the disease spread into eight new districts. Thus, policy-makers are now looking to identify new control strategies that are at once appropriate, cost-effective and sustainable. These include the regulation of cattle movement and restocking and the dissemination of relevant information to farmers and health staff alike. Meanwhile, Uganda has taken steps to table legislation mandating the treatment of cattle in areas where outbreaks of HAT occur.

Thus, tsetse-transmitted trypanosomosis is an intersectoral problem lying at the heart of African rural development. The potential benefits arising from T&T control (T&TC) are outlined in Figure 2 on the following page, which shows the overlaps among the three sectors (human health, livestock health and rural development) affected by T&T. Most widely found in livestock, trypanosomosis primarily affects cattle, small ruminants and donkeys. Thus, controlling the disease will not only increase the available supply of meat and milk but also benefit cropping by increasing the supply of manure, improving the work performance of draught animals and encouraging more farmers to acquire draught animals. Improvements in livestock productivity will also benefit, if indirectly, the health of rural people by increasing the amount of protein in their diets and thereby supporting their health.

FIGURE 2
The intersectoral nature of the benefits arising from programmes designed to control tsetse-transmitted trypanosomosis



Improvements in human health brought about by T&TC directly benefit rural development because healthier people are better able to engage in productive activities such as looking after their livestock and their crops. The rural development sector also benefits in some cases from immigration motivated by the better conditions that exist where tsetse are effectively controlled (PAAT, 2000). Furthermore, in those rural areas where tourism is an important component of economic activity, T&TC can help secure this source of income while leaving protection for wildlife and their habitats intact.

The involvement of the various organizations working in these three sectors (human health, livestock health and rural development) is a key factor in ensuring that the successes of T&TC interventions are consolidated and maintained.

Just as the impact of the T&T problem is spread over three sectors, so also is its impact felt at different socio-economic levels. These levels can be characterized as macroeconomic, mesoeconomic and microeconomic. At the macroeconomic level, trypanosomosis reduces the total stock of livestock by 10–60 percent (Kristjanson *et al.*, 1999; PAAT, 2000; Gilbert *et al.*, 2001). In mixed crop-livestock systems and cropped areas, yields and responses to new economic incentives are also reduced. In countries that are completely infested by tsetse, trypanosomoses reduce total agricultural production by 2–10 percent (PAAT, 2000).

All of these effects can be traced along an impact chain from the livestock keeper/farmer at the microeconomic level to the national economy at the macroeconomic level through the mesoeconomic level, which links them (Table 1). According to Bravo-Ortega and Lederman (2005), the marginal welfare effects found in past studies suggest that agricultural development has an important positive impact on national welfare, especially in developing countries (see also Irz *et al.*, 2001). In contrast, in industrialized high-income countries, marginal welfare gains from non-agricultural activities tend to be much greater than those derived from agriculture. This disparity underlines the need for sustained agricultural development in developing countries.

At the microeconomic level, an important concern is the need for effective management of technical and organizational learning processes among stakeholders – effective technology management being a necessary condition for sustained production and innovation. In view of the new economic exigencies, such management must be geared to optimizing the close interactions among producers, suppliers, services, specialized researchers and development institutions at the same time that it intensifies producer-user contacts.

At the mesoeconomic level, the primary focus is the specific environment in which farmers operate, especially the configuration of the physical infrastructure (transportation, communication and energy systems). Sectoral policies are also significant – in particular those that concern education and training, research and technology, agriculture, and regulatory systems that contribute to the emergence of specific national competitive advantages (e.g. environmental standards and technical safety standards). An import-protection policy, if limited in time and tied to clear performance criteria for emerging agro-industries with great development potential, can facilitate the process of building competitive advantages at the farming and agro-industrial level. Within individual countries, such policies, implemented on both the regional and the local level, have

TABLE 1
The nature of the microeconomic, mesoeconomic and macroeconomic impacts of the tsetse/AAT complex

Microeconomic	Mesoeconomic	Macroeconomic
• Reduced livestock ownership	• Increased vulnerability of livelihoods in rural areas	• Rural poverty
• Reduced livestock productivity, which translates into lower farm incomes	• Underutilization of high-potential agricultural areas	• Malnutrition
• Constrained use of draught animal power	• Reduced land and labour productivity	• Food insecurity
• Expenditures on veterinary drugs and time taken to care for sick livestock	• Inefficient marketing chains	• Rural unemployment
• Poor access to markets		• Migration
• Increased transaction costs		• Unsatisfied demand for livestock products
		• Imports of livestock products
		• Deficit in trade flows
		• Lowered gross national product
		• Government expenditures on T&T and research

gained in significance. Close interaction among regional and/or local administrations, research and development institutions and local groups can thus serve to enhance agriculture performance and the quality of agro-industries. The importance of the mesoeconomic level has been repeatedly demonstrated in developing countries when the creation of stable macroeconomic conditions fails to produce the expected economic reactivation. The reason is usually that the mesoeconomic level has been neglected.

This paper outlines an approach to the setting of normative guidelines for the strategic planning of livestock-agricultural development and sleeping sickness surveillance and control in areas affected by both AAT and HAT. These guidelines take into account the impact of trypanosomosis on three sectors and at three levels. This paper aims to complement the other papers in the PAAT Scientific and Technical Series and other recent studies by approaching the T&T problem from the point of view of policy design and identification of the key variables that need to be considered in order to link the various T&TC activities with sustainable rural development strategies. In this paper, the general term *T&TC* should be understood to mean measures ranging from the treatment of people and animals to all the various methods for reducing tsetse populations, whether ultimately resulting in their suppression or elimination.

In this context four main areas need to be addressed:

- determination of an appropriate analytical framework (a prerequisite for formulating T&TC policy) through clear priority-setting and planning;
- identification and consultation of the stakeholders who would be involved in implementing strategies for T&TC;
- description of steps and links for coordinating policy design and implementation of T&TC;
- identification of the accompanying measures required for successful, sustainable T&TC.

These topics are discussed in the next four chapters.