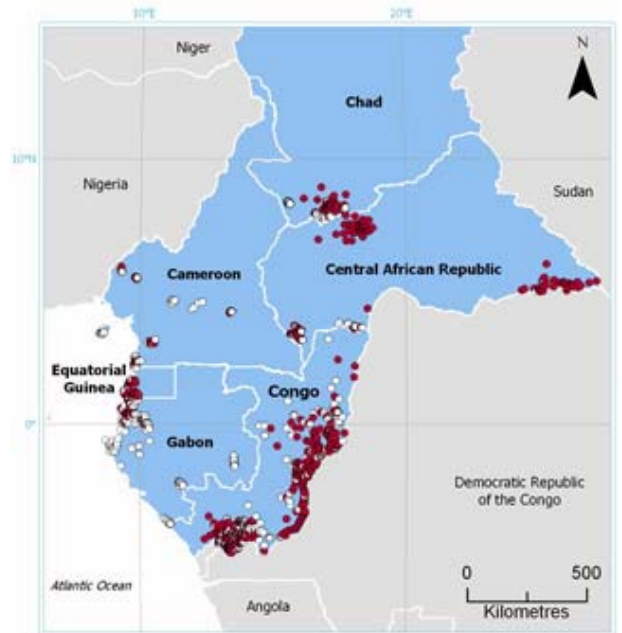
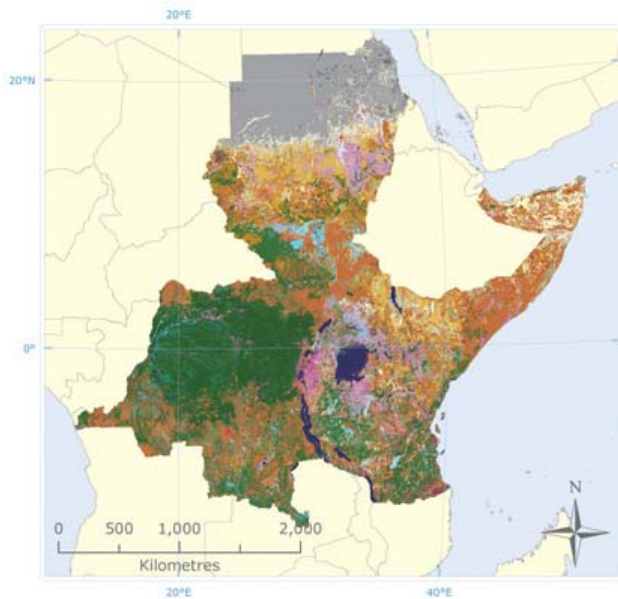
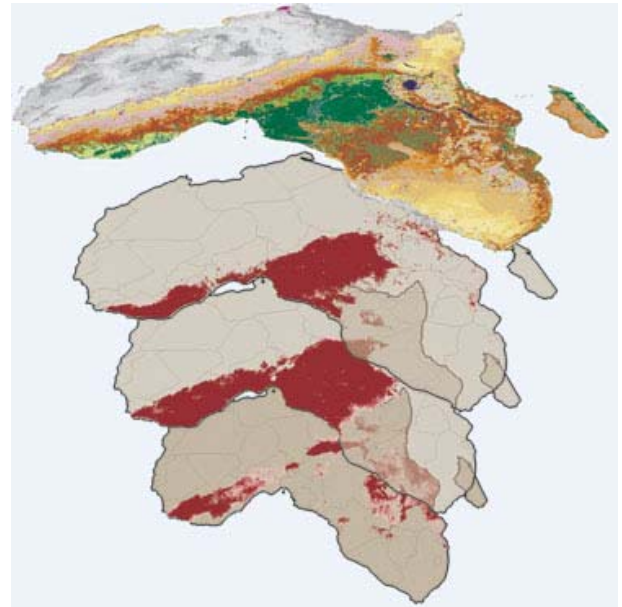


TECHNICAL ADVISORY NOTE (TAN)

PROGRAMME AGAINST AFRICAN TRYPANOSOMIASIS - INFORMATION SYSTEM



## INTRODUCTION

### **Grants' titles and lead research partners**

The Information System of the Programme against African Trypanosomiasis (PAAT-IS) aims at guiding strategic and technical decisions on tsetse and trypanosomiasis (T&T) intervention in sub-Saharan Africa. PAAT-IS was supported, *inter alia*, by the International Fund for Agricultural Development (IFAD) through the grant No. 686 “*Programme Against African Trypanosomiasis - Strengthening its Information System*” (GCP/RAF/403/IFA). IFAD continues its support to PAAT-IS through the grant “*Pro-poor integrated packages to enhance policy and decision making against the African animal disease burden in sub-Saharan Africa*” (GCP/RAF/442/IFA). The activities of PAAT-IS are also sustained by members of the PAAT Secretariat. In particular, the World Health Organization (WHO) contributes financially and leads the activities related to the Atlas of human African trypanosomiasis (HAT), jointly implemented by WHO and the Food and Agriculture Organization of the United Nations (FAO) in the framework of PAAT.

The activities of PAAT focus on the 37 countries of sub-Saharan Africa that are affected by T&T, which are characterized by a very diverse range of agro-ecological zones. The most recent outcomes of PAAT-IS research activities can be grouped into three categories: (1) generation of customized and standardized land cover datasets for tsetse habitat mapping; (2) selection, review and sharing of geospatial datasets for T&T decision making; and (3) production of maps of HAT distribution.

### **Conditions for uptake**

Research activities are developed devoting particular attention to the issue of replicability. From a technical standpoint, it must be stressed that all data, methods and techniques developed have given priority to public domain datasets, open source software (e.g. FAO GeoNetwork), and user-friendly applications. The use of these tools is intended to maximize up-take and to facilitate dissemination of results.

From an institutional perspective, activities have been carried out in close collaboration with all national and international stakeholders with an interest in the T&T problem, which will help up-scaling and out-scaling of research outcomes.

### **Existing linkages with other IFAD initiatives:**

- *Development of Innovative site-specific integrated animal health packages for the rural poor*
- *Sustainable Rural Development Programme; Community Investment Programme for Agricultural Fertility, Burkina Faso.*
- *Upper East Region Land Conservation and Smallholder Rehabilitation Project-Phase II; Northern Region Poverty-Reduction Programme Ghana.*
- *Pastoral Community Development Project, Ethiopia.*
- *Sallholder Dairy Commercialization Programme, Kenya.*
- *Support to the Livestock Sub-Sector Reconstruction – Projet d'appui au sous-secteur élevage (PARSE), Burundi.*

## PROGRAMME IMPLEMENTATION

### **Beneficiaries**

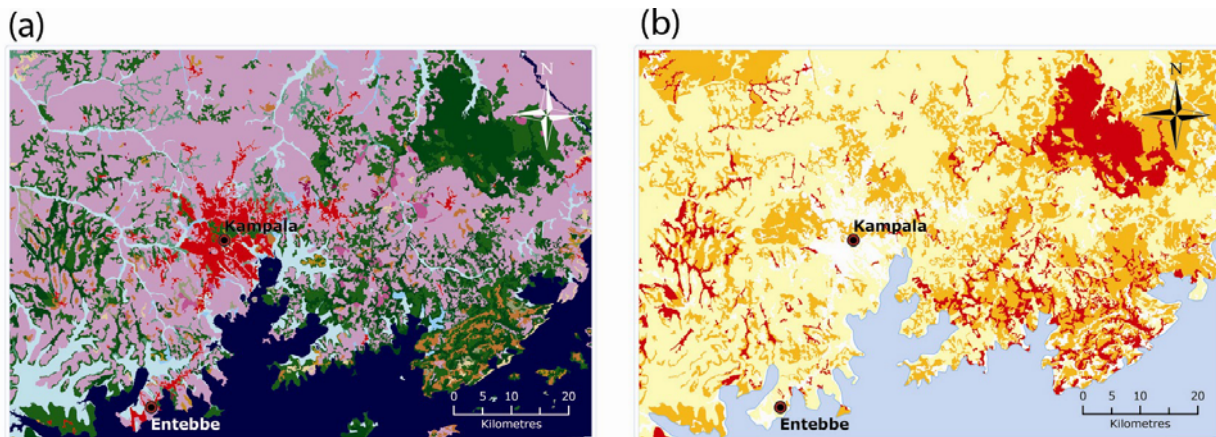
The primary beneficiaries of the research programme are planners, policy advisors and managers responsible for formulation and implementation of interventions targeting rural poor in tsetse affected areas. Data managers and information system specialists in T&T affected countries are another prominent target group. Additional beneficiaries are research institutes and universities dealing with different aspects of the tsetse and trypanosomiasis problem.

### **Outputs and impacts**

#### 1. *Generation of customized land cover datasets for tsetse habitat mapping*

Land cover maps are useful tools for supporting several phases of tsetse and trypanosomiasis (T&T) intervention: mapping vector habitats, planning baseline entomological surveys, monitoring the environmental impact of intervention strategies at landscape level and planning land use of reclaimed areas. A study of the relationship between existing land cover maps and tsetse habitat allowed (i) to investigate the broad patterns of

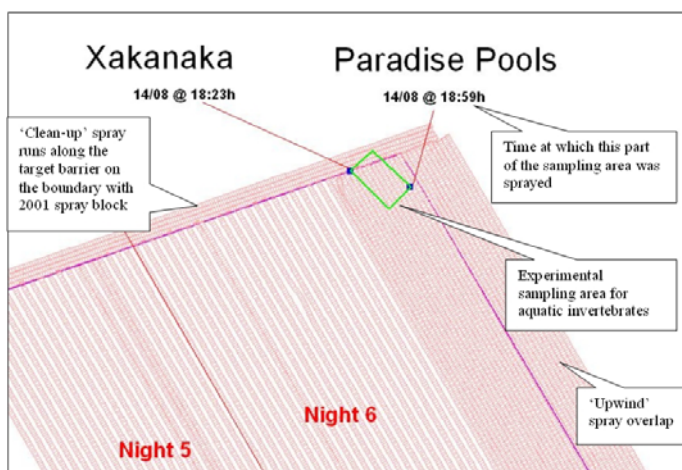
the association between land cover and the three groups of tsetse flies (i.e. *fuscus*, *palpalis* and *morsitans*) in sub-Saharan Africa; and (ii) to derive high resolution harmonized land cover maps for eight T&T affected countries: Burundi, Democratic Republic of the Congo, Kenya, Rwanda, Somalia, Sudan, United Republic of Tanzania and Uganda. A review of the literature also permitted estimation of land cover suitability for the three tsetse groups. An example of land cover map customized for tsetse habitat mapping is given in Figure 1a for the area around Kampala (Uganda). Figure 1b shows the corresponding land cover suitability for tsetse flies of the *palpalis* group ('riverine flies'). Suitability ranges from high (red) to nil (white) and it is based on a review of the literature of tsetse habitat requirements (Figure 1a, b adapted from Cecchi *et al.*, 2008).



**Figure 1 (a) Africover land cover map of the area of Kampala (Uganda). Land cover classes of Africover have been tailored for tsetse habitat mapping. (b) Land cover suitability for tsetse flies of the *palpalis* group, 'riverine flies'. Suitability ranges from high (red) to nil (white) and it is based on a review of the literature of tsetse habitat requirements (Figure 1 adapted from Cecchi *et al.*, 2008).**

## 2. Selection, review and sharing of global geospatial datasets for T&T decision making

PAAT-IS aims at facilitating data access and sharing for all stakeholders with an interest in the problem of T&T. The upcoming PAAT Position Paper, entitled "Geospatial datasets and analyses for an environmental approach to African trypanosomiasis", stems from the recognition that Geographic Information Systems (GIS) are becoming increasingly important in all phases of the project cycle, from its initial conceptual elaboration to the final evaluation. The paper provides (i) a review of state-of-the-art global geospatial datasets available in the public domain and deemed relevant to assist in T&T decision-making; (ii) an analysis of the relationship between low- and medium-resolution global datasets and high-resolution local data by using the Mouhoun river basin in Burkina Faso as study area; (iii) a case study of the utilization of GIS, database management systems and image processing software in the context of a T&T elimination project in Burkina Faso; and (iv) a case study that illustrates how GIS can be combined with satellite-assisted navigation systems to enhance the execution of a tsetse elimination project, based on the application of a sequential aerosol technique, in the Okavango delta (Botswana) (Figure 2).



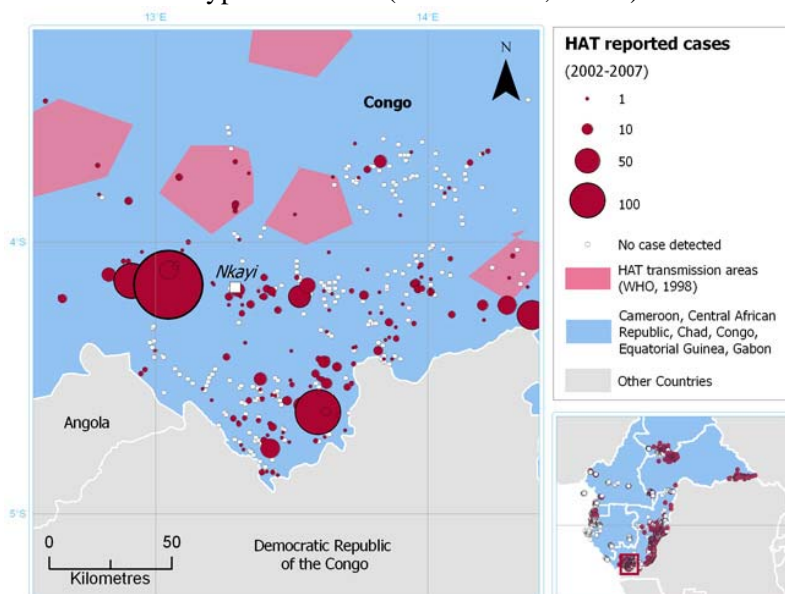
**Figure 2 Tsetse elimination project based on the application of the sequential aerosol technique (Okavango delta, Botswana). GIS and GPS-assisted navigation systems enhance the execution of aerial spraying operations against tsetse fly (Kgori *et al.*, in press).**

In addition to the PAAT Technical Publication described above, PAAT-IS also promotes data sharing within and beyond the PAAT community through the FAO GeoNetwork infrastructure. GeoNetwork is an open source application for sharing geospatial information. Key PAAT datasets have been made available through FAO GeoNetwork (<http://www.fao.org/geonetwork>), and support has been given to PAAT partners in order to facilitate the use of FAO GeoNetwork (Cecchi and Mattioli, 2007).

The data available in the PAAT-IS (including the customized and standardized land cover maps described in the previous section) are downloaded from the FAO GeoNetwork web site at a rate of approximately 100 downloads per month. The large number of downloads proves the interest in PAAT-IS datasets within the T&T community and beyond.

### 3. Production of maps of the distribution of human African trypanosomiasis

The Atlas of HAT, also known as sleeping sickness, is a WHO initiative, jointly implemented with FAO in the framework of the PAAT. The Atlas aims at mapping at the village level all sleeping sickness cases reported from endemic areas in sub-Saharan Africa, and to build the capacity at country level for future regular updates. The initiative's ultimate objective is to provide affected countries, the scientific community and policy advisors with a sound basis to elaborate control strategies, to carry out interventions and to monitor their impact on disease distribution. Figure 3 shows one of the possible outputs that can be generated from the database of human African trypanosomiasis (Cecchi *et al.*, 2009a).



**Figure 3 Cumulative number of sleeping sickness cases recorded in the area of Nkayi, Bouenza Region - Congo (Cecchi *et al.*, 2009a)**

Activities are ongoing to complete the Atlas and to derive updated, evidence-based estimates of people at risk and disease burden. Furthermore, efforts are being made to explore how the population dynamics and climate changes may have had an impact on HAT epidemiology and spatial and temporal distribution, with a view to clarifying possible future evolutions (Cecchi *et al.* 2009b).

The Atlas of HAT has raised considerable interest in the T&T community and beyond. The paper "Towards the Atlas of human African trypanosomiasis", recently published in the International Journal of Health Geographics, received the label 'Highly accessed' that identifies those articles that have been especially highly consulted, relative to their age, and the journal in which they were published (number of accesses in the first three months: 1330)

#### **Constraints faced during implementation**

No major constraint was encountered in the implementation of the activities. However, in few occasions requested feedback and follow up from the beneficiaries of provided training and information were rather slow and weak. Further pro-active actions will be required in order to encourage and facilitate up-take of programme outcomes.

#### **Sustainability, acceptability and accessibility**

The emphasis placed on public domain, free datasets, open source software, and user-friendly applications is expected to contribute to sustainability and acceptability. Accessibility has been maximized by making all

research outcomes freely available on the internet (FAO/PAAT website, WHO website). Scientific publications are also freely available because open access journals are given preference. In addition, those journals that do not normally grant open access are contacted by the FAO Electronic Publishing Policy and Support Branch so that a post-print version of the published material can be posted on FAO servers, thus assuring free and complete access to research outcomes.

## **Dissemination Pathways**

### **1. Generation of customized land cover datasets for tsetse habitat mapping**

Results of this component were made available through: (i) Scientific publication (available at: <ftp://ftp.fao.org/docrep/fao/article/aj227e.pdf> (post-print version); <http://dx.doi.org/10.1111/j.1365-2915.2008.00747.x> (print version), (ii) Technical publication (available at: <ftp://ftp.fao.org/docrep/fao/010/i0215e/i0215e.pdf>) and (iii) International Conference (poster is available at: [http://www.gisvet.org/Documents/GisVet07/Poster/Cecchi\\_et\\_al\\_GISVET07.pdf](http://www.gisvet.org/Documents/GisVet07/Poster/Cecchi_et_al_GISVET07.pdf))

### **2. Selection, review and sharing of global geospatial datasets for T&T decision making**

Results of this component were made available through: (i) Technical publication (in press), (ii) Publication of scientific divulgation (available at: [http://www.osgeo.org/files/journal/v2/en-us/final\\_pdfs/OSGeoJournal\\_vol2\\_FAO\\_geonet.pdf](http://www.osgeo.org/files/journal/v2/en-us/final_pdfs/OSGeoJournal_vol2_FAO_geonet.pdf)) and (iii) International Conference.

### **3. Production of maps of the distribution of human African trypanosomiasis**

Results of this component were made available through: (i) Scientific publications (available at: <ftp://ftp.fao.org/docrep/fao/article/ak244e.pdf> and <http://dx.doi.org/10.1186/1476-072X-8-15>) and (ii) International Conference

## **Future research needs**

As concerns Animal African Trypanosomiasis (AAT), it is believed that available geographical data stop short of adequately capturing the areas where the presence of AAT poses major constraints to rural development. Substantial differences in terms of disease prevalence and, most crucially, impact exist within the vast tsetse belt of sub-Saharan Africa and novel approaches are needed if these spatial variations are to be captured. Accurately mapping the presence and impacts of AAT would have important repercussions on the choice of the most appropriate disease management strategies. There are strong reasons to believe that different ecological settings within tsetse-infested areas result in varying degrees of AAT impact, which can range from severe to negligible. There is a need to improve our knowledge of where severe impacts occur in order to better target interventions against animal trypanosomiasis. Efforts will be made to develop tools applicable to all countries where AAT is endemic, even though it is foreseen that adaptations will be needed to adjust the methods developed in Southern Africa to the prevailing ecological setting in different sub-Saharan Africa regions. With regard to human African trypanosomiasis, further efforts will be needed to complete the mapping of HAT in all endemic countries. WHO will continue to play a leading role in this field with the support of FAO in the framework of the PAAT. Future analysis will aim at estimating and mapping people at risk of HAT, as well as the burden of the disease at different geographic scales.

## **USEFUL INFORMATION**

### **Keywords:**

*Trypanosomiasis, tsetse habitat, poverty reduction, rural development land use planning, OpenSource software, GIS, networking, knowledge sharing.*

### **Useful links:**

- PAAT website ([www.fao.org/ag/paat.html](http://www.fao.org/ag/paat.html))
- PAAT datasets in FAO GeoNetwork (<http://www.fao.org/geonetwork>)
- WHO, Human African trypanosomiasis ([http://www.who.int/trypanosomiasis\\_african/en/](http://www.who.int/trypanosomiasis_african/en/))
- IFAD Grants (<http://www.ifad.org/grants/about.htm>)
- Pan African Tsetse and Trypanosomiasis Eradication Campaign - PATTEC ([http://www.africa-union.org/Structure\\_of\\_the\\_Commission/depPattec.htm](http://www.africa-union.org/Structure_of_the_Commission/depPattec.htm))

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See section "Dissemination Pathways" for more references.

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### **Acronyms:**

|         |  |
|---------|--|
| AAT     | Animal African Trypanosomiasis                           |
| AU-IBAR | African Union - Inter African Bureau of Animal Resources |
| HAT     | human African trypanosomiasis                            |
| IAEA    | International Atomic Energy Agency                       |
| IFAD    | International Fund for Agricultural Development          |
| PAAT    | Programme against African Trypanosomiasis                |
| PAAT-IS | PAAT Information System                                  |
| WHO     | World Health Organization                                |