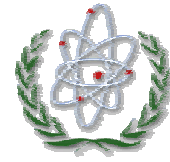




## Report



# Workshop on strategic planning of area-wide tsetse and trypanosomiasis control in West Africa

OUAGADOUGOU, BURKINA FASO  
21-24 MAY 2001



**Workshop on  
strategic planning of area-wide tsetse  
and trypanosomiasis control  
in West Africa**

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## **Foreword**

It was good to have been in Ouagadougou, Burkina Faso, and better still to have participated in the workshop on strategic planning of area-wide tsetse and trypanosomiasis control in West Africa. It is no news any more that the control efforts in the 60s and the 70s to combat tsetse and trypanosomiasis have, in the last two decades of the last century, come to grief, following the collapse of the economy of virtually all African countries and, therefore, the collapse of their infrastructure. The evidence of this collapse is widespread, but seen most pointedly in the rural areas where the quality of life of the rural people has vastly deteriorated. Thus, the need to alleviate poverty in the rural areas of West Africa has become more urgent now than ever before. Given this scenario and the impending launching of a gigantic campaign code-named PATTEC, to rid the continent of the scourge of tsetse and trypanosomiasis, this workshop could not have come at a better time.

The workshop was organized and sponsored by FAO in co-operation with the Joint Division of IAEA and in collaboration with the Government of Burkina Faso. The forum was attended by staff of FAO, IAEA, CIRDES, ITC, and ILRI specialists in the field of tsetse and trypanosomiasis and related development, field workers and those involved in the administration of PATTEC. Discussions were led on robust methodology for strategy planning and decision support. It is hoped that the outcome of this workshop will enable countries in the West African sub-region to implement their control/intervention programmes in a way to achieve sustainable development, which would guarantee the well being of the rural population and the preservation of natural endowments.

The participants at the workshop, drawn mainly from the field in the West African sub-region, brought much energy and enthusiasm to the discussion and contributed significantly to the strategy whereby tsetse and trypanosomiasis will not only be controlled, but ultimately eliminated from the African continent in the foreseeable future.

**Professor A.A. Ilemobade**  
**Workshop Chairman**

<b>TABLE OF CONTENTS</b>	<b>Page</b>
<b>Foreword</b>	<b>1</b>
Table of contents	2
Acronyms	4
Executive summary and Recommendations	5
1- Introduction	11
2- Opening and closing ceremonies	12
3- Adoption of the agenda and arrangements of the workshop	13
<b>Results of working groups</b>	<b>14</b>
4- Working Group 1: Institutional and socio economic aspects of tsetse/trypanosomiasis control and eradication campaign	15
5- Working Group 2: Tsetse/trypanosomiasis risk assessment, tsetse vulnerability and integrated control/eradication strategies	19
6- Working Group 3: GIS-as potential supportive tool in risk assessment analysis and selecting priority areas for control and/or eradication	22
7- General discussion	25
8- Conclusion	28
9- Acknowledgements	28
<b>Appendices</b>	<b>29</b>
1- Time table and themes	30
2- Composition of the working groups	33
3- Opening address by <b>Dembele M'Pe</b> , Secretary General of the Ministry of Animal Resources, Burkina-Faso	34
4- Opening address by <b>Raffaele C. Mattioli</b> , FAO Animal Health Officer	36
5- Continental appraisal of tsetse and trypanosomiasis problem. <b>A.A. Iemobade</b>	38
6- Socio cultural aspects of livestock agricultural systems of tsetse infested area in West Africa. <b>M. Kamuanga and J. McDermott</b>	39
7- Guiding economic principles for strategic planning in tsetse and trypanosomiasis control/eradication in West Africa. <b>A. M. Shaw</b>	40
8- Some risk assessment tools for area-wide tsetse control and eradication. <b>J. McDermott</b>	42

	Page
9- Practical application of GIS for the identification and selection of control areas in West Africa. <b>G. Hendrickx</b>	44
10- Overview of methods currently available to control tsetse fly and trypanosomiasis their integration and comparative advantages. <b>V. Codjia and O. Diall</b>	49
11- Integrated control of animal trypanosomiasis through creation of a tsetse fly freed zone. <b>A. Bado and S. Maiga</b>	50
12- Presentation of CIRDES. <b>A. Gouro</b>	53
13- The plans, progress and problems of the PATTEC initiatives. <b>J. Kabayo</b>	54
14- The role of trypanotolerant livestock in the context of the methodological approach for tsetse and trypanosomiasis control/eradication strategies with particular reference to West Africa. <b>K. Agyemang</b>	59
15- Option for tsetse eradication in the moist savannah zone of West Africa technical feasibility: phase 1 GIS based study. <b>L. Budd</b>	60
16- Policy, strategy and institutional structure for setting up and implementing tsetse trypanosomiasis control and/or eradication. <b>A. Ilemobade</b>	61
17- List of participants	62

## Acronyms

CILSS : Comité International de Lutte contre la Sécheresse dans le Sahel

CIRDES : Centre International de Recherche-Développement sur l'Élevage en zone Subhumide

DFID : United Kingdom Department for International Development

FARA : Forum Africain pour la Recherche Agricole

FAO : Food and Agriculture Organization of the United Nations

GIS : Geographical Information System

IAEA : International Atomic Energy Agency

ILRI : International Livestock Research Institute

IITA : International Institute of Tropical Agriculture

ITC : International Trypanotolerance Centre

LGP : Length of Growing Period

PAAT : Programme Against African Trypanosomiasis

PAAT IS : Programme Against African Trypanosomiasis Information System

PAAT L : Programme Against African Trypanosomiasis Link

PATTEC : Pan African Tsetse and Trypanosomiasis Eradication Campaign

OAU : Organisation of African Unity

OFZ : Onchocerciasis Freed Zones

UN : United Nations

SIT : Sterile Insect Technique

WHO : World Health Organization of the United Nations

## **Executive summary and recommendations**

Tsetse-transmitted trypanosomiasis is a disease unique to Africa affecting both humans and animals. This disease occurs in about 10 million km<sup>2</sup> in 37 sub-Saharan countries corresponding approximately to one-third of Africa's total land area, and threatens an estimated 50 million people, 48 million cattle and a countless population of other domestic animal species. Trypanosomiasis has a severe impact on African agriculture; estimated annual losses in cattle production alone are in the range of 1.0-1.2 billion dollars. To this, we have to add the indirect negative effects engendered by trypanosomiasis on total crop production. The disease influences where people decide to live, how they manage their livestock and the intensity of crop agriculture. The combined effects result in changes in land use, environment and affect human welfare and increase the vulnerability of agricultural activity.

FAO has identified the reinforcement of agriculture as a key element in the fight against poverty and the improvement of food security in developing countries. The need to reduce poverty is particularly felt in tsetse infested areas of sub-Saharan Africa. In this region half of the population suffers from food insecurity. Approximately 85% of the poor are located in rural areas and more than 80% of the population depends on agricultural production for their livelihood.

In order to respond to the need in the fight against tsetse and trypanosomiasis (T&T) in people as well as livestock, the Programme Against African Trypanosomiasis (PAAT) was endorsed in November 1997 by the FAO Conference. The Programme seeks to combine the forces of FAO, IAEA, OAU/IBAR and WHO in order to:

- promote and co-ordinate international alliances and efforts assisting in harmonised interventions against T&T;
- effectively combat the disease in Africa; and
- delineate the policy framework, strategies and guiding pest management principles.

This workshop was primarily concerned with the development of science-based standards for designing viable, sustainable T&T interventions in West Africa. The workshop was attended by staff of FAO, IAEA, CIRDES, ITC, ILRI specialists in the field of T&T and related development, field workers and those involved in the administration of PATTEC.

The key points discussed and respective issues and outcomes were :

### ***1. The economic principle for strategic planning of T&T control/eradication in West Africa.***

The participants noted that :

- economic analysis of T&T interventions is complex because of the diversity of socio-economic conditions encountered in different tsetse infested areas. Therefore, the formulation of economic guidelines should concentrate on factors governing the economic performance to assist the planning process of control programmes.
- decision whether to go for eradication or control needs to take into account aspects of feasibility and economic justification.

Land use/land tenure appeared to be very sensitive issues that need to be addressed properly in most of the countries affected by T&T problems. In fact, land use/land tenure have complex and tricky implications on:

- rural economy;
- rural area administration;
- ancestral relationship between different ethnical groups.

Therefore, the subject is often kept on "stand-by" by decisions-makers.

The participants to the workshop noted that there is still a need for further work on land use/land tenure for a better planning of T&T control in the countries affected. They pointed out several relevant aspects (including appropriate utilisation of natural resources, socio-economic aspects etc.) which need also to be addressed (and this should be reflected in the participation of different specialists in development of project planning and monitoring process). Moreover, involvement of communities and stakeholders should be encouraged at all stages of T&T control/eradication projects.

## ***2. Methodological approach for T&T risk assessment and analysis***

The participants agreed that the decision for eradication or control needs to take into account aspects of feasibility and economic justification.

Appropriate data to be collected in the field were identified and strategies for breaking tsetse/trypanosomiasis transmission cycle were highlighted.

## ***3. The role of trypanotolerant livestock with particular reference to West Africa***

The participants recognized the important role that the trypanotolerant livestock continues to play in the animal industry in tsetse infested areas. However, the importance of trypanotolerant animals, as a component of the integrated approach for T&T interventions, varies according to the nature of production systems, the agro-ecozones and the T&T risk.

## ***4. Use of trypanocidal drugs***

The emergence and spread of chemoresistance to trypanocides among populations of trypanosomes was recognised as an important threat for the control tsetse/eradication of the disease as no new drug is marketed.

## ***5. The practical application of GIS for identification and selection of control areas in West Africa***

Effort in initial phase of any T&T control programme should be put on the efficient use of GIS.

It was also noted that GIS should be designed to allow flexibility and compatibility with livestock information systems.

## **General recommendations**

### ***Recommendation 1***

Interventions against T&T must be seen and considered in the broader context of poverty alleviation and food security through livestock-agricultural development. Therefore in a given area, actions related to T&T interventions, dealing with land use, natural resources, environmental concerns and socio-economic development should be undertaken.

The Workshop recommends further investigation and validation of the river basin concept, with particular reference to tsetse flies crossing from one river basin to another.



### ***Recommendation 2***

#### **Data collection**

To facilitate exchange of technical data and information between countries at subregional level and to harmonise methods of collecting biological, ecological and socio economical data for rational appraisal of T&T situation in view of facilitating decision making, priority should be given to the following key data according to locally prevailing conditions :

- density of tsetse flies and their spatial distribution
- prevalence of trypanosomiasis in domestic animals
- prevalence of sleeping sickness
- species and breeds of animals
- livestock breeding systems
- tsetse control measures applied or on-going tsetse control programmes

### ***Recommendation 3***

#### **Geographical information systems**

To guarantee the efficient use of GIS the workshop recommends :

- that in an initial phase a major effort should be put into capacity building and the equipment of state of the art GIS-Units as required at the national level;
- the use of the themes identified in B and C (see lead paper on practical application of GIS for identification and selection of control areas in West Africa) as core decision making criteria;
- the variables mentioned under D and E (see lead paper on practical application of GIS for identification and selection of control areas in West Africa), for the application of GIS in monitoring and evaluation, should be further clarified in a multidisciplinary forum such as provided by PAAT-Link;
- the establishment and application of standard formats for data, software, projection and resolution to allow vertical and horizontal data exchange such as :
  - Digital data standards: BIL, BSQ, BIP
  - Software: ESRI, Clarck Labs
  - Projection: UTM and Lat-long (metric, degrees)
  - Resolution and scale as defined above (B, C);
- the practice of updating and sharing data within the tsetse community (e.g. PAAT-IS) is essential for proper decision making;
- that GIS as discussed here should be designed to allow flexibility and compatibility with other livestock information systems;
- that though research priorities to improve the performance of such a system should be identified at a national level, the study of barrier related issues within the river basin model should be considered as the general priority.

### ***Recommendation 4***

#### **Socio-economic aspects**

The workshop recommends that for individual T&T projects the following aspects should be considered:

sensitization of communities before any project commences  
active participation of the community  
potential crop farmer/pastoralist conflict (land tenure issues)  
gender/ethnic/religious/equity issues.

***Recommendation 5***  
**Cost-benefit aspects**

The workshop recognized the fact that the programme is now largely technology-driven, in the sense that the major considerations guiding current priorities are concerned with sustainability in terms of keeping areas fly free and minimising the risks of re-invasion and hence barrier costs. It recommended that:

- the relative cost-effectiveness of the different methods for initially suppressing the flies and for achieving eradication should be investigated during the project design stage;
- quantification of benefits should be undertaken, looking both at tangible benefits (in terms of increased livestock and crop productivity) and intangible factors (such as land use issues and possible positive and negative environmental effects);
- the goal of transparency should be maintained by analysing the benefits and costs of different project scenarios.

**Recommendations to international organizations**

***Recommendation 6***  
**Capacity building**

FAO, IAEA, OAU/IBAR, WHO and other international organizations should continue their support to capacity building in the different countries of West Africa.

***Recommendation 7***  
**Institutional aspects**

The Workshop

- noting the implementation of the OAU declaration to establish PATTEC;
- taking cognizance of the Concept Note prepared by the PATTEC Task Force;
- noting the briefing on PATTEC and link between PAAT and PATTEC;

recommends that the tasks and responsibilities of the different collaborating institutions (international, regional and national) be defined, clarified and agreed upon.

***Recommendation 8***

OAU/PATTEC and partners should contact African governments affected by T&T, particularly those in identified priority intervention areas (i.e. the East African valley systems and the moist savannah/“cotton belt” of West Africa) and “opportunity areas”, with the aim to include action against T&T in the national Poverty Reduction Strategic Plans (PRSP) currently being developed.

***Recommendation 9***

OAU and mandated organizations of the UN family should ensure that the T&T problem gets appropriate recognition in international policy and strategic councils, such as ECOSOC, and in documents issued by these groups.

***Recommendation 10***

The Workshop welcomes the present temporary arrangement of siting the PATTEC co-ordination office in the OAU Headquarters (Addis Ababa) for strategic reasons and recommends that sub-regional offices (West and Central, East and South) be set up as soon as possible.

### ***Recommendation 11***

#### **Issues of scale**

The Workshop recognizes that dis-economies of scale can occur as a result of disproportionate overheads, delays in implementation and recommends that PAAT/PATTEC should set up guidelines to guard against this.

## **Recommendations to countries**

### ***Recommendation 12***

The Workshop recommends that the countries in the West and Central African sub-region should recognise T&T as a national priority in their development strategy (food security, poverty alleviation) and accord it the necessary resource allocation.

### ***Recommendation 13***

The different countries affected by trypanosomiasis and tsetse should create or reinforce within the veterinary or health service a structured unit in charge of the collection and analysis of data related to T&T.

### ***Recommendation 14***

Countries in the West African sub-region should prepare their national project proposal for tsetse intervention.

### ***Recommendation 15***

A comprehensive scheme should be initiated to identify zones of isolated tsetse infestations, for which evaluated project proposals detailing the inputs required to render each zone ultimately tsetse free can be prepared and used for purposes of planning and resource mobilisation.

### ***Recommendation 16***

Mali and Burkina Faso Projects, the workshop receives with appreciation the joint project between Mali and Burkina Faso as an example of regional co-operation in furtherance of the goal of eradicating T&T.

It endorses this collaboration as a model of a co-operative initiative between neighbouring countries and recommends that other countries in the sub-region should consider starting such collaborative projects; it calls for technical, financial and political support from African governments, PATTEC, PAAT, international bodies, bilateral and multilateral agencies.

### ***Recommendation 17***

The multiplicity of approaches to deal with the problem of T&T should be acknowledged, and taken into account when planning area-wide control/eradication; specifically by recognizing that the highly productive trypanotolerant cattle and small ruminant breeds would continue to have a role to play whatever the tsetse status of the region – since they are intrinsically highly-productive and compare well with the other African breeds both in the absence and presence of tsetse, are resistant to other disease problems, and offer livestock and crop-livestock farmers a way to harness the benefits of livestock production despite the presence of trypanosomiasis and other diseases.

### ***Recommendation 18***

Work to plan potential control/eradication projects in West Africa should continue, concentrating on the most cost-effective ways to suppress and possibly ultimately eradicate fly populations, while harnessing such economies of scale as exist and taking advantage of the insights gained, such as the potential benefits of using river basins as a practical unit for eradication.

## 1.- Introduction

Tsetse control programmes are intrinsically complex because of the need to harmonize technical, socio-economic, agro-ecological and environmental considerations.

In West Africa, tsetse fly infestation runs from its ecological northern limit (dry/hot) in the Sudano-Sahelian zone down to the humid coastal areas. The feasibility to eliminate tsetse infestations across West Africa varies from species to species, but certainly flies are more vulnerable towards the drier end of the ecoclimatic spectrum.

From an economic perspective, eradication is invariably the preferred option. However, experience has indicated that such task is notoriously difficult to achieve.

The Sterile Insect Technique (SIT) may serve as a convenient 'finishing touch' in fly eradication schemes. The practical feasibility of SIT application for tsetse eradication has been conclusively demonstrated in Zanzibar but the potential for SIT in continental tsetse eradication programmes requires further consideration. A very important aspect here is the requirement to move into areas of sufficient size, in order to be able to exploit the economies of scale.

The economic viability of tsetse intervention schemes is however much more complex. For example, when developing programmes of significant scale, it is crucially important to first consider how the land utilization pattern may change in response to tsetse removal. In some areas, tsetse clearing will translate into an instant influx of trypanosusceptible Zebu cattle and enhance the use of draught animals for crop production. In other areas, there may not be a major change in land use. It may even turn out tsetse control provides access to areas where the level of agricultural exploitation is already critically high, or where the land resources do not sustain crop-livestock farming and are subject to degradation, or comprise forest and game reserves protected from agricultural exploitation.

Clearly, in such situations tsetse eradication may bring unwanted side effects which may jeopardise the positive developments anticipated. The risk that unwanted, negative land use changes will occur enlarges with the size of the intervention area selected. It is also possible to be selective and only consider land portions where agricultural benefits are expected to be maximal and at the same time tsetse populations most vulnerable to attack. The latter scenario occurs in isolated drainage systems in the wetter portions of the semi-arid zone and the moist sub-humid areas.

Here mixed farming is already in place, tsetse distribution is confined to the riparian vegetation, and the potential exists for further mixed farming development.

Some of the above criteria were explored during the workshops held in Geneva, November 2000 and Vienna, December 2000. The results of this analysis form part of the Ouagadougou Workshop deliberations. The Ouagadougou workshop was not intended to produce a proposal for an intervention scheme. It is felt that the best way forward is to continue building a more robust methodology for strategy planning. The definition of criteria, standards and guidelines would need to be worked out into further detail before it becomes possible to draw up more definitive proposals for intervention.

In any case, intervention schemes will have to be agreed upon by the direct stakeholders rather than by a technical/scientific forum. Hence, the workshop was concerned with decision support and capacity development rather than seeking to dictate tsetse control or eradication programmes.

In addition to the various aspects raised above, the strategic planning workshop required reflection on a number of issues not yet incorporated. Of paramount importance, in the West Africa environment, is the fact that most of the sub-humid middle belt has become freed from onchocerciasis. Millions of people returned to fertile river valleys previously abandoned because of river blindness. The dynamic land utilisation pattern in Onchocerciasis Freed Zones (OFZ) directly interferes with

agricultural and rural development scenarios in West Africa. A further factor is the possible upsurge of Sleeping Sickness, which deserves attention when demarcating priority areas.

The interests of the rural populations residing in the affected areas must remain the bottom-line consideration in all aspects of the strategic planning process. A particular point of attention here is the prospect to improve the livelihood of the poorest fraction of the rural society. What will be the impact of tsetse control and eradication on poverty reduction?

Further points not yet covered comprise technical issues such as the presence of trypanotolerant breeds, the variation in animal productivity levels across different environments and systems, the presence of other livestock diseases, and the myriad of locally specific conditions which enter the broader rural development equation.

There is no finite answer or recipe to all the questions on T&T management and control that can be sited. However, a careful, cautious planning process is possible and the guiding principles become pertinent in the process of active exploration and discussion of the different scenarios. The clarification of these guiding principles would be the output of the workshop.

The objective of the workshop was to further the strategy development of a programme for T&T control and eradication in West Africa, through adoption of a rational, data driven approach towards area-wide intervention schemes. This workshop was attended by experts from International Organizations: FAO, IAEA, ILRI, DFID, OUA/IBAR, CIRDES, ITC, CIRDES and representatives of different countries: Burkina Faso, Benin, Côte d'Ivoire, Ghana, Mali, Nigeria and Togo. Scientific papers produced by experts formed the basis of discussions. The concept note on Pan African Tsetse and Trypanosomosis Eradication Campaign (PATTEC) was distributed to the participants.

## **2- Opening and closing ceremonies**

The workshop was opened by Dr Dembele M'Pe Augustin, Secretary General, Ministry of Animal Resources, Burkina Faso who emphasized the importance of the event in providing guidelines on strategic planning of area-wide T&T control in West Africa and, in particular Burkina Faso, because the country has an important population of livestock susceptible to trypanosomiasis, the increased risk of sleeping sickness following the return of compatriots who formerly settled in coastal regions and the presence of an important research centre, CIRDES in Bobo Dioulasso. He wished participants successful deliberation.

Dr Raffaele C. Mattioli, in his speech on behalf of the Director of FAO Animal Production and Health Division, welcomed participants to the workshop and emphasized the importance that FAO has always attached to effectively combating T&T in sub-Saharan Africa. He drew attention to the need to see T&T interventions not in isolation but as an integral part of a general development action plan and, in some cases, as the initiator or catalyst factor for development process. Therefore, converging actions dealing with land use, natural resources, environmental and socio-economic aspects would need to be undertaken. He concluded his speech by presenting the objectives of the workshop, which is to continue to build a more robust methodology for strategy planning.

The workshop was closed by Dr Raffaele C. Mattioli on behalf of the Director, FAO Animal Production and Health Division. Dr Mattioli thanked the participants for their valuable contributions and for the high scientific quality of the discussions during the workshop and wished them a safe journey back to their respective countries.

### **3- Adoption of the agenda and arrangements for the workshop**

After the official opening ceremony, the participants unanimously elected Professor A.A. Ilemobade as the Chairman of the workshop and the rapporteurs of the different sessions.

Drs R.C. Mattioli, FAO, Rome, (Italy), H. G. Chizyuka, FAO Regional Office, Accra (Ghana), A. Erkelens, IAEA, Vienna, (Austria) and V. Codjia, were in charge of the secretariat

The provisional agenda of the workshop after slight amendments was adopted.

The scientific papers presented during the workshop constituted the basis of the discussions.

On the second day of the workshop, the participants formed three working groups on the following themes:

- Socio-economy and institutional aspects of T&T control and eradication campaign;
- Tsetse/trypanosomiasis risk assessment and integrated control/eradication programme;
- GIS as potential supportive tool in risk assessment analysis and selecting priority areas for control and/or eradication.

**Results of working groups**



## **4- Working Group 1 : Institutional and socio-economic aspects of tsetse and trypanosomiasis control and eradication campaign**

### **4.1- Terms of Reference**

The terms of reference given to the working group were to discuss “economies of scale, socio-economics and institutional aspects of tsetse-trypanosomiasis control”, with a view to outlining strategies to guide the area-wide programme. The group initially discussed whether its brief should include control work as well as eradication, but the majority view was that since this Ouagadougou workshop considered the PATTEC initiative, the group should also address eradication.

### **4.2- Institutional Aspects**

The workshop discussed at length the recommendations from its working group on this sub-theme and agreed that PAAT should continue to provide the technical and scientific advice/support needed and that the role of OAU/ISCTRC would be crucial in this context, as will the continued involvement of the SIT forum. There is a need, however, to identify and bring on board “patrons” such as former and incumbent African Heads of State and large international charitable foundations, who could either help identify sources of funding or provide direct financial support for the programme

Turning to the main pan-African and regional Organizations that would need to be brought on board, the following were identified, not necessarily in any particular order:

- WHO Regional Office
- FAO Regional Office
- ILRI
- ITC
- IITA
- CIRDES
- CILSS
- CORAF
- FARA
- IESMV
- UEMOA
- ECOWAS

At the national level, the involvement of NARS and regional research institutes/organizations e.g. Nigerian Institute for Trypanosomiasis Research (NITR), Institut Pierre Richet in Côte d'Ivoire, CIRDES and ITC was discussed and their role as potential stakeholders in the implementation of the programme. Generally, however, contacting and bringing NARS on board would be the responsibility of the national co-ordinators. At the national level, a national steering committee would be required. The FAO national liaison officers would be among those involved. It was further agreed that it would be essential to have a **memorandum of understanding** between implementing countries and PATTEC in order to set up a contractual relationship and define responsibilities. At a later stage, however, the ways in which the different institutions involved would relate to each other and their various tasks and responsibilities would need to be further set out.

### **4.3- Funding**

Funding was considered very crucial to any effort at combating T&T and the need to discuss it alongside institutional issues was emphasized. Potential funding would need to be sought at three levels, namely, **national, regional and international**. At the **national level**, as countries become involved in the programme, they would be required to provide funding either from government, NGO or

private sources. At the **regional and international levels**, some of the organizations mentioned were the World Bank, IFAD, the African Development Bank (ADB), international charitable foundations, the possible diversion of loan repayments under agreed international debt relief schemes (Jubilee 2000), bilateral and multilateral agencies and NGOs. The need for an imaginative and dynamic approach to public relations and an international media campaign was discussed. It was suggested that the key players set up an international “kill a tsetse fly day” and that this approach be backed by full media campaign. Other suggestions included making use of such tools as radio, TV, local village level dramas, schools, etc. The details of how to design this and at what stages would need working out together with professional media people. The importance of timing and keeping momentum going was emphasised, in other words, it is necessary to be sure that publicity at various levels be followed by project activity so that the enthusiasm and commitment of people are sustained.

#### **4.4- Economies of scale**

The main issues involved in obtaining economies of scale were discussed. In order to avoid paying for expensive barriers to prevent re-invasion of already cleared areas, potentially, the most economic size of unit to work with had been identified as the river basin. In West Africa, this probably falls within the range of 10,000 and 20,000 sq. km. It was thought that re-invasion across watersheds, from other river basins, was unlikely. Some techniques, such as SIT would also benefit from economies of scale.

The potential for **diseconomies of scale** was also discussed. These could arise for technical reasons where the area treated was so large that it became unwieldy to manage. The problems of the sizeable overheads associated with large international projects were discussed. These could result from the setting up of an international structure and delays between this and successful implementation in the field. Evidence from large projects of this nature indicates that this could happen. The need to quantify the on-going costs of monitoring completed tsetse clearance operations was highlighted, as well as the importance of the involvement of the private sector at the various stages of the work, primarily as contractors.

#### **4.5- Socio-economic and cultural aspects**

The main socio-cultural aspects, which would need to be considered, were outlined. The extent to which farmers and communities would be expected to be involved would depend on the techniques used, some of which would be more, some less, efficient at the farm level. If the techniques have “private good” characteristics as would be the case for pour-ons to some extent, then farmers would be motivated to participate. Where, however, a prolonged suppression phase was envisaged, the involvement of farmers would be particularly important. In this context, past experiences should be reviewed in order to identify factors which predispose to successful community participation. The example of Odienné in Côte d’Ivoire, where some of the part-time farmers were investing in traps, which they had commissioned to be made locally, was mentioned.

Irrespective of whether or not local communities have significant participation in the control phase, all aspects of post-control activities will still affect them. Therefore, a number of factors would need to be given careful consideration, viz.:

- sensitization of communities;
- land tenure issues;
- an awareness of any ethnic or other divisions within communities, in particular:
  - a) the potential for clashes between pastoralists and crop farmers;
  - b) understanding of the structure of the community and its existing organizations;
  - c) how resources and tasks are allocated within communities and within families, with respect to gender and social structure and which aspects might be of relevance in planning tsetse control and post-clearance activities.

#### **4.6- Benefit-cost considerations**

The likely overall profitability of eradication had been emphasised at previous meetings. Given that PATTEC aims at eradication, the role of economics was no longer considered an issue to guide overall decision-making (since the decision had already been taken), but to illuminate important issues as the work progresses. After some discussion, the workshop:

- recognized that the major considerations guiding current priorities are concerned with sustainability in terms of keeping areas fly free and minimizing the risks of re-invasion and hence barrier costs;
- agreed that the relative cost-effectiveness of the different methods for initially suppressing the flies and for achieving eradication should be investigated as the project design stage;
- recommended that quantification of benefits should be undertaken, looking both at tangible benefits (in terms of increased livestock and crop productivity) and intangible factors (such as land use issues and possible positive and negative environmental effects);
- agreed that the goal of transparency should be maintained by analyzing the benefits and costs of different project scenarios.

Another important issue discussed was whether other livestock diseases would emerge as important once trypanosomiasis was dealt with. It was the general feeling that such a situation would only become prominent once tsetse clearance operations moved into the forest zone.

The extent to which potential benefits incurred in the long run should be weighted against current expenditure on eradication.

#### **4.7- Conclusions and recommendations**

On the basis of the foregoing discussions, the following recommendations were made:

##### **(1) Institutional aspects**

The workshop:

- taking note of the implementation of the OAU declaration to establish PATTEC
- taking cognisance of the Concept Note prepared by the PATTEC Task Force
- noting the briefing on PATTEC and link between PAAT and PATTEC:

recommends that the tasks and responsibilities of the different collaborating institutions (international, regional and national) be defined, clarified and agreed.

The workshop recommends that countries in the West and Central African sub-region should recognize tsetse and trypanosomiasis as a national priority in their development strategy (food security, poverty alleviation) and accord it the necessary resource allocation.

The workshop welcomes the present temporary arrangement of siting the PATTEC co-ordination office in the OAU Headquarters (Addis Ababa) for strategic reasons and recommends that sub-regional offices (West and Central, East and South) be set up as soon as possible.

##### **(2) Issues of scale**

The workshop recommends further investigation and validation of the river basin concept, with particular reference to tsetse flies crossing from one river basin to another.

The workshop recognizes that dis-economies of scale can occur as a result of disproportionate overheads, delays in implementation and recommends that PAAT/PATTEC should set up guidelines to guard against this.

### **(3) Socio-economic aspects**

The workshop recommends that for individual tsetse and trypanosomiasis projects the following should be considered:

- sensitization of communities before any project commences
- active participation of the community
- potential crop farmer/pastoralist conflict (land tenure issues)
- gender/ethnic/religious/equity issues.

### **(4) Cost-benefit aspects**

The workshop recognized the fact that the programme is now largely technology-driven, in the sense that the major considerations guiding current priorities are concerned with sustainability in terms of keeping areas fly free and minimizing the risks of re-invasion and hence barrier costs. It recommended that:

- the relative cost-effectiveness of the different methods for initially suppressing the flies and for ultimately achieving eradication should be investigated during the project design stage;
- quantification of benefits should be undertaken, looking both at tangible benefits (in terms of increased livestock and crop productivity) and intangible factors (such as land use issues and possible positive and negative environmental effects);
- the goal of transparency should be maintained by analyzing the benefits and costs of different project scenarios.

## 5-Working Group 2 : Tsetse/trypanosomiasis risk assessment, tsetse vulnerability and integrated control/eradication strategies

### 5.1- Terms of reference

The working group focused on the development of guidelines facilitating and standardising risk assessment methodologies with a view to developing strategic planning for area-wide integrated tsetse/trypanosomiasis intervention measures.

The participants first of all decided to agree on what should be understood in the context of tsetse and trypanosomiasis by risk and risk assessment. The following definitions were retained.

### 5.2- What is “risk”?

The tsetse/trypanosomiasis risk has to be seen in the context of rural poverty and agricultural development, because it has direct severe implications on current and future land use and related development. It may be defined as the probability of failure of maintaining human well-being and obtaining benefits from livestock/agriculture based investments due to presence of tsetse/trypanosomiasis.

In the narrow sense, and in particular from a biological viewpoint tsetse/trypanosomiasis risk refers to the probability of livestock and/or humans in coming in contact with the vector and the parasite, resulting in establishment of the disease.

### 5.3- Risk assessment

Risk assessment associated with tsetse/trypanosomiasis may refer to the actions and steps taken to determine the extent of the current and predicted disease and development problems for defined human and livestock populations.

It will usually be based on the utilisation and analysis of existing relevant information and, if necessary, the collection and analysis of essentially required field data. In order to prepare for an intervention campaign the participants estimated that information on several key factors from the list below need to be collected. The factors listed in **bold** form part of a minimum required data set. Additional data may be collected depending on information provided by the affected communities, availability of historical information, the local situation and the intervention/management tools that will likely be used.

- a. Vector: factors affecting risk
  - i- Presence of tsetse flies
  - ii- Number of tsetse species
  - iii- Tsetse densities**
  - iv- Spatial distribution**
  - v- Seasonal fluctuations and population structure
  - vi- Vectorial capacity and rate of infection
  - vii- Habitat
  - viii- Host preference and feeding habits
  
- b. Parasite: factors affecting risk
  - i- Trypanosome prevalence in livestock**
  - ii- Presence and prevalence of human trypanosomiasis**

- iii- No. of pathogenic *Trypanosoma* spp
  - iv- Availability of host reservoir
  - v- Emergence of chemoresistance to trypanocides among populations of trypanosomes
- c. Livestock hosts: factors affecting risk
- i- Species and breeds**
  - ii- Livestock densities
  - iii- Livestock system and husbandry**
- d. Human and environmental factors
- i- Human population density
  - ii- Endemic habitat stability
  - iii- Human activities in vector habitats
  - iv- Control measures** (ongoing control [AAT] and access to surveillance and treatment [HAT])

#### **5.4- The development and implementation of a strategy**

For area-wide management of tsetse/trypanosomiasis, the participants advised that the creation and expansion of tsetse fly free zones should require a phased approach, integrating various technologies. The selection of these technologies and the sequence in which they should best be applied depends on prevailing conditions, favouring or disfavouring their application. The list below outlines factors that are relevant for, and facilitate the development and implementation of an integrated strategy for area-wide intervention

- a. Area of manageable size
- i- Treatment possible as one area
  - ii- Geography or other factors favour intervention in sequential blocks
  - iii- Intervention benefits from economics of scale
- b. Tsetse vulnerability
- i- Confinement of target population / isolation
  - ii- Susceptibility of target species to certain intervention measures
  - iii- Favourable climatic conditions for intervention
  - iv- Land use pressure/habitat changes
- c. Livestock breeds and practices
- i- Presence and acceptance of trypanotolerant breeds under different tsetse challenge
  - ii- Intensive animal care
  - iii- Knowledge based management of tsetse infested grazing areas
- d. Availability of infrastructure and capacity
- i- Adequate perception of the problem by affected communities and decision makers
  - ii- Support of the affected communities in the implementation
  - iii- Structured institutional system and service delivery systems
  - iv- Availability of past and current information
  - v- Easy accessibility to intervention area

- e. Availability of, and access to intervention technologies
  - i- Effective chemical formulations (drugs and insecticides)
  - ii- Effective bait technologies, e.g. efficient visual and odour attractants
  - iii- Environmentally acceptable spraying techniques (e.g. SAT components)
  - iv- Sterile Insect Technique components
  - v- Breeding, multiplication and dissemination of trypanotolerant livestock breeds
  
- f. Market demand and trade opportunities
  - i- High demand for livestock and their products
  - ii- Access to markets
  - iii- Favourable economic trends for livestock and agricultural development

## 5.5- Recommendations

- Considering the necessity to harmonise data collection procedures for the planning of area wide trypanosomiasis and tsetse flies control programmes in West Africa;

- Considering the need of specialised personnel in the field of tropical diseases control, the working group recommends to FAO, IAEA, OAU/IBAR , WHO and other International Organisations to continue their support to capacity building in the different countries of West Africa;

- Considering the necessity to have within the veterinary services of the countries affected by trypanosomiasis and tsetse a structured unity in charge of the collection and analysis of data related to tsetse and trypanosomiasis;

The working group **recommends** to the authorities in different countries the creation or the reinforcement of units in charge of T&T.

- Considering the necessity to facilitate exchange of technical data and information between countries at the sub-regional level;

- Considering the advantages to harmonise methods of biological, ecological and socio-economic data for a rational appraisal of the situation in order to facilitate decision making concerning T&T;

The working group **recommends** giving priority to the following key data according to locally prevailing conditions:

- density of tsetse flies and their spatial distribution
- prevalence of trypanosomiasis in domestic animals
- prevalence of sleeping sickness
- species and breeds of animals
- livestock breeding systems
- tsetse control measures applied or on-going tsetse control programmes.

## **6- Working Group 3 : GIS as potential supportive tool in risk assessment analysis and selecting priority areas for control and/or eradication**

### **6.1- Term of reference**

GIS: from theory to strategic planning.

### **6.2- Introduction**

Geographic Information Systems (GIS) allow analysis, composition and visualisation of digital and analogue geo-referenced data that can be used to model spatial problems in time and space. To study the impact of the disease and the people economically affected by the disease, GIS has proven to be a valuable decision tool to identify and to prioritise intervention areas as well as to contribute to the selection of appropriate control or eradication methods. Various GIS techniques defining the epidemiological and related aspects of vectors and vector-borne diseases have been developed and are now commonly used.

GIS contribute to different levels of multidisciplinary decision making: continental policy – regional and national programmes – operational projects, each having its own scale and resolution constraints. The presentation on the application of GIS to select areas in West Africa was used as a guideline for discussion. Specific topics discussed included:

- effectiveness and appropriateness of GIS;
- validation of criteria for priority setting, implementation, monitoring and evaluation: variables used, other parameters (data layers: existing or new);
- resolution issues, training data, error multiplication, quality – quantity;
- ground truthing issues;
- compatibility with other livestock information systems in a given country;
- standardization issues.



### 6.3- Selection criteria for priority setting at the regional level

Scale: 1/200.000 Resolution : 5km raster

Error: high before ground truthing

Theme	Type (V-R) <sup>1</sup>	Ground truthing	Time <sup>2</sup>	Error sensitivity	Source
Oncho-controlled zones.	V	-	H, R	NA	OCP
Tsetse distribution and species including seasonal variation.	R	+	H, R	+/- 5 km	Predicted PAAT-IS
Climate (Rain, aNDVI, LGP)	R	-	TS	Standard error (0.05)	Artemis
Derived tsetse ecology bands	R	+	R	+/- 5 km	Predicted
Impact of land use intensity on tsetse presence and abundance: people, crops, cattle.	R	+	H, R	+/- 5 km	Predicted PAAT-IS
Reinvasion (isolated or isolable): land use intensity, cultivation, game, forest.	R, V	+	R	Case dependant	Case studies: e.g. Nigeria, Sidéradouougou
Potential benefit: impact of removal tsetse on cattle, land use (cash crops).	R	-	R	High	Predicted PAAT-IS Artemis
Control Unit: DEM derived river basins (level 1-4) and river systems	R, V	-	-	Standard error (0.05)	Derived USGS

<sup>1</sup> Vector or Raster data

<sup>2</sup> Historical, Recent, Time Series

#### 6.4- Decision criteria for planning at the operational level (fly eradication projects)

Scale: 1/50.000 Resolution: ≤ 30 m

Error: high before ground truthing

Theme	Type (V-R) <sup>3</sup>	Ground truthing	Time <sup>4</sup>	Error sensitivity	Source
Hydrography	V	-	P	1 km	Aerial ph., 1km DEM WHO, UNICEF
Sleeping sickness foci	V	+	H, P	Unknown	WHO
Livestock distribution patterns	R, V	+	P	> 1 pixel	Census derived pred.
Land use: Standard FAO classification Derived layers such as vulnerable areas	R, V	+	(H), P	+/- 1 pixel derived: multiplied	Landsat
Tsetse biotopes	R, V	+	P	+/- 1 pixel	Landsat
Tsetse distribution	V, R	+	(H), P	Unknown	Survey derived pred.
River basin modelling	V	+	P	1 km	Aerial ph., 1km DEM
Human population distribution	R, V	+	(H), P	> 1 pixel	Census derived pred.
Land cover and Soils	R, V	+	(H), P	+/- 1 pixel	Landsat
Land tenure systems	V	+	(H), P	Unknown	Census derived
Infrastructure	V	-	P	Unknown	Miscellaneous

<sup>3</sup> Vector or Raster data

<sup>4</sup> Historical, Recent, Time Series

### **6.5- Monitoring indicators (selected river networks)**

- 1- Entomology:
  - a- species, density, sex, age, blood meals
  - b- infection rates
  - c- abundance (mark release techniques)
  - d- distribution pattern change
  - e- genotype strains (sub-populations)
- 2- Epidemiology:
  - a- parasite species, incidence, prevalence
  - b- anaemia

### **6.6- Evaluation topics (selected village sample)**

- 1- Land use
- 2- Socio-economics
- 3- Productivity
- 4- Human health
- 5- Animal health

### **6.7- Conclusion**

The participants concluded that Geographical Information Systems (GIS) are cost-effective and timesaving. One of the most efficient outputs of GIS are ground truthed, satellite predicted themes based on proper field surveys. This ability to produce high quality data layers at an operational resolution and scale, combined with the fact that GIS allow for a multidisciplinary approach makes it an appropriate decision tool to assist in planning and implementation of proper vector management.

An important aspect of data-quality includes error assessment, particularly derived data layers where individual errors tend to multiply with increasing numbers of data layers involved. This can be reduced by ground truthing.

The participants insisted that it should be understood that besides the availability of good quality data, the desired output of any GIS effort will largely depend on trained personnel in a multi disciplinary environment as well as on the performance of the equipment used. These are considered as prerequisites for success, therefore they were not discussed here.

## **7- General Discussion**

During a plenary session the participants shared their experience in establishing normative issues in providing supportive instrument and guidelines for designing and implementing plans of action for tsetse and trypanosomiasis control and/or eradication programme.

The following major issues were discussed:

### ***The economic principle for strategic planning of tsetse and trypanosomiasis control/eradication in West Africa***

The participants noted that:

Economic viability of tsetse and trypanosomiasis control interventions is much more complex because of the diversity of situations encountered in the field. Therefore the formulation of economic guidelines to concentrate on factors which govern the economic performance to assist planning process of control programmes is very important. It was pointed out that dealing with the tsetse-trypanosomiasis problem is not just a question of increasing the productivity of existing cattle populations, but of enabling producers to upgrade their stock, and of dealing with a problem that fundamentally constraints agricultural development.

Land use/land tenure appeared to be very sensitive issues which need to be addressed properly in most of the countries affected by tsetse and trypanosomiasis problems. In fact, land use/land tenure have complex implications on:

- rural economy
- rural area administration
- ancestral relationship between different ethnical groups.

Therefore, the subject is often kept on “stand-by” by decisions makers.

The participants to the workshop noted that work remains to be done concerning land use/land tenure for a better planning of tsetse and trypanosomiasis control in the countries affected. They stressed several relevant aspects (including appropriate utilisation of natural resources, socio-economic etc) which also need to be addressed (and this should be reflected in the participation of different specialists in development project planning and monitoring).

### ***Methodological approach for tsetse and trypanosomiasis risk assessment and analysis***

The reasons for not using sleeping sickness as a criterion for selecting priority areas for tsetse eradication in West Africa were discussed. It was explained that areas were selected mainly on the basis of the cost-effectiveness and technical feasibility of eradication, looking at areas where barriers would not be required in the north and where eradication would be feasible. Participants agreed on :

- the decision whether to go for eradication or control needs to take into account aspects of feasibility and economic justification. Appropriate tools for breaking tsetse/trypanosomiasis transmission cycle should always be considered;
- involvement of communities and stakeholders should be encouraged at all stages of tsetse and trypanosomiasis control/eradication projects;
- harmonization of techniques for assessment and analysis of tsetse and trypanosomiasis risk at the sub-regional level preoccupied also the attention of the participants because of the necessity to exchange information and data between neighbouring countries for a better control of tsetse and trypanosomiasis along the borders.

### ***The role of trypanotolerant livestock with particular reference to West Africa***

The participants agreed on the use of integrated techniques to control/eradicate T&T. In this respect trypanotolerant livestock should continue to play an important role according to production systems and ecological zones.

The question was raised as to whether tsetse eradication posed a threat to the trypanotolerant breeds.

The issue of drug resistance was also mentioned, and it was explained that the BMZ/ILRI/CIRDES project would look at the issue of drug resistance in trypanotolerant stock in Guinea-Conakry. It was asked, if trypanotolerant stock are more productive, why were farmers crossbreeding these animals with zebu stock. Partly this is due to the failure of the market to properly value these animals, which sometimes fetch a lower price than their condition warrants. However, there is ample evidence that farmers who have, for example, introduced a zebu bull into their herds have later on paid a heavy price for this, as the resultant crossbred stock suffered from trypanosomiasis. The herd model calculations presented during the workshop clearly illustrated how profitable the N'dama production system in The Gambia is.

### ***Use of trypanocidal drugs***

The emergence of chemoresistance was presented as an important threat for tsetse and trypanosomiasis control/eradication as no new drug is marketed.

It was observed that :

- the repertoire of trypanocidal drugs is limited and no new compounds are being produced. Only "new" generic products of the old drugs are coming on the market;
- the farmers/livestock owners use trypanocidal drugs under different conditions: Diminazene is used to treat sick animals. This is usually preferred by farmers instead of chemoprophylaxis. Prophylactic treatments are sometimes applied for protection of state farm animals or draught animals;
- chemotherapy can be used under any production system, in any ecological zone, and the farmers individually apply trypanocides to their cattle. The emergence of chemoresistance highlights the limits of chemotherapy. Nevertheless, trypanocides will continue to be used as a key component of an integrated intervention campaign until the vector has been eradicated.

### ***Privatisation of tsetse and trypanosomiasis control activities***

The participants noted that although the number of private veterinarians working in the field in different countries is increasing, it appeared that a long term commitment to controlling the vector and the disease needs particular attention specially in an environment with reported occurrence of trypanosomes resistant to trypanocides, substandard trypanocides available in the market and absence of new drugs.

### ***The practical application of GIS for identification and selection of control areas in West Africa***

Effort in initial phase of any tsetse and trypanosomiasis control programme should be put on the efficient use of GIS.

It was also noted that GIS should be designed to allow flexibility and compatibility with livestock information systems. Bearing in mind the necessity to adopt an integrated and regional approach for the control/eradication of tsetse and trypanosomiasis.

### ***Community participation***

Community and various stakeholders' participation was considered to be very useful. The anticipated success and sustainability of T&T control will largely depend on whether technicians and developers are in a position to actively involve the community in planning and implementation of project and related activities.

It was generally agreed that the involvement of communities at all stages of projects should be encouraged.

### ***Capacity building***

Capacity building preoccupied the attention of the participants. They insisted on the fact that many trained staff are getting old for field work and very often trained personnel in T&T control are deployed in other sectors because of lack of projects or incentives. The consensus reached was to continue training activities.

### ***PATTEC initiatives***

The meeting was informed that OAU/IBAR will organize a meeting of the Ministers of Agriculture and Livestock in Addis Ababa, Ethiopia during the 3<sup>rd</sup> week of September 2001 and the use of this occasion to brief them on the various issues including progress related to PATTEC.

Comments from the participants suggested the harmonization of PAAT/PATTEC and pointed to the need to further elaborate the institutional structure. The concept of tsetse free zones was also mentioned. There was a consensus on the urgent need to move into action quickly.

The participants to the workshop encouraged T&T control initiative of PATTEC and related projects and strategies formulation.

Mali and Burkina Faso were commended for the decision of collaborating in joint field tsetse projects. Although the presentations did not specifically mention all partners collaborating in PAAT and PATTEC it is understood and the presenters confirmed that PATTEC, PAAT and other partners will be involved/consulted.

The proposed budgets for additional interventions (estimated US\$ 1.7 million and 8 million for activities in Mali and Burkina Faso, respectively) will need to be carefully reviewed after obtaining additional data on areas/fly populations to be included, in order to ensure that the operations follow the area-wide approach, i.e. cover entire fly populations.

Likewise the strategically best sequence, in which the respective river basins should be tackled, i.e. starting with the Niger basin in the Bamako area at the edge of the fly distribution and, in an advanced (2<sup>nd</sup>, 3<sup>rd</sup> or 4<sup>th</sup>) stage, the Mouhoun basin, should be carefully investigated, in order to reduce the cost of (temporary) barrier systems in the expansion of created tsetse fly free zones. This will also ensure that the presented proposed activities and action on tsetse/trypanosomiasis intervention by other partners will be part of one larger-scale sub-regional approach, as previously discussed by the partners in PAAT and PATTEC.

The issue of whether the proposed projects should be seen as trial or pilot projects or as part of the ongoing eradication initiative was raised. This would need further clarification, but in principle, the type of projects proposed should be seen as first steps in the eradication initiative.

## **8- Conclusion**

For many decades, T&T have been known as major constraints for rural development in sub-Saharan African countries and therefore contribute to poverty, malnutrition, poor animal and human health. Dedication of scientists, support of international organizations such as FAO, WHO, IAEA, World Bank and donor communities just to mention a few, have contributed to the development of cost-effective and environmentally friendly techniques (targets and screens, impregnated with insecticides, “pour on”, the use of trypanotolerant livestock and sterile insect, etc.) to combat the disease and its vectors. The area-wide application of these techniques even according to an integrated approach is a complex process which deserves precautions for strategies development.

The workshop on strategic planning of area-wide T&T control in West Africa held on the 21-24 march 2001 in Ouagadougou, Burkina Faso should be seen as an important step in the process of building up strategies for the control/elimination of T&T in vast areas with high agricultural potential which have been freed from the onchocerciasis scourge.

The workshop offered an opportunity to participants to discuss at length many important and delicate issues such as land use/land tenure, GIS applications, capacity building river basin concept, drug resistance, community participation and contributed to the necessary harmonization of techniques for socio-economic, biological and environmental data collection in the field. Many guidelines in this respect have been agreed on. But it is obvious that planning exercises for a rational data-driven approach towards area wide T&T interventions schemes are not an easy task. Nevertheless, the recommendations formulated during the workshop will contribute to pave the way for sustainable rural development programmes in West Africa. In this respect PATTEC initiative appears to be a big challenge not only for decision-makers in the countries affected but also for international organizations, drug manufacturers, donors, since the ultimate goal is poverty alleviation, welfare of million people on a continent with high agricultural potential.

Let us hope that step by step the control/elimination of T&T from vast areas in Africa for development purposes will become a reality and the success achieved will be shared by all stakeholders as a contribution towards a peaceful world without hunger.

## **9- Acknowledgements**

The workshop expresses its heartfelt appreciation and thanks to the Government of Burkina Faso and to His Excellency, Alphonse Bonou, Minister of Animal Resources for having accepted to host this meeting. Dr Issa Sidibé is acknowledged for his efficient contribution to the organization of the workshop.

Appendices



## Appendix 1

### Time table and themes

#### Monday, 21 May

- 09.00-09.30 Welcome address, administration and workshop presentation (**R.C. Mattioli and H.G. Chizyuka**)
- 09.30-10.00 Coffee break
- 10.00-10.30 Continental appraisal of tsetse-trypanosomiasis problem (**A.A. Ilemobade**)
- 10.30-11.30 Socio-cultural aspects of livestock-agricultural systems of tsetse infested areas in West Africa (**M. Kamuanga**)
- 11.30-12.30 Economics of the livestock-agricultural systems of tsetse infested areas in West Africa (**A. Shaw**)
- 12.30- 14.00 Lunch
- 14.00-15.00 Some risk assessment tools for area-wide tsetse control and eradication (**J. McDermott, I. Sidibe and M. Kamuanga**)
- 15.00-16.15 GIS and its practical application for tsetse-trypanosomiasis risk assessment and for identification/selection of control areas: the case of Mali-Burkina Faso (**G. Hendrickx**)
- 16.15-16.30 Coffee break
- 16.30-17.15 Overview of methods currently available to control tsetse fly and trypanosomiasis: their integration and comparative advantages (**V. Codjia and O. Diall**)
- 17.15-17.30 Integrated control of animal trypanosomiasis through creation of a tsetse fly freed zone (**A. Bado and S. Maiga**)
- 17.30-17.45 Presentation of CIRDES (**A. Gouro**)
- 17.45- 18.30 Discussion

#### Tuesday, 22 May

- 08.30-09.30 The role of trypanotolerant livestock in West Africa in the context of the methodological approach for tsetse-trypanosomiasis control/eradication strategies (**K. Agyemang**)
- 9.30-10.30 Technical and economic feasibility of tsetse elimination in the moist savannah zone of West Africa (**L. Budd**)
- 10.30-10.45 Coffee break
- 10.45- 11.00 Policy strategy and institutional structure for setting and implementing tsetse-trypanosomiasis control and/or eradication campaign (**A. A. Ilemobade**)

- 11.00-11.30 The plans, progress and problems of PATTEC initiative (**J. P. Kabayo**)
- 11.30-12.30 Discussion and constitution of working groups (**L. Budd and R.C. Mattioli**)
- 12.30-14.30 Lunch
- 14.30-17.30 Working group sessions

**Wednesday, 23 May**

- 08.30-10.30 Working group sessions: finalization of output of working groups
- 10.30-11.00 Coffee break
- 11.00-12.30 Presentations of working group output (**H.G. Chizyuka**)
- 12.30-14.30 Lunch break
- 14.30-16.30 Plenary sessions: analysis and integration of working group output for establishing normative issues in providing supportive instrument and guidelines for designing and implementing plans of action for tsetse-trypanosomiasis control and/or eradication programmes (**U. Feldmann and L. Budd**)
- 16.30-16.45 Coffee break
- 16.45-17.45 Continue plenary session (**G Hendrickx**)

**Thursday, 24 May**

- 09.00-10.30 Final discussion and presentation of analysis results (**L. Budd**)
- 10.30-11.00 Coffee break
- 11.00-12.00 Formulation of recommendations (**A.A. Ilemobade**)
- 12.00-12.15 Closing session (**R.C. Mattioli**)

## Appendix 2

### Composition of the working groups

#### **Working group 1: Socio-economy and institutional aspects of tsetse-trypanosomiasis**

Prof. A.A. Ilemobade  
Mr L. Budd  
Dr G.H. Chizyuka  
Prof. A. Gouro  
Dr M. Kamuanga  
Dr A. Shaw  
Dr H. Solomon

#### **Working group 2: Tsetse-trypanosomiasis risk assessment and integrated control/eradication**

Dr R.C. Mattioli  
Dr U. Feldmann  
Dr O. Diall  
Dr K. Agyemang  
Dr V. Codjia  
Dr I. Sidibé  
Dr P. Solano  
Dr S. Maiga  
Mr I. Kaboré  
Mr J. B. Rayaisse

#### **Working group 3: Geographical Information Systems (GIS) as a potential supportive tool in risk assessment analysis and selecting priority areas for control and/or eradication**

Dr A. Bado  
Dr B. Dao  
Dr A. Erkelens  
Dr G. Hendrickx  
Dr C. Mahama  
Dr Z. Mebrate  
Dr I. Tamboura  
Dr A. Erkelens  
Mr Z. Koudougou  
Mr O. Serdebeogo

## **Appendix 3**

### **Opening address by Dr Dembele M'pe Augustin, Secretary General, Ministry of Animal Resources, Burkina Faso**

Madame et messieurs les représentants de la FAO  
Monsieur le représentant de l'AIEA  
Mesdames et messieurs les directeurs et chefs de service  
Honorables consultants et invités  
Mesdames et messieurs

Au nom du Ministre des Ressources Animales, je souhaite la bienvenue et un bon séjour à tous ceux qui sont venus pour participer à l'atelier FAO/AIEA sur le développement d'une stratégie pour un programme de contrôle et d'éradication des glossines et de la trypanosomose en Afrique de l'Ouest.

#### **Mesdames et Messieurs**

Cet atelier n'est que le début d'une série de rencontres relatives aux trypanosomoses que notre capitale est appelée à abriter au cours de l'année 2001. Cette série de rencontres feront ainsi de Ouagadougou, la capitale de la trypanosomose de l'année.

En effet, le présent atelier que j'ai l'agréable plaisir d'ouvrir sera suivi :

- 1°) d'une réunion des officiers de liaison avec le programme FAO de lutte contre la trypanosomose, prévue du 25 au 26 septembre 2001,
- 2°) d'une réunion des coordonnateurs du groupe consultatif du programme PAAT, qui aura lieu du 27 au 28 septembre 2001,
- 3°) de la 26<sup>ème</sup> réunion du Conseil Scientifique International pour la Recherche et la lutte contre les trypanosomes prévue du 1<sup>er</sup> au 5 octobre 2001.

#### **Mesdames et Messieurs**

Je demeure convaincu que le choix du Burkina Faso pour abriter ces différentes rencontres n'est pas un fait du hasard. Ce choix a été certainement dicté pour trois raisons essentielles :

- D'abord, le Burkina Faso est un pays d'élevage. Son cheptel, nombreux et varié, comporte beaucoup d'animaux sensibles à la trypanosomose mais obligés de vivre dans les zones à tsé-tsé grâce à des traitements trypanocides très onéreux ;
- Ensuite, avec le retour massif de nos compatriotes des pays côtiers ces dernières années, les risques d'une recrudescence de la maladie du sommeil nécessitent une vigilance accrue des autorités du Ministère de la Santé .
- Enfin, le Burkina Faso abrite certaines Structures de Recherche/Développement et/ou de formation, notamment le Centre de Recherche- Développement sur l'Élevage en Zone Subhumide (CIRDES) et l'École de Lutte Anti-Tsé-Tsé (ELAT), tous deux basés à Bobo-Dioulasso et dont la renommée dépasse nos frontières.

Ces deux structures ont mené des opérations de lutte anti-vectorielle assez intéressante pouvant être appliquées facilement par les communautés villageoises. Elles ont également formé du personnel de niveaux différents pour l'Afrique de l'Ouest et du Centre.

## Mesdames et Messieurs

En Afrique de l'Ouest, l'infestation par les mouches tsé-tsé s'étend de sa limite écologique nord, sèche et chaude en zone soudano-sahélienne, aux régions subhumides. La faible productivité de l'agriculture vivrière accompagnée de la forte croissance démographique y sont telles que les disponibilités alimentaires par tête d'habitant ont tendance à stagner voire à régresser. D'où la nécessité dans tous les pays concernés de réunir les conditions d'une augmentation significative de la production agricole, en général et en particulier des produits de l'élevage dont la demande devient de plus en plus forte dans les centres urbains.

Fort heureusement, en raison des potentialités, d'une part et d'autre part, des migrations des populations humaines et de leurs animaux, la zone subhumide de cette portion de l'Afrique offre encore des conditions favorables à une croissance rapide de la production agricole ; mais, c'est aussi dans cette zone que l'on rencontre les différentes espèces de glossines et les maladies qu'elles transmettent. Pour rendre cette zone subhumide viable et exploitable, il est indispensable de mener des actions de lutte contre les vecteurs et /ou d'effectuer des traitements trypanocides. L'élevage du bétail trypanotolérant est également une stratégie de lutte ou de contrôle de la trypanosomose.

Sur ce qui concerne la lutte anti-vectorielle, la recherche a mis au point plusieurs méthodes, les unes dites polluantes et les autres non polluantes. Il ressortira certainement des résultats de vos travaux les méthodes les plus adaptées à chaque situation dans la zone à couvrir. Certes, l'idéal aurait été l'éradication des glossines ; mais, celles-ci est-elle économiquement et techniquement faisable dans le contexte de l'Afrique et l'Ouest ?

J'ose espérer qu'une réponse claire à cette question ressortira dans les conclusions du présent atelier.

La finalité de lutte contre les tsé-tsé et les trypanosomoses est, de toute évidence, la libération des terres qu'elles empêchent d'exploiter. Aussi, je voudrais vous inviter à porter vos réflexions sur l'utilisation rationnelle de ces terres qui seront libérées des mouches tsé-tsé et des trypanosomoses.

Toutes les actions de lutte contre les glossines et les trypanosomoses ne pourront être efficaces sans une association des bénéficiaires aux prises de décisions et sans leur participation à leur exécution sur le terrain. Pensez-y donc.

Je ne saurai terminer mon propos sans remercier la FAO et l'AIEA qui ont accepté financer cet atelier dont les conclusions sont très attendues par les Etats de la sous-région.

En souhaitant plein succès à vos travaux, je déclare ouvert l'atelier de Programmation Stratégique du Contrôle à grande échelle des tsé-tsé et de la trypanosomose.

## **Appendix 4**

### **Address by Dr Raffaele C. Mattioli, Animal Health Officer, FAO Animal Production and Health Division**

Distinguished Secretary General of the Ministry of Animal Resources, the Director of Veterinary Services

**Dear Colleagues, Ladies and Gentlemen,**

On behalf of the Director of the Animal Production and Health Division of FAO I wish you all a warm welcome to this workshop.

The workshop is mainly organized in collaboration with colleagues from Burkina Faso, IAEA and the Regional Office for Africa in Accra, Ghana and we are very pleased with this joint effort. I started my career in Burkina Faso (I spent almost six years in Burkina from 1984 to 1990) and I still have excellent memories of the friendly people of Burkina. I am sure that Ouagadougou offers an ideal working environment, which combined with the high scientific and technical level of the participants, will get us the best out of this forum.

The work that FAO and IAEA carry out incorporates and fuses normative actions with technical assistance. Normative actions aim to define, normalise and standardise guidelines and policy strategies for the implementation of actions plans having, as the ultimate goal, food security and a sustainable livestock-agricultural development. In our specific case, our efforts are devoted to address the livestock-agricultural and socio-economic development of tsetse and trypanosomiasis infested areas. In a very recent meeting attended by the DDG of IAEA, the Director of AGA Division of FAO and IAEA Technical Staff it was recognised that tsetse-trypanosomiasis remains a major issue for rural development and that the removal of this factor would be a major contributor in large-scale poverty reduction in sub-Saharan Africa. The magnitude of the trypanosomiasis problem in sub-Saharan Africa as a priority in poverty eradication is underpinned by the fact the DG of FAO will highlight it in the UN ECOSOC documentation.

In this context, it has to be emphasised that tsetse-trypanosomiasis interventions should be seen not in isolation but as an integral part of the general development action plan, and in some cases as the initiator (catalytic factor) for the development process. Therefore, parallel action dealing with land use, natural resources, environment concerns and socio-economic development should be undertaken to complement and integrate tsetse-trypanosomiasis interventions.

Considering the West African region, efforts for tsetse control and, eventually, area-wide eradication may concentrate in priority area identified as the moist Savannah zone comprising Mali and Burkina. An additional and already identified priority area in Africa is the river-valley systems of Ethiopia. In these areas, from an economic perspective and in terms of sustainability, eradication is the preferred option. However, experience has indicated that such task is difficult to achieve. The use of the Sterile Technique may serve as a convenient 'finishing touch' in fly eradication schemes. A very important aspect here is the requirement to move into areas of sufficient size, in order to be able to exploit economies of scale.

However, we should bear in mind that the creation of tsetse-free zones will undoubtedly have implications on land use that needs careful monitoring and, when necessary, appropriate and corrective measures applied. The risk that unwanted negative land use changes will occur increases with the size of the intervention area selected. A sensible option is to be selective with the land that will be made available for agriculture and only consider land portions where agricultural benefits are expected to be maximal and at the same time tsetse populations most vulnerable to attack. Some of the above criteria were explored during workshops held in Geneva in November 2000 and Vienna in

December 2000. This workshop moves forward and is intended to continue in building a more robust methodology for strategy planning. The definition of criteria, standards and guidelines will be worked out during this forum into further detail for possible drawing up of more definitive proposals for intervention. Hence, the workshop is concerned with the decision support and capacity development.

We are aware that there is no finite answer or recipe to all the questions that deserve to be considered. There is also no precise mechanism for scientifically sound, data-driven pest management. However, a careful, cautious planning process appears possible and the guiding principles become pertinent in the process of active exploration and discussion of the West African scenarios. The clarification of these guiding principles will be the concrete output of the workshop.

I would like to conclude my statement by saying that FAO and PAAT congratulate the PATTEC initiative of OUA-IBAR on tsetse eradication. In this respect, PAAT and PATTEC harmonisation is very important and PAAT will continue to support PATTEC placing emphasis on effective collaboration in functional terms.

The Director-General of FAO welcomes the suggestion of His Excellency Lawrence Agubuzu, Ambassador – Assistant Secretary General of OUA, to hold a meeting between representatives of FAO and OUA and other PAAT partners to further discuss key issues of inter-Agency functional, structural and organizational linkages.

I wish to thank the Government of Burkina Faso for having accepted to host this workshop and a series of other important meetings, such as the FAO Liaison Officers meeting, the meeting of the PAAT Advisory Group Co-ordinators and the PAAT Secretariat meeting in September and the 26<sup>th</sup> ISCTRC in October this year. The results of this workshop will be reported at the ISCTRC Conference. Special thanks go to my colleagues and friends in Burkina and FAO in Accra for their collaboration in the workshop organization.

## Appendix 5

### Continental appraisal of tsetse and trypanosomiasis problem

#### A.A. Iemobade

The presenter gave a background and overview of the tsetse and trypanosomiasis problem in Africa. He illustrated the severity of the situation on the continent with figures and numbers of cattle and human population infected and at risk of the disease as well as the number of countries affected. The occurrence in some instances of civil strife has led to a break down in surveillance systems of human African trypanosomiasis, thus the figures on human sleeping sickness may be under-estimated. He touched on the need for the accurate figures of countries affected since there seems to be discrepancies in the statements of different workers. All the same, the current picture still confirms that trypanosomiasis should no longer be considered solely as a health problem but as a developmental one. This was underscored by the meeting of OAU Heads of State and Government in Lome, in July 2000, where rural poverty, human welfare, underdevelopment and land use distortions were indirectly linked to trypanosomiasis. A follow-up of the historic declaration of the Heads of State and Government has been the production by a task force that was commissioned by the Secretary General of the OAU of an elaborate Action Plan (Concept note) for a Pan African Campaign.

He reminded the participants to the workshop to reconsider the tsetse distribution for the control or eradication of tsetse. The disappearance or absence of the tsetse fly following control operations in various parts of Africa, such as Nigeria, shows that the Savannah and *Fusca* group of flies tend to disappear once demographic pressure increases in target areas. On the contrary the *Palpalis* or riverine group appear to show considerable resilience and will persist despite demographic pressure. A major constraint to the launching of area-wide tsetse control operations has been a deficiency in the quality and quantity of data on tsetse distribution and abundance. Several African countries have been constrained by financial and logistic problems to make sound assessments of tsetse distribution and abundance. Even in countries where this information is fairly accurate, the formulation and implementation of sustained control or eradication programmes have been stalled by competing demands from other sectors of national economies.

He recapitulated initiatives of the OAU on tsetse and trypanosomiasis eradication and reminded participants that the current initiative of the OAU of controlling trypanosomiasis is not new; it is however significant from the point of view of scale and commitment. There is a growing consensus on the need to recognize the various scenarios of the tsetse and trypanosomiasis problem across the continent; the situation is even more complex in West Africa where trypanotolerance features prominently as a cost-effective option for the viable production of livestock in high tsetse challenge areas. The presenter was emphatic that there is no panacea for the trypanosomiasis problem in Africa, but that the option or group of options to be adopted to mitigate the effects of animal trypanosomiasis or human African trypanosomiasis in any given area be based on dispassionate and holistic assessments of the ramifications of the problem.

The presenter reiterated the need for appropriate land use planning with inputs from beneficiary communities to be given serious thought during programme planning but stressed the fact that it was not sufficient to make land use policies alone. The crucial issue, in his view, was the enforcement of such policies.

He pointed out the importance of some assumptions for the success of any control or eradication programme such as good governance and political stability.



## Appendix 6

### **Socio-cultural aspects of livestock-agricultural systems of tsetse-infested areas in West Africa**

#### **M. Kamuanga and J. McDermott**

The authors presented a paper on the incorporation of socio-cultural factors in strategies for the development of area-wide tsetse and trypanosomiasis control and eradication plans. He explained that while technical-economic studies take a telescopic view of the entire life of the programme to derive quantitative measures that justify the intervention, socio-cultural factors have an impact on the practical operations and functioning of the programme. Working in a pluridisciplinary setting, social scientists have the task of identifying pathways along with people so that communities can manage the transition to a more efficient and sustainable tsetse and trypanosomiasis control or eradication programme.

The involvement of the community in area-wide control requires a diagnosis of local problems, followed by the formulation of an appropriate set of actions and implementation of agreed action plans. He advocated the right of farmers to choose what they considered appropriate, stating that while outside inputs are necessary they will have to be offered rather than imposed, coming in the form of a menu of options to choose from and not pre-packaged instructions. Quoted were case studies of community-based control programmes in Burkina Faso and Côte d'Ivoire that were based on government-assisted settlements of pastoralists and mixed-farming in areas of in-migration of agropastoralists. The studies illustrate the successes and failures in the delivery of services, organization of labour and money contribution schemes and the overall sustainability of tsetse and trypanosomiasis programmes.

It was emphasized that sustainability in area-wide control with involvement of communities will depend on the ability of local people to sustain their interests over time and the willingness of its members to make financial and other contributions in a situation where "free-riders" can benefit. The lessons of the past need to be used to inform the future. The bottom-up strategy whereby the community recognizes the problem, initiates remedial actions and approaches an external agency for assistance was supported. Empowerment of the community will enable beneficiaries to embark on and sustain self-help action.

Several factors are generally accepted as impacting on the participation of community members in tsetse and trypanosomiasis programmes. These include incidence of sleeping sickness, cattle ownership, knowledge of the disease, time devoted to communal work and previous involvement in public works. Past experience has also shown that contingent and actual contributions of beneficiaries will decline overtime, and at the farm level, people are interested and more impressed by direct, tangible personal benefits such as that provided under chemotherapy schemes and the use of trypanotolerant livestock. Prospective actions in the management and organization of tsetse and trypanosomiasis control need to be addressed with respect to the types of organizations to put in place, whether the programme will control tsetse and trypanosomiasis alone or pursue other development and social objectives. The need for planners and implementers to anticipate equity and gender issues was stressed.

## Appendix 7

### **Guiding economic principles for strategic planning in tsetse and trypanosomiasis control/eradication in West Africa**

**A. M. Shaw**

This paper seeks to address the issue of how to integrate economic criteria into the strategic planning process for tsetse and trypanosomiasis control in West Africa. This paper takes as its starting point Brent Swallow's position paper for FAO, which reviewed the growing literature on the economic impact of the disease, and complements this with recent references and a rapid overview of the benefit-cost studies undertaken.

Since this has been much debated, and has profound implications for the type of strategy adopted, the methodological issues involved in the economic appraisal of potential projects to control the disease are first discussed in some detail. The literature on the economic appraisal of livestock projects universally advocates putting some value on the use of money over time, reflecting its opportunity cost in terms of resources diverted from other projects and the need to fix some minimum acceptable rate of return on public investments. The use of 'discount' rates is accordingly recommended here, while applying low discount rates in the examples used, so as to reduce the effect of deflating benefits occurring in the distant future as compared to present costs. The terms of reference for this work were to produce economic guidelines for planners in this field, accordingly it is argued that in the current institutional context, each individual project or zone should be the subject of a separate benefit-cost analysis, so that it is assessed on its own merits, not on its possible technical contribution to a potential continent-wide programme. This again is part of sound economic practice. The setting out of benefits and costs according to the rules of partial analysis is explained for the case of tsetse and trypanosomiasis control. This discussion, in particular, emphasises the importance of incorporating farmers' current strategies to control the disease into the analysis. Studies have shown that in many areas their use of trypanocides is effective, this means that a proportion of disease losses are already being successfully avoided. The benefits from introducing tsetse control in this situation would not be the elimination of all possible losses due to trypanosomiasis, but would consist of savings in the use of trypanocides plus a further reduction in the losses due to the disease. A dynamic herd model incorporating animal traction is used to simulate the benefits and costs of tsetse eradication, trypanocide use, and the switch from one to the other. This implies that farmers' current strategy of targeting productive animals brings high returns. Tsetse control becomes profitable in high challenge areas if sufficiently high cattle populations exist to make up the 'benefit units' per square kilometre.

Secondly, from the discussion on methodology, it is argued that there is a need for planners to adopt a standardised approach for assessing tsetse and trypanosomiasis control schemes. This would aim firstly to be cost-effective and secondly to produce results for different projects that could be compared and used for ranking and priority setting.

Thirdly, the paper tries to complement the GIS work on the spatial distribution of the factors influencing the economics, and the predictions of the likely rate of changes, by looking at the dynamics of benefits and costs over time, especially in relation to the densities of human and cattle populations. A conceptual model shows tsetse control costs falling with rising human populations. Benefits, however, initially rise, then peak when mixed farming is well established but tsetse challenge persists, and lastly, fall when human populations rise to a level where the fly's habitat becomes eroded. This points to the existence of two turning points in the economics of tsetse control – below a certain cattle or human population density there are insufficient benefit units to make it profitable, above a certain level, fly challenge is reduced, losses due to the disease decline, and cattle numbers may also be lower as the amount of grazing land is reduced. This model is used to characterise

situations where controlling the disease may or may not be profitable. These situations and the profitability limits or turning points identified coincide to a large extent with those emerging from the GIS priority setting exercises.

The two approaches thus very much complement each other, suggesting that the economic appraisals should focus on those zones which emerge as priority areas from the GIS filtering process.

## Appendix 8

### Some risk assessment tools for area-wide tsetse control and/or eradication

**J. McDermott, I. Sidibe and M. Kamuanga**

Eradication has been defined by many authors. A definition that is particularly relevant to area-wide tsetse control is “ the purposeful reduction of a specific disease to the point of continued absence of transmission with an area by means of a time-limited campaign” (Yekutieli, 1967). The decision to embark on an eradication or a control programme depends largely on feasibility and economic arguments. In the context of West Africa, a probable scenario is that distinct areas can be identified that are suitable for eradication (suitable ecology, isolated population, suitable technical tools), eradication efforts are economically justified and sufficient manpower and resources can be mobilized to conduct the eradication campaign.

Risk assessment is a useful project-planning tool for investigating the probability that a project will not be successful. For this purpose, the risk is that tsetse eradication will not be successful and the greater the probability of not eradicating, the greater the risk. Five key steps for assessing risk are:

1. Identifying potential hazards and failure points
2. Assessing the likelihood of failure
3. Assessing the consequences of failure
4. Estimating and ranking risk
5. Monitoring and evaluation

The major potential failure points from previous area-wide tsetse eradication projects have been that (1) the methodology applied was not sufficient to eradicate tsetse from the area (e.g. incorrect technique applied, insufficient spatial coverage, insufficient resources available) or that once eradicated, tsetse re-invaded from other areas (e.g. area was not geographically isolated from other tsetse populations or re-invasion barriers were inadequate). Once these failure points are identified, the likelihood of failure can be assessed. For area-wide eradication this is likely to be a qualitative rather than quantitative process, relying on assessments of previous eradication attempts (e.g. previous spraying operations in Botswana, Lambwe Valley, etc.; previous SIT projects in Zanzibar, Burkina Faso, mainland Tanzania, etc. and assessment of previous tsetse barrier operations (e.g. Burkina Faso, Zimbabwe (RTTCP), etc.). For the project area, factors such as human population, agricultural activity and tsetse ecology also need to be considered in assessing the likelihood of failure to eradicate.

Methods to assess the tsetse population targeted for eradication begin in the planning phase and need to be continued through the eradication campaign until eradication is declared. For the declaration of tsetse eradication, sampling methods must: (1) maximize the probability of detecting both tsetse and trypanosomes (usually the greatest requirement is to establish optimal tsetse detection methods); (2) account for the sensitivity and specificity of test methods used; (3) cover all spatial areas of interest; (4) cover longitudinally both pre and post-eradication periods (to account for seasonal and secular trends).

Strategies for assessing declining tsetse populations and trypanosomiasis risk have been developed and applied to assess the tsetse eradication campaign in Zanzibar. Methods applied included: Bayesian methods for assessing tsetse population decline and eradication; and statistical methods for assessing disease or infection absence. The availability of quality field data on tsetse and trypanosomes, collected over many years, was crucial to this assessment. This longitudinal data collection was also crucial for monitoring and evaluation throughout the project.

Tsetse eradication is expensive and deserves careful consideration. Based on previous experience, the characteristics of areas to be targeted and other technical details of eradication are crucial to success. Risk assessment and monitoring tools are key elements at all stages of the decision-making process.

There was discussion on the definition of eradication, and there appears to be a difference in eradicating the vector or the disease.

In the process of choosing a strategy for eradication/control, the importance of HAT will play a major role.

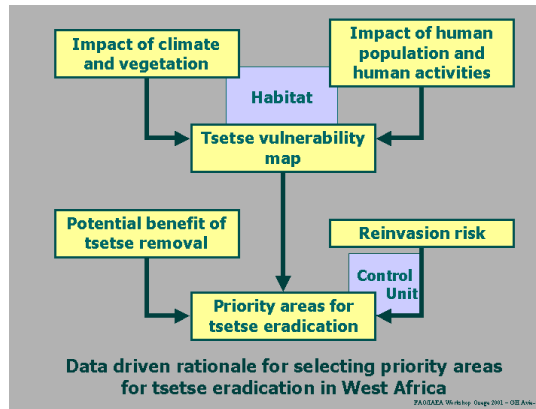
Who decides on priorities for intervention? This depends on the scale of the problem and the situation in the area; decisions of priorities are made at different levels, starting at the farmers level and up to the Government level, depending which impact intervention / non-intervention has, particularly if a problem (like tsetse/trypanosomiasis) is a development problem with substantial implications on various economic sectors. Unfortunately often the people that currently have to live with the problem cannot imagine a life without tsetse/trypanosomiasis what do not realise that there are tools available now to remove it.

## Appendix 9

### Practical application of GIS for the identification and selection of control areas in West Africa

#### G. Hendrickx

This paper builds further on a series of workshops where past applications of GIS for priority setting were presented and some basic principals underlying the present paper were adopted. It summarises a PowerPoint presentation of which six key slides are given here.



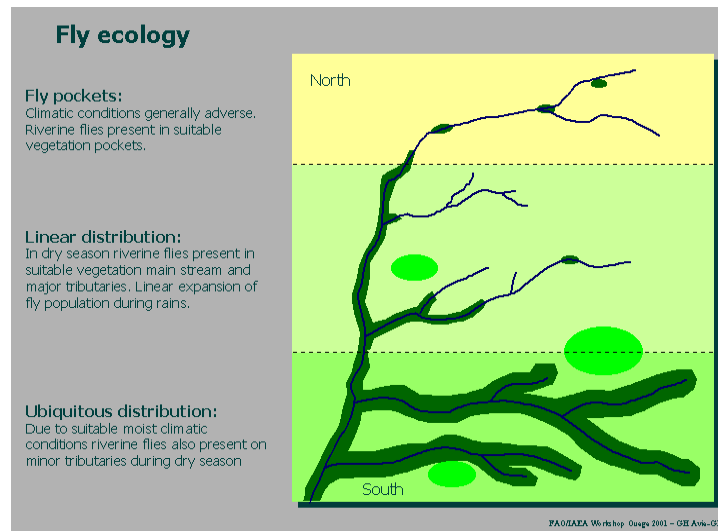
**Figure 1**  
**Decision support framework**

Not surprisingly decision support aiming at selecting project areas will differ significantly depending on the goals to achieve.

**Trypanosomiasis control** aims at sustained suppression of the disease and/or the vector. Therefore decision making will be mainly anthropocentric, i.e. daily farmers' inputs and participation are the keystone of success for any operation (socio-economics of trypanosomiasis control). Decision making towards selecting priority areas can be carried out independently at a national or sub-national level where discrete priority areas can be selected according to potential costs and benefits. The relative location in the fly belt of selected areas is of lesser importance.

**Vector eradication** on the other hand involves a political decision which aims at permanently removing a major constraint, in our case tsetse as a vector of African animal trypanosomiasis and Human Sleeping Sickness from an area. Independently of peoples' will to participate, areas have to be selected on a data driven basis aiming at optimal technical feasibility (figure 1).

Since the success of the actual eradication campaign will highly depend on the technology used, chosen technologies will have to be carried out by professional teams to guarantee quality and speed. Therefore efforts towards community participation can mainly focus on disease management (basic animal health and production in *sensu lato*) and land-use, actively preparing the "post tsetse era". Here decision making is highly dependant on concerted action between countries involved. Large-scale areas have to be selected according to the feasibility of tsetse eradication, starting from the most vulnerable parts of the distribution limits of the fly and systematically working towards more complex types of habitat.

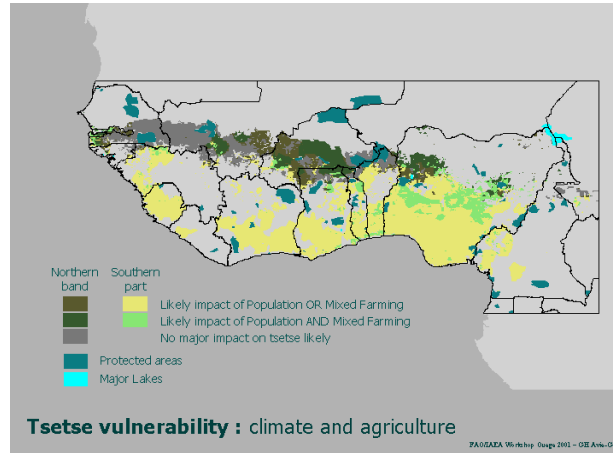


**Figure 2**  
**Tsetse ecology**

A typical feature of the climate in West Africa is its band like pattern. This was shown using data on rainfall, vegetation index and the Length of Growing Period (LGP). From North to South the climate changes from arid to moist. This strongly affects tsetse ecology as depicted in figure 2. In the northern part of fly belt it is more likely that tsetse could be permanently removed. Populations are expected to be more fragmented. After removal reinvasion is less likely since gaps of adverse conditions prevent fly dispersal. In the southern part where tsetse are widespread, high reinvasion pressure will likely jeopardise permanent fly suppression and/or eradication attempts. The separation between « feasible » and « less feasible » is expected to be near the southern border of the linear distribution band (band 2) where the entire river network is not yet populated by tsetse. From an operational point of view it is important to identify this limit as accurately as possible. Based on results obtained in Burkina Faso limits of such a “Northern band” has been tentatively set at a LGP of 170 days.

### **Tsetse and the influence of people and agriculture**

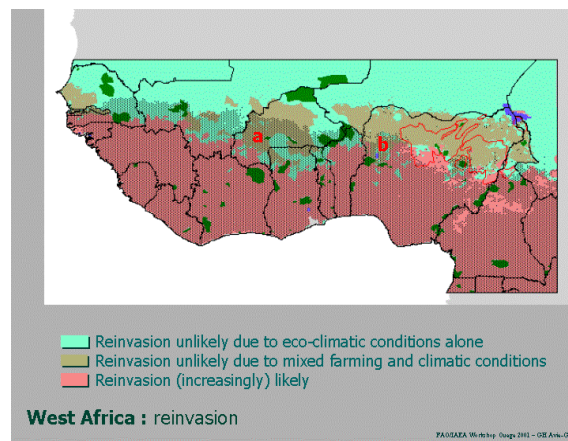
With increasing human populations the number of natural tsetse hosts will drop (hunting) and an increasing part of the land will be cleared through cultivation and due to firewood consumption. As a result tsetse populations will lack both food sources and suitable habitat, and populations will drop and/or previously continuous distribution patterns may become fragmented. This potential impact on tsetse populations was assessed by combining detailed data (5 km resolution) on expected population impact and predicted crop and livestock agriculture distributions (PAAT-IS).



**Figure 3**  
**Tsetse vulnerability**

As a next step the combined potential effect of climate, human activity on tsetse habitat was modelled by overlaying the various map outputs described above. From a fly eradication point of view this impact offers both a direct and indirect advantage: (i) direct advantage: high land pressure will reduce fly populations. Savannah flies are expected to be more affected than riverine flies. Fly distribution is fragmented and once identified fly pockets are more easily dealt with; (ii) indirect advantage: the existing high land use pressure contributes to prevent fly reinvasion following eradication. This affects both riverine and savannah flies. It is important to mention here that agricultural practices might create new habitat types, especially for riverine tsetse. Nevertheless such habitats are expected to be relatively isolated and therefore vulnerable once identified.

The obtained result (figure 3) highlights areas where tsetse populations are expected to be most vulnerable to control measures. Two major impact areas are highlighted. In Nigeria both mixed farming and human population are likely to influence tsetse, not only in the LGP<170 zone but also in more humid southern parts whilst in Mali-Burkina levels of human population densities and mixed farming are less extreme. There, impact appears to be restricted to the LGP<170 zone. These areas compare with previously produced predictions on potential benefit areas (PAAT-IS).



**Figure 4**  
**The reinvasion issue**

A vital aspect of tsetse eradication is fly reinvasion. Ideally flies should be removed from a completely isolated area with zero reinvasion pressure (e.g. Zanzibar Island in East Africa). This

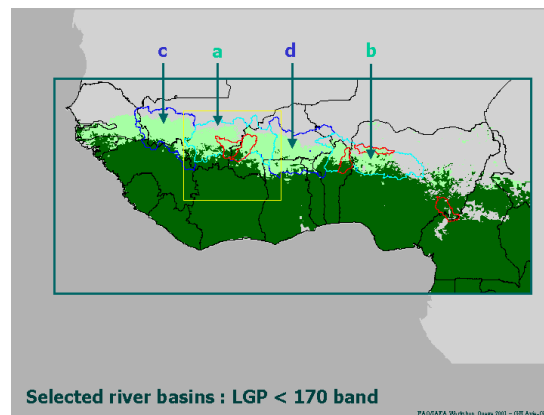


rarely is the case. On the other hand no example is known of the successful maintenance of a permanent artificial barrier against tsetse after fly removal.

Nevertheless above it was seen that in the northern band of the fly belt low reinvasion pressure is likely due to: (i) isolated fly pockets in otherwise marginal habitat; (ii) interrupted linear distribution patterns due to high land pressure and (iii) reduction of re-invasion pressure due to high land pressure. In such circumstances it may be possible to conduct a concerted area-wide eradication campaign. Historically similar conditions have occurred in North-Eastern Nigeria where flies have been removed from a large area without barriers and with no significant re-invasion to date. Analysis of climatic and mixed farming patterns occurring in this area allowed to generate a model depicting re-invasion risk in West Africa (figure 4).

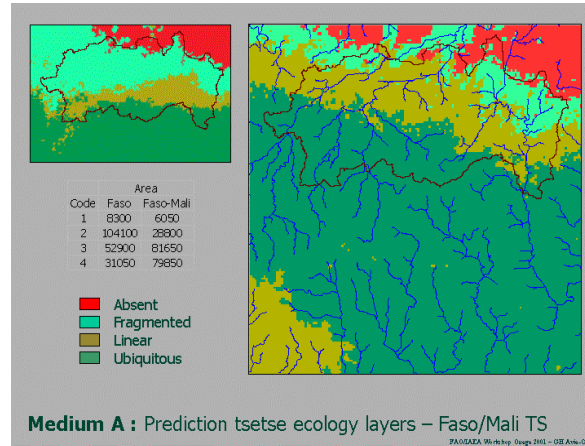
### Selecting priority areas

Tsetse being closely linked to water systems river basins are the most suitable control units or entities. Therefore a DEM-derived river basin model was used to select projects within areas where (i) flies are most vulnerable, (ii) reinvasion risk is less likely and (iii) potential benefits are highest (figure 5).



**Figure 5**  
**Case study: Mali – Burkina Faso priority area**

Finally a model was developed using discriminant analysis techniques to identify the subsequent fly ecology bands described above in the common 'Cotton belt' of Burkina Faso and Mali (figure 6). The model includes field data for Burkina Faso collected by the FAO project GCP-RAF-347-BEL, CIRDES and by Dr A. Djiteye (LCV, Bamako) for Mali. A set of 5-km satellite data, processed by the TALA research group in Oxford-UK, was used as predictor variables.



**Figure 6**

The result obtained shows the output of the model using only Burkina Faso field data (left hand map) and on the larger map on the right the model output using both field data from Burkina Faso and Mali. Both outputs show major differences for Niger. This may be due to two factors:

1. Even when two areas are adjacent a similar set of eco-climatical conditions may affect tsetse ecology in a different way. Field data confirm this: vegetation patterns along the Niger river are different from patterns observed along the Mouhoun river.
2. Class division into a set of “ecological bands” is subjective, and limits between classes will vary from author to author. This can be illustrated with the Bamako example: close to Bamako large parts of the Niger river vegetation are infested with tsetse. Further north a gap of approximately 50 km exists before the next fly concentration is found. Should this be classified as “linear distribution” (argument: vegetation absent in gap, therefore no flies) or “fly pockets”?

## **Conclusion**

Produced results are a significant step towards data driven selection of priority areas for large-scale vector management. Whilst previously such approaches aimed at selecting areas for trypanosomiasis control, here the focus is put on concerted vector eradication. Taking the selected Mali - Burkina Faso priority area as an example, a series of subsequent fly ecology bands, of particular interest with regard to vector eradication feasibility, were identified.

Follow up studies should now focus on (i) further refining the developed approach at an operational scale, (ii) identifying fly fragmentation indicators and (iii) clarifying the impact of land use pressure on riverine tsetse habitat and behaviour.

## Appendix 10

### **Overview of methods currently available to control tsetse fly and trypanosomiasis: their integration and comparative advantages**

#### **V. Codjia and O. Diall**

In their paper, the presenters argue that tsetse/trypanosomiasis is not just a veterinary or medical problem, but a major development issue. Therefore, there is a need to identify priority intervention areas.

Different techniques are available for intervention aiming at the parasite or the vector: trypanocides and trypanotolerant cattle breeds to control the parasite, and insecticides in the fly habitat, on targets or on livestock, traps and SIT for vector control.

All intervention methods/approaches have specific advantages and disadvantages, and the presenter highlighted technical and cost implications of the different intervention tools. A combination of different techniques in an integrated manner and the consideration of relevant land development tools must be taken into consideration.

Long-term planning and commitment, as well as sound co-ordination are needed. It was pointed out that the repertoire of trypanocidal drugs is limited and no new compounds are being produced. Only “new” generic products of the old drugs are coming on the market.

The farmers and livestock owners use trypanocidal drugs under different conditions: diminazene is used to treat sick animals. This is usually preferred by farmers instead of chemoprophylaxis. Prophylactic treatments are sometimes applied for protection of state farm animals or draught animals.

Chemotherapy can be used under any production system, in any ecological zone, and the farmers individually treat their cattle with trypanocides. The emergence of chemoresistance highlights the limits of chemotherapy. Nevertheless, trypanocides will continue to be used as a key component of an integrated intervention campaign until the vector has been eradicated.

## Appendix 11

### **Integrated control of animal trypanosomiasis through creation of a tsetse fly freed zone: Presentation of a joint tsetse and trypanosomiasis project Mali-Burkina Faso in West Africa**

**A. Bado and S. Maiga**

#### **Context**

Mali and Burkina Faso are neighbouring countries. They share a border which measures 1800 km. Both countries are Sahelian, agricultural and pastoral, therefore they share similar agro-ecosystems. In Mali and Burkina Faso trypanosomiasis is a major pathological constraint, socio-economically very important. Burkina Faso has a tsetse fly rearing facility. Both countries have well-trained professionals in tsetse control.

In September 2000, the two Governments jointly decided to combine their efforts to control and ultimately eradicate trypanosomiasis and tsetse in selected areas by using SIT.

The project will have 3 phases:

Phase 1: in Mali

Phase 2: in Burkina Faso after completion of Phase I

Phase 3: extension to the common borders Mali/Burkina Faso/Côte d'Ivoire (a very important cotton production area).

#### **Justification of the choice of the area**

The project area is suitable for the development of animal production, particularly milk production because of the following reasons:

- the availability of agricultural and agro-industrial by-products;
- the existence of a big market for milk and meat;
- the presence of 40 000 cattle at risk (20-25% of the total number of cattle is in the peri urban area of Bamako (160 000 – 200 000). Among these 25% there are crossbreeds). The total number of crossbred cattle around Bamako is about 6 665. These crosses produce 2 206 000 litres of milk/year. More than half of this production comes from the project area;
- local, cross, and pure exotic breeds are all susceptible to trypanosomiasis;
- 4-5 trypanocidal treatments/year are applied and their cost is estimated at 112 140 million FCFA, additionally about 80 million FCFA are spent for insecticides (“Pour on” formulations);
- the project area is an important orange, mango, lemon and vegetable production area.

#### **Justification of the choice of SIT for the eradication**

The justifications of the choice of SIT in the project are:

- the size of the project area is small (1 500 km<sup>2</sup>);
- it is possible to isolate the project area;
- there is an important number of small and scattered islands with difficult access;
- surveys have shown infestation with only one subspecies of tsetse fly, i.e. *Glossina palpalis gambiensis*.

### **Objective of the project**

The main objective of the project is to eliminate animal trypanosomiasis through eradication of tsetse fly in order to increase animal production and to contribute to a sustainable agricultural development.

### **Methodology of the inventions**

Phase 1: activities of the project will focus on base line data collection.

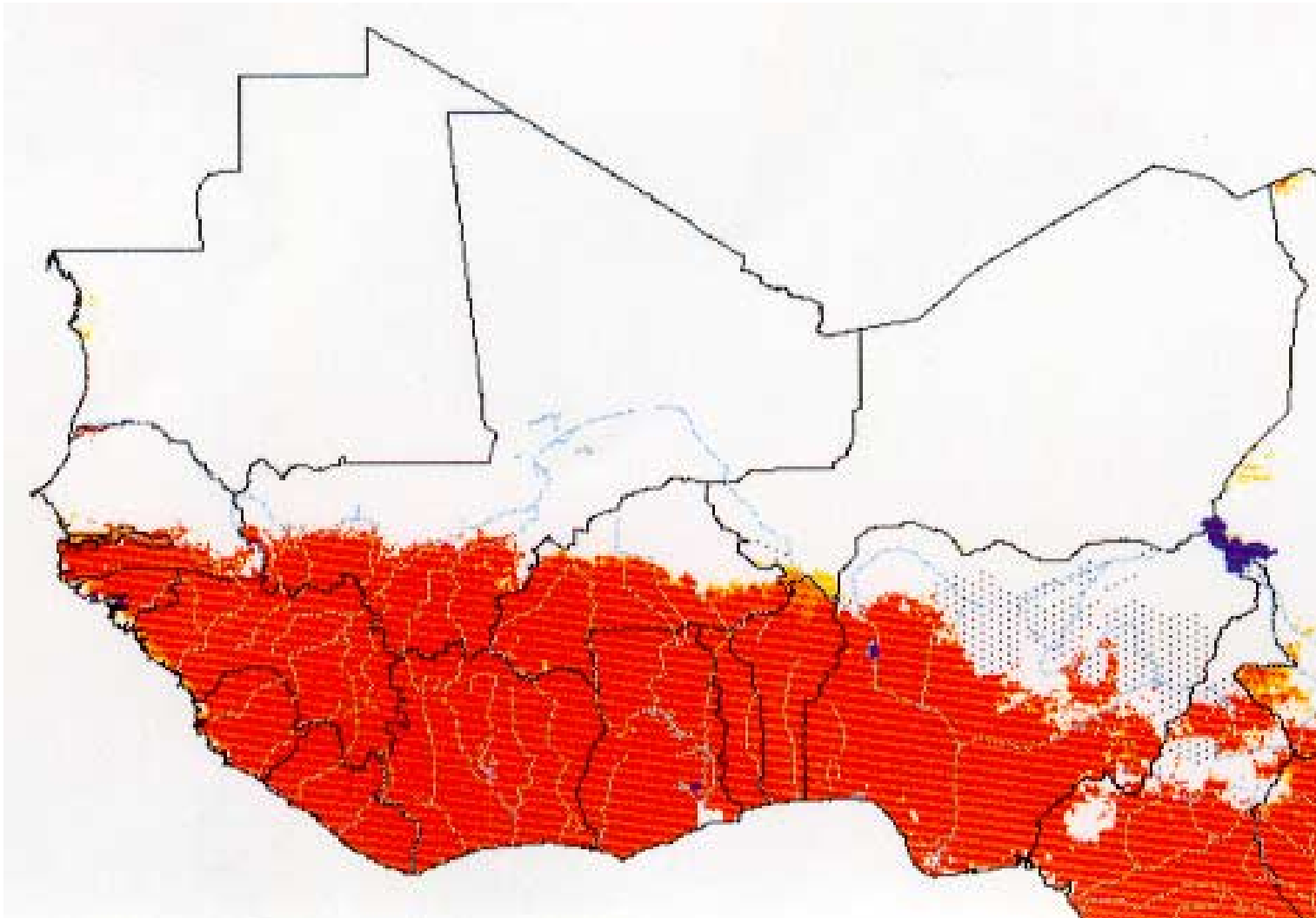
Phase 2: project activities will aim at the suppression of tsetse fly population.

Phase 3: activities will be oriented towards eradication of tsetse population.

### **Total budget (US\$)**

The total budget of the project is estimated at US\$4 160 00 (US\$1 778 000 for activities in Mali and US\$2 382 000 for activities in Burkina, including increase of the fly production to meet the needs of phase 1.

**Limit of tsetse flies in West Africa**



## Appendix 12

### Presentation of CIRDES

#### A. Gouro

The Centre International de Recherche-Développement sur l'Élevage en zone Subhumide (CIRDES) is located in Bobo-Dioulasso, Burkina Faso. CIRDES research activities aim at enhancement of the productivity of domestic ruminant livestock throughout the sub-humid zone of West Africa and subsequently at improvement of the nutritional status of populations, the economic welfare of livestock owners and of rural communities. Research activities are performed by teams which maintain inter-disciplinary interactions in field surveys, laboratory practices and data analyses. While taking into account sustainability at all levels of intervention, CIRDES research puts emphasis on effective control of animal trypanosomiasis. Many new formulations of pesticides and of blue cloth materials designed for tsetse control were tested. Several disease control operations at field level with an important component of community participation were realized in the so-called Agropastoral Units of southern provinces of Burkina Faso. They resulted in disease reduction and increase of cattle productivity. Further ongoing research aims at minimizing costs of interventions.

Due consideration is also given to capacity building in West Africa and to the improvement of epidemiological survey tools and of vector detection devices. Recent trials comparing a detection test (ELISA-Antigen) with other classical trypanosomiasis diagnostic techniques resulted in discrepancies of results. This ELISA-Antigen test deserves further evaluation.

Additional CIRDES activities deal with the epidemiology of AAT for a better understanding of disease transmission trends and relationships between parasites, vectors and vertebrate hosts. Several biotechnical methods were successfully assayed and PCR (polymerase chain reaction) was used to characterise types of *Trypanosoma congolense* (savannah, forest and Kilifi types) and *T. simiae* in West Africa.

It is postulated that in West Africa the *Palpalis* group of *Glossina* may have a greater vectorial capacity for trypanosomes of the Subgenus *Nannomonas* than reported before. This trend was apparent from studies on vector-parasite relationships performed in sites surveyed south of Burkina Faso. In addition to PCR, RAPD was also used to characterize trypanosomes. Biotechniques are also applied to characterize tsetse populations at species and intraspecies levels.

Other activities are related to compare productivity of trypanotolerant livestock breeds and crossbreeds under different production systems.

It is important to underline joint activities involving CIRDES, ILRI and ITC on trypanotolerance and trypanotolerant livestock in West Africa and the close co-operation with CIRAD-EMVT. Research through consortia having common interests deserves more attention and should be further enforced.

Part of the CIRDES research activities benefits from the financial support of the European Union.

## Appendix 13

### **The plans, progress and problems of the PATTEC initiative**

**J. P. Kabayo**

#### **Background**

The PATTEC initiative arose from the urgent need to eliminate the severe problems caused by tsetse-transmitted diseases in Africa. It came at a time of special concern for the increasing tsetse infestation and high incidences of trypanosomiasis against a background of reduced effectiveness and availability of drugs to treat the disease and the frustrations caused by the unsustainable approaches to eliminate the tsetse fly vector. The initiative was, on the one hand, inspired by the successful eradication of tsetse flies from Zanzibar which demonstrated the technical feasibility of achieving the sustainable elimination of trypanosomiasis, and on the other, encouraged by results of economic studies, showing the economic justification of tsetse eradication.

In their Summit meeting held in Lome, Togo in July 2000, the OAU Heads of State and Government passed Decision AHG/Dec.156 (XXXVI) seeking to eradicate tsetse flies from the Continent of Africa. In accordance with this Decision the Secretary General of the OAU was charged with the task of initiating and co-ordinating a Pan African campaign and requested to undertake all necessary consultations with possible partners to seek their support and co-operation in the implementation of the Pan-African Tsetse Eradication Campaign.

Following the Decision by the African Heads of State and Government, urging OAU Member States to embark on a Pan African Tsetse and Trypanosomiasis Eradication Campaign (PATTEC), the OAU Secretary General commissioned a Task Force of experts to review proposals and recommendations and design a Plan of Action for the implementation of the Summit Decision on tsetse eradication. The Task Force met in December 2000 in Nairobi and drew up a Plan of Action prescribing the initiation and execution of PATTEC.

The Plan of Action recommended the adoption of an area-wide approach and proposed the identification of "islands" of tsetse infestation within geographic, biological or artificial barriers, each of which can be rendered tsetse-free by a combination of intervention methods, including trapping, use of insecticides and the application of the Sterile Insect Technique (SIT). The aim is to produce an ever-expanding tsetse-free zone in a systematic, sustainable manner. The PATTEC initiative is based on a plan to identify zones of isolated or confined infestations of tsetse flies, each of which is then eliminated, in an area-wide approach.

The OAU General Secretariat has now established a PATTEC Co-ordination Office, at the OAU Headquarters in Addis Ababa.

In February 2001, with the assistance of the International Atomic Energy Agency (IAEA), an expert was appointed to assist the OAU General Secretariat in the initiation and co-ordination of the campaign.

To be effective in the execution of the campaign, it was deemed necessary for all affected countries, all stakeholders and all players, whose interest or mandate is relevant to the implementation of the campaign, to exercise concerted action and maximize synergy in all operations.

The tsetse and trypanosomiasis problem is trans-boundary in nature. The PATTEC co-ordination office shall provide a mechanism through which intervention protocols on tsetse belts shared between different countries will be discussed and executed.



The OAU General Secretariat has initiated a dialogue with the Government of Ethiopia, with a proposal for the establishment of a Regional Centre for Tsetse Eradication to serve all Member States in the provision of sterile male tsetse flies, and offer facilities for research and training. Through PATTEC, the OAU General Secretariat is also seeking to provide a mechanism through which the planning and activities of FAO, WHO and IAEA on tsetse can be united for better co-ordination and coherence.

### **Consultations**

- Sensitization of OAU Member States to highlight the implications of the Decision by the Heads of State and Government and the framework for the implementation of the tsetse eradication campaign. Inclusion of the obligations of the campaign in national plans and programmes.
- Consultations with mandated organisations (especially FAO, IAEA and WHO) to harmonise activities and restructure policies governing programmes in related fields to emphasize the objectives of the area-wide approach to tsetse eradication.
- Consultations with donors to create the necessary awareness and sense of urgency, focus and priority. To highlight the fact that tsetse-transmitted disease represents a major constraint to socio-economic development and is one of the principal causes of poverty in Africa.

### **Operational Activities of PATTEC**

- Identification of the principal zones of tsetse infestations.
- Description and evaluation of the *modus operandi* and inputs required for eradication of identified zones of tsetse infestation (i.e. preparation of a project document).
- Creation of regional tsetse eradication centres for mass rearing of tsetse flies and research on intervention characteristics and training. Concentration and pooling of efforts will be instrumental for the success of a Pan African campaign.
- Training of cadres and operational focal points. The Pan African SIT Forum will assist and other partners are invited to collaborate in the design and implementation of specific training courses on the preparation, planning and detailed implementation of various components of an integrated area-wide campaign for creating tsetse fly free zones. Courses will target the principles of baseline data collection, initiation of GIS based land use planning and the preparation of specific project documents.
- Mobilizing resources for identified requirements of the activities of the campaign.
- Involvement in the development of national and regional plans for the eradication of tsetse flies.
- Providing information on the plans, progress and problems of the tsetse eradication campaign in all affected Member States.
- Preparation of Presentation Packages tailored to specific target groups (tsetse/trypanosomiasis affected countries, donors, national or regional/interregional stakeholders, including NGOs) will be prepared and disseminated.

### **Success Stories**

PATTEC recognises the need to generate success stories in the near future, in order to substantiate the feasibility of creating tsetse-free zones as a prerequisite for raising the substantial international support required for long-term and larger scale intervention campaigns. Concurrent with the recommendations of international expert groups, PATTEC ranks the following areas/countries as priority areas for the establishment of tsetse-free zones in Africa:

- Ethiopian Valley systems;
- moist savannah areas in West Africa, the “cotton belt”;
- the Okavango Delta in Botswana, followed by an expansion of the tsetse-free zone into Namibia and southern Angola.

Priority should also be given to other areas, where the preparations (baseline data collection; economic sensitivity analyses; steps for land use planning, etc, in respect of each proposed project) for active intervention are reasonably advanced and the commitment of the Government authorities and/or other key stakeholders is already evident. Such opportunity areas include:

- the Lake Victoria basin (including Kenya, Tanzania, Uganda);
- the border zone of South Africa with Mozambique;
- the tsetse infestation zone in Zimbabwe;
- island situations (for example: Mafia Island in Tanzania, Buvuma Islands in Uganda).

### **PATTEC Management**

- In accordance with the Decision by the OAU Heads of State and Government the OAU Secretary-General shall be the one in charge of the tsetse eradication campaign.
- The Secretary General is expected to submit a report to the Summit of the Heads of State and Government, on the progress made, every year.
- The Secretary General may appoint high profile personalities, to act as Patrons or Goodwill Messengers, who will assist PATTEC in the tasks of raising awareness and generating funds.
- There shall be a Policy and Mobilisation Committee whose members shall include people in positions of high responsibility who have expertise or experience in the management and support of similar campaigns. This committee shall be responsible for policies on the administration and finances of the campaign.
- A Technical Advisory Committee will be established to provide technical guidance to the PATTEC Co-ordination Office and the Policy and Mobilisation Committee. The Pan-African SIT Forum will participate in the Technical Advisory Committee and assist the PATTEC Co-ordination Office in the design and execution of relevant training programmes and in the dissemination of relevant technical information.
- Dynamic animators will be identified in the affected countries to act as Operational Focal Points to assist the PATTEC Co-ordination Office in follow-up activities.

### **Development of publicity and public relations materials**

- Promotion of awareness and lobbying for support and understanding shall require well-prepared publicity materials, including videos, books and booklets, charts and pamphlets, calendars and diaries, etc.
- Articles directed at different readerships, describing the problem of tsetse and trypanosomiasis, the PATTEC initiative and benefits that will arise from the elimination of the problem will need to be written.
- Scripts for TV and radio shows and interviews will be prepared.
- The assistance of efficient professional public relations experts will be enlisted to ensure production of effective publicity materials and products.
- Special articles and papers for presentation at conferences, international meetings and other audiences will be prepared.
- Material and news items featuring the plans, progress and execution of the PATTEC initiative will be prepared.

- Organizations and institutions that have been producing publicity materials or that have the facilities that could be used to produce publicity materials for publication will be approached to and requested to assist PATTEC.

### **Identification, training and equipping of national Operational Focal Points (OFPs)**

- In order to initiate and intensify action in the tsetse eradication campaign, it shall be necessary to identify key individuals in the affected countries who can serve as dynamic animators to mobilise local understanding and support for the objectives of the campaign. The Operational Focal Points (OFPs) should be persons who occupy positions of responsibility, and are appropriately motivated and mandated on tsetse issues.
- The OFPs shall be trained in standard procedures of tsetse eradication technology and equipped to form a nucleus around which the tsetse eradication campaign activities can be initiated and enhanced to grow.
- The OFPs will form a network of the PATTEC system and serve as the contact points with the PATTEC Co-ordination Office.
- The terms of reference of the OFPs will be developed by the PATTEC Co-ordination Office in consultation with the affected countries, the Pan African SIT Forum and the Technical Advisory Committee.

### **Development of criteria for selection of project areas and preparation of project proposals**

- Attempts will be made to apportion the entire tsetse belt on the African continent into potential project areas, comprising isolated, confined or isolatable zones of infestation of particular tsetse fly species.
- Use will be made of GIS data, satellite imagery maps and vegetation indices, known information on tsetse density and distribution.
- Confirmatory baseline data will be collected in entomological, parasitological and socio-economic field surveys to guide formation of project structure, characteristics and implementation protocol.
- Criteria will be developed for purposes of determining project area size and delineation, choice of applicable strategies and methods, location of facilities, exploitation of tsetse-free land, etc.
- Preparation of project documents as bankable project proposals.

### **Management, Monitoring and Evaluation of tsetse eradication projects**

- Each project will have an independent management team, with a clear mandate and autonomy for the execution of the objectives of the project.
- As much as possible each project will be managed in accordance with the provisions of the project document schedule.
- PATTEC will be involved in the monitoring and evaluation of projects to keep track of the progress of project implementation and to exercise its role of giving direction and stimulating activity.
- Management teams for projects covering more than one country will be appointed through the PATTEC Co-ordination Office in close consultations with the affected country authorities.
- PATTEC will provide a mechanism of co-operation and mediation between country authorities in transboundary aspects of the campaign.

### **Mobilization of Resources**

- One of the principal functions of PATTEC will be to source the human, material, and financial resources required for the execution of the campaign.

- The principal players in the activity of resource mobilisation will be the office of the OAU Secretary General and his appointed representatives.
- The principal mechanism of resource mobilisation will involve the inclusion of tsetse issues among the priorities and national development plans of affected countries.
- A Donors' Conference will be held at which representatives of all likely donors will be invited.
- The Donors' Conference shall be preceded by lobby work, sensitization missions and consultation meetings led by the Secretary General or his appointed emissary.
- Pledges will be solicited and announced.
- Approaches will be made to potential donors with specific requests comprising evaluated project proposals. Patrons and members of the Policy and Mobilisation Committee will assist the Secretary General in lobbying work for resource mobilization.

## Appendix 14

### **The role of trypanotolerant livestock in the context of the methodological approach for tsetse-trypanosomiasis control/eradication strategies with particular reference to West Africa**

#### **K. Agyemang**

The control of tsetse-trypanosomiasis in West Africa and in other regions of the continent, has historically been the domain of government investment for the good of the human populations in tsetse-infested areas. Tsetse eradication is contemplated on a large scale on the African continent but meanwhile integrated control is seen as a better approach in dealing with the tsetse-trypanosomiasis problem in view of limitations of existing control methods when applied independently. The objective of the current study is to provide overviews on the current thoughts and views on the nature of the tsetse-trypanosomiasis problem, various options for controlling the disease complex, the limitations of these control options, and to synthesise this information to provide a guiding principle that will facilitate the defining of the role of trypanotolerant livestock in an integrated approach to combat tsetse-trypanosomiasis. The study aims ultimately to provide a framework that can contribute to the decision making process of determining where, and under what circumstances might trypanotolerant livestock be used economically and sustainably to combat the tsetse-trypanosomiasis problem. The early methods of tsetse control included widespread bush clearing to destroy tsetse habitats. The major short-coming of these methods lie in the limited size of area for which they can be economically deployed relative to the total size of tsetse-affected area and the continual costs associated with preventing re-invasion. The use of trypanocidal drugs to control trypanosomiasis represents the most widely used approach. The most serious setback in the use of drugs to control trypanosomiasis is the increasing trends in drug resistance. The exploitation of the genetic resistance to trypanosomiasis through the use of indigenous ruminant livestock is one approach in the control of the disease. Limitations include relatively small numbers of trypanotolerant livestock breeds and the perception among some producers that because of their small size, they are less productive. There is now productivity and economic data that show that these animals are competitive, even in low tsetse density areas. Their current use in production systems in tsetse affected areas in West Africa reduces the tsetse trypanosomiasis problem and permits the realisation of outputs that provide livelihoods to those who keep them. The deployment of any integrated control of tsetse-trypanosomiasis must be based on quality information, not only on abundance of tsetse flies, infection rates in them, as well as in the host livestock but also on how the livestock owners view the extent of the problem. Factors and issues deemed to have important bearing on the role trypanotolerant livestock include changes in production systems, societal or market valuation of trypanotolerant stock, the numbers of trypanotolerant stock, scientific breakthroughs in disease control and improvements in level of tolerance. Since these factors or elements of them are themselves variable, that is changing overtime, an analytical framework (3 x 3 matrix) which considers the temporal element, past, present and future with respect to knowledge, perceptions, technology, etc, on one axis, and ecological zone/production systems, namely the semi-arid, the sub-humid and the humid zones, where tsetse infestation pose considerable constraint to livestock production, is proposed. The procedure appears robust in analysing the potential roles trypanotolerant livestock may play in integrated control.

## Appendix 15

### Options for tsetse eradication in the moist savannah zone of West Africa technical and economic feasibility: phase 1 – GIS-based study

#### L. Budd

This study, which is being funded by the Joint FAO/IAEA Division, commenced in November 2000 and through a series of workshops and individual study projects is investigating the technical and economic feasibility of tsetse eradication projects in the Moist Savannah Zone of West Africa. The study itself is still ongoing and will be completed shortly. Even though the study is not yet complete a series of issues have been identified and interim conclusions can be drawn.

#### Issues

- Projects should be considered only where it is currently technically feasible to eradicate flies, i.e. where the fly is most vulnerable.
- *G. tachinoides* is the most important species in terms of transmission and projects should be designed with this in mind.
- Preventing re-invasion is potentially the major project cost and projects should be designed in order to reduce the risk of re-invasion.
- On technical and economic grounds the river basin would appear to be the optimum size of project as there is little or no transfer of flies from one river basin to another.
- The potential for conflict between sedentary farmers and pastoralists over the use of newly tsetse free areas is high.
- In some areas there is the potential for land degradation caused by overgrazing resulting from increased productivity in tsetse-free areas.
- Sleeping sickness is not a major determinant when locating projects.
- Land pressure, land clearing, settlement and farming virtually eliminate the presence of *G. morsitans*.
- The PAAT GIS provides spatial predictions but is not able to incorporate the time effect or inter-pixel movement of cattle or humans.
- Where baseline data are available they are collected on a local government area basis. These data have to be interpolated for projects which cross local and national boundaries.
- The need for an environmental impact assessment of tsetse eradication.

#### Preliminary Conclusions

Preventing re-invasion could be the major project cost.  
Cost-Benefit ratios look promising.

## Appendix 16

### **Policy, strategy and institutional structure for setting-up and implementing tsetse-trypanosomiasis control and/or eradication**

#### **A.A. Ilemobade**

The author presented this study based on socio-economic observations. He presented various possibilities of selective intervention based on:

- Vulnerability of the tsetse species to be attacked;
- The potential for maximizing benefits;
- The presence of natural barriers;
- Potential for increased cash crops;
- Increased use of animal traction;
- Securing funding necessary for intervention;
- It is also important to consider land use after the removal of tsetse flies. Equally important is farmer or community group commitment to the success of intervention
- The methodology depends on the prevailing circumstances;
- Simple technology (traps, targets);
- Area-wide approaches.

#### **Institutional structure needs:**

- Trained man-power;
- Structure for control of tsetse (departments);
- Research institutes for back-stopping;
- Strengthen NARS to enable them to contribute effectively;
- Increase regional co-operation;
- Implement tsetse control or eradication.

Appendix 17

List of participants

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