

**PROGRAMME FOR ENHANCING THE DIFFUSION
OF NEW TSETSE CONTROL TECHNOLOGIES
FOR IMPROVED LIVESTOCK HEALTH AND PRODUCTIVITY IN SMALLHOLDER
INDIGENOUS COMMUNITIES OF SUB-SAHARAN AFRICA**

Abstract

*The abstract should provide the following information:
the project title, the main research outcomes/impacts, the replicability perspectives (scaling-up/out) and
the overall context in which the research has been conducted
(geographical, political, socio-cultural and economic dimensions).*

Tsetse-fly-transmitted trypanosomosis remains one of the major disease constraints on improved livestock production in sub-Saharan Africa. It directly reduces productivity in cattle, contributes to mortality, and discourages the use of more productive and improved breeds in infested areas. Particularly affected are pastoral and agropastoral communities, comprising a population of approximately 260 million, among the poorest in Africa. Current control relies on three principal strategies: trypanocidal drugs, trypanotolerant cattle and tsetse control or eradication; although trypanocidal drugs are the most common methods of trypanosomosis control, their use as a sustainable method to prevent or treat disease is limited by cost, availability and growing drug resistance, particularly threatening to future control.

The research programme No. 554 “*Programme for enhancing the diffusion of new tsetse control technologies for improved livestock health and productivity in smallholder indigenous communities of sub-Saharan Africa*” furthered the development of a novel repellent-based technology for tsetse control for improving livestock health and productivity in smallholder communities of Sub-Saharan Africa. The ultimate goal was to reduce poverty among pastoral and agropastoral communities whose livestock are at risk of trypanosomosis. The specific objective of the project was to accelerate the adaptation and transfer to livestock keepers of a new, more cost-effective, biocontrol technique to combat trypanosomosis by adopting a Research & Development approach used by the private sector, including : (i) optimising the technology; (ii) evaluating the prototype version of the technology with target users; and (iii) developing a plan for translating the technology into a commercial product.

Main beneficiaries of this research programme were pastoralists and agro-pastoralists livestock keepers in marginalized rural areas of Sub-Saharan Africa where the research programme recorded the following impacts on:

- *Human capital*: Increased knowledge and technical skills of pastoralists and local students involved in the research activities through fellowships,
- *Social capital*: Development of collaboration among private sector, NARS and advanced research institutes,
- *Natural capital*: Reduced incidence of trypanosomosis and increased milk and meat productivity.

The prototype technology did not prove to be viable for immediate commercial production and is still under development.

**Main successful technical
components of the
research programme:**

- Development of a prototype synthetic repellent for tsetse control suited for transhumant communities – as it affords mobility;
- Identification of the repellent blend responsible for making waterbuck refractory to tsetse.
- Technical and socio-economic evaluation of prototype technology under representative field conditions completed.

SECTION ONE: THE INSTITUTIONAL CONTEXT

The project within the IFAD context, relevance to/linkages with other IFAD programmes/initiatives, implementing partners and main activities carried out.

- Existing linkages with other IFAD initiatives:

- Grants:

- Loans:

- Grant No.284 “*Integrated Approach to the Assessment of trypanosomosis Control Technologies & their Impact on Agricultural Production, Human Welfare & Natural Resources in the Tsetse-affected areas of Africa*” (phase I and II).

- [*Umutara Community Resource and Infrastructure Development Project*](#), Rwanda

Collaboration explored with the following Loans, but all were in transition phases:

- [*The Mara Region Farmers Initiative*](#), Tanzania;

- [*Kagera Agricultural and Environmental Management Projects*](#), Tanzania;

- [*The Southern Province Household Food Security Project*](#), Zambia;

- [*The Family Sector Livestock Development Programme*](#), Mozambique;

- [*Pastoral Community Development Project*](#), Ethiopia

- [*South Kordofan Rural Development Project*](#), Sudan

- Target regions and implementing partners:

- Zambia, Tanzania, Uganda and Kenya (Nguruman and Narok pastoralist areas of Southern Kenya).

- ILRI was the grant recipient, and *icipe* and KARI-TRC (former KETRI; Kenya NARS) were the implementing partners.

SECTION TWO : THE PROGRAMME IMPLEMENTATION

The research programme:

Description of the technology/participatory methodology/approach developed, costs of the inputs used to implement the research programme, rural areas and context where the research has been implemented (specifying environmental conditions)

- The research programme has been developed around 5 main components, namely:

- i.Optimizing the prototype tsetse repellent through laboratory and field studies;

- ii.Development of an epidemiological model prototype to permit assessing the appropriateness of the technology as a strategy under a range of conditions;

- iii.Testing deployment of the technology as a component of integrated control strategies and evaluating the technical effectiveness of the prototype tsetse repellent technology package through on-farm epidemiological field trials;

- iv.Socio-economic evaluation of “best-bet” control strategies in farmer-managed trials;

- v.Development of a business plan for private-sector production and delivery.

- The technology has been developed through the identification of potent repellents from synthetic sources and from animals un-preferred by tsetse. It has been based on a mild, natural repellent of Savannah tsetse species developed by molecular optimisation studies using structures of a mild natural repellent and attractants associated with tsetse-preferred hosts.

- The methodology used to assess the biological efficacy of the repellent

under field conditions involved trials implemented in the pastoral and agro-pastoral area of Kenya (Nguruman and Narok area). During the year-long longitudinal epidemiological evaluation, pastoralists were able to monitor the presence of tsetse on their animals and evaluate for themselves if the repellent worked. Other fields trials conducted by *icipe* indicated that repellents could be integrated with other tsetse control options like traps to enhance tsetse suppression rates and reduce disease incidence.

- The findings from laboratory and field studies reported by *icipe* indicated that significant effects of the repellent on disease incidence, and incorporating additional components isolated from waterbuck odours strengthen the effectiveness of the repellent.
- Researchers at *icipe* produced the repellent in-house via a synthetic route indicating the potential of scaled-up production by local entrepreneurs. In this way, the costs have been reduced from US \$ 875 per kg when commercially purchased in small quantities for research purposes, to US \$ 474/kg in the first year to US \$ 225/kg in the second year. It is anticipated that the costs could be further reduced through scaled-up production and if cheaper sources of raw materials can be identified (China, India or Korea).
- However, independent, rigorously designed field trials conducted by ILRI and KARI-TRC did not confirm technical effectiveness of the prototype technology, defined as reducing herd-level incidence of trypanosomosis by 50% in herds having all animals carrying the repellent. Insufficient effect was attributed in part to difficulties encountered with the collar and dispenser design which incurred frequent damage.
- Socio-economic evaluation with farmers found farmer interest in using the technology, but raised questions about its ability in its form to compete with existing control options.
- The project demonstrated the value of applying a private-sector R&D approach for moving forward the development of a potential technology for commercial use, and successfully identified issues that need to be addressed if the technology is to become a viable candidate for commercial development.
- Use of mathematical population and disease transmission dynamics modeling helped to explain the results, and could be used to predict expected effects of the technology under a variety of conditions and when integrated with other control techniques, permitting better justification and design for costly field trials.

Target group and impact:

Description of the target group, the beneficiaries and the benefits and the main research outcomes/impacts (vulnerable groups, project impacts and effects on the human, social and natural capital).

- *Impacts on the human capital:*
- *Impacts on the social*

Project target group :

Pastoralists and agro-pastoralists livestock keepers in marginalized rural areas of Sub-Saharan Africa.

Impacts on the human capital:

- Increased knowledge and technical skills of pastoralists – 110 farmers and 134 Masai pastoralists have been trained in basic tsetse biology and ecology, trap construction, deployment and servicing and in maintenance of repellent dispensers;
- Increased scientific knowledge of local graduate students involved in the research activities through fellowships, several of which were NARS staff.

Impacts on the social capital:

capital:

- *Impacts on the natural capital:*

- Development of collaboration among private sector, NARS and advanced research institutes;
- Enhanced linkages among pastoralists.

Impacts on the natural capital:

- Reduced incidence of trypanosomosis and increased milk and meat productivity (note: these impacts were not confirmed statistically);
- Toxicological acceptability of the repellent in terms of having no adverse effects on the health of the exposed animals, mainly goats;

The gender dimension:

Women's role in the research programme, impacts on the gender equity and women's empowerment.

Women in pastoralist systems in sub-Saharan Africa are responsible for many livestock-related activities such as care and management of animals or transformation and marketing of certain livestock products (especially milk). Effective trypanosomosis and tsetse control increases the productivity of these activities, both in terms of income and food security, and thereby improving the benefits for women.

Accessibility:

Identification of the physical availability of the research outputs in different time and places as well as their affordability by the rural poor.

The affordability of the repellent by the rural poor still remains an issue to be addressed in terms of being able to produce and market it at a sufficiently low cost to compete effectively with existing insecticides and trypanocides.

Constraints faced during the programme implementation:

Difficulties faced during the implementation of the research programme, specifying the internal (limited infrastructure, lack of inputs etc) and the external (socio-political and environmental aspects) constraints.

Constraints related to:

- *Internal conditions:*
- *External conditions:*

Constraints related to the internal conditions:

- Substantial damage to the repellent collar and dispensers in farmer herds;
- Weak netting material for the trap technology.
- One of the original implementing partners, KETRI, underwent institutional realignment within the NARS (merged with KARI and became KARI-TRC), creating a period of uncertainty and delays.
- ILRI lost critical epidemiology capacity to support its role in the project when one of the PIs moved to a management position. External consultants were used to fill this gap.
- The quantities and cost of repellent supplies required for the various activities was substantially underestimated, contributing to delays in initiating the field evaluation trial and a reduction of activities among the planned researcher-managed trials.

Constraints related to the external conditions:

- Site selection: the original field research site was found to be too small for the various field trials undertaken by the project, so delays and added expenses were incurred to evaluate alternative sites.

Institutional sustainability and degree of farmers' involvement in the research programme:

Underlying the degree of farmers' meaningful involvement in the definition and implementation of the main research steps/research process - which determines also the level of social and psychological acceptability- and explanation of the measures taken to support the institutional, organizational and professional changes at all levels.

- The approach used during the implementation has been focused on the engagement of rural communities especially in validating the new repellent technology, working towards its appropriate adaptation to local conditions.
- During and immediately after the trials, livestock keepers' attitudes, preferences and perceptions on the impact of repellents and other tsetse and trypanosomosis control options have been assessed.
- However, within the timeframe of the project it was not possible to refine and validate the technology in different agro-pastoral regions as well as make it ready for a wider diffusion to livestock keepers.
- NARS and government staff were directly involved in the research and so will be able to support the continued development and eventual commercialization of the technology, as well as its licensing.

Dissemination pathways:

Description of the ways through which the project results are made available at the village level and at the national/international level (workshops, reports, seminars etc).

- *The communication strategies at the village level:*
- *The communication strategies at the national and international level:*

The communication strategies at the village level:

- Baraza (kiSwahili for community meeting) were held with participants and other community members to explain the research and address concerns, both before and during the field work.
- Farmer to farmer dissemination and field trials.

The communication strategies at the national and international level:

- Participation of Department of Veterinary Services and University of Nairobi staff on the Programme Steering Committee;
- Articles published in local newspapers;
- Interviews with livestock owners broadcasted on Kenya Television Network (KTN);
- Highlighted during DFID Animal Health Programme workshop "Recent advances in livestock keeper-based tsetse control: the way forward", Nairobi 2004, and published as a DFID report
- Regional, national and international workshops and conferences;
- Scientific reports and papers;
- Articles posted on Agfax by Wren media of U.K. (www.agfax.net);
- 7 *icipe* scientific articles published in international journals.

Further research needs:

Identification of the new areas considered to be relevant and needed to be taken into account since they influence the adoption and/or the relevance of the research results (new problems or links not investigated by the research).

- To technically refine the dispenser to improve its robustness for field deployment;
- To continue evaluating the inclusion of the developed technologies in the integrated control of trypanosomosis, reducing reliance on drugs;
- To investigate cheaper sources of raw materials in other countries such as China, India or Korea in order to reduce production costs for the synthetic repellent material;
- To undertake additional validation trials when evidence confirms the investment is merited;
- To develop an appropriate commercial strategy with local entrepreneurs to ensure a future rapid delivery to the intended users (namely, pastoralists and agro-pastoralists).

SECTION THREE: USEFUL INFORMATION

Vocabulary:

Trypanosomosis: animal disease that constraints livestock productivity and agricultural development across much of sub-Saharan Africa.

Keywords:

Trypanosomosis, cattle disease, tsetse control, acaricides.

Useful links:

IFAD: <http://www.ifad.org/lrkm> - ILRI: www.cgiar.org/ilri - PAAT: www.fao.org/PAAT/html/home.htm

Livestock and gender: <http://www.fao.org/WAIRDOCS/LEAD/X6106E/X6106E00.HTM> - *icipe*: www.icipe.org

References:

www.fao.org/ag/againfo/programmes/en/paat/home.html

Main subjects are:

Animal Health; Animal Production; Livestock and Environment; Food and Feed Safety; Genetic Resources & Reproduction; Poverty Alleviation; Sector Analysis and Policy; Veterinary Public Health and Livestock & Gender

www.ilri.org/ilripublication/ShowDetail.asp?CategoryID=NEWS&ProductReferenceNo=NEWS%5F060419%5F001

Women and Livestock

www.ilri.org/research/Index.asp?SID=6 People, Livestock and Environment

A list of *icipe* and ILRI publications is available also at IFAD upon request.

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Acronyms:

- *International agricultural research centers:*

ILRI: International Livestock Research Institute (member of the CGIAR).

icipe: International Centre for Insect Physiology and Ecology.

- *NARS:*

KARI: Kenya Agriculture Research Institute.

KARI-TRC: Trypanosomiasis Research Centre (former KETRI: Kenyan Trypanosomosis Research Institute).