FARMING IN TESTSE CONTROLLED AREAS

OAU/IBAR EASTERN AFRICAN REGIONAL PROGRAMME

KENYA PROGRAMME

IMPLEMENTATION DETAILS

3162.06

StockWatch Ltd. Nairobi May 1995

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FARMING IN TESTSE CONTROLLED AREAS

KENYA COMPONENT EASTERN AFRICAN REGIONAL PROGRAMME

FINAL REPORT

EC Service Contract No: KEN/L.F.-TSETSE/94

StochWatch Ltd. Nairobi May 1995

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, LOGICAL FRAMEWORK

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Intervention logic Objectively verificable indicator Samuel Samuel

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and the second se				
	Intervention logic	Objectively verifiable indicators	Sources of verification	Assumptions
Overall objective	Improved welfare of the people of the region	- % secondary school children which are female	- Min of Educ, star's and sociologists survey -	
Project	Increased livestock productivity	- decrease in cow:calf ratio	- Project and DLPO reports	Increased consumer demand for livestock products
icsults	1. Tsetse and trypanosomiasis control	1. Tsetse and trypanosomiasis control	1. Tsetse and trypanosomiasis control	1. Tsetse and trypanosomiasis control
	- precise information on extent of tsetse infestation and on trypanosomiasis prevalence	- accurate teetse and tryp's distribution map	- KETRI and district zoologists' reports	- effective tsetse controi in Uganda
	- reduced tsetse infestation and tryp's transmission	- number of functional traps installed and a 95% reduction in number of files per trap per day	- trap attendants' and field assistants' reports	- tryp's is the major disease constraint
	- reduced tryp's prevalence in livestock	- 90% reduction in prevalence of tryp's infections in cattle and a 95% reduction in the prevalence of <i>T.Sracei</i> infections	- DVS report	
	- reduced mortality in livestock, increased calving rates, increased number of draught animals	- 10% reduction in cattle mortality per year, 20% increase in no. of calves per cow per year and a 10% annual increase in the no. of draught animals	- DL2O report	
	- reduction in no. of reservoir hosts of human infective trypanosomes and human SS	- no. human sleeping sickness cases	- MoH statistics	
sults	2. Education and training - project sums understood and supported by GoK officials and NGOs	2. Education and training • no. of GoK officials and NGOs attending project seminars	2. Education and training - project reports	2. Education and training - continued operation of participating NGOs in the region
	- efficient project management	-3 zoologists and 3 project staff trained in management	- bolect under stronder	
	- widespread awareness and understanding of project auns throughout the districts	- no. of households aware of project and no. of households supportive of the project aims	- sociologist's reports	
	 farmers using improved livestock husbandry practices in relation to tryp's control 	- no. of farmers using trypanocides and no. of farmers watering cattle away from tsetse babitat	- DLPO and sociologist's reports	
	 communities involved in tsetse and tryp's control activities 	- 192 individuals involved in textse and tryp's commol activities	- DLPO and sociologist's reports	
	- trained farmers participating in demonstration units	- no. of farmers involved in demonstration units	- DLPO reports	

Intervention logic Objectively verifiable indicators Sources of verification Assumptions

	4	1	
Intervention logic	Objectively verifiable indicators	Sources of verification	Assumptions
3. Rural development - livestock production data gathered by DLPO	3. Rural development - reliable livestock production statistics available in both districts	3. Rnral development - DLPO reports	3. Rural development - effective control of other livestock diseases
- livestock keepers with crossbred culves	- 12,000 inseminations per district per year	- project veterinarians reports	
- bull keepers generating income from bulls	- 100 grade bulls supplied to farmers by end of	- project veterinarian's and DLPO reports and	
•	livestock keepers with crossbred cattle by end of project		• • • •
- livestock keepers producing and selling milk from zero-grazing units	- 40 viable zero-grazing units by end of year 4 and no. litres mile day sold by the units	- project veterinarian's and DLPO reports and farmers records	
- other non-specified rural development activities			
4. Institutional strengthening - efficient project management and integration of MALDM and KETRI activities with project activities	4. Institutional strengthening - no. of Gok KETRI staff involved in project activities	4. Institutional strengthening - project reports	4. Institutional strengthening
- active disease surveillance by DVS staff	- no. of blood samples processed per month	- DVS reports	
 data on tsetse intestations, tryp's prevalence and prevalence of other diseases and data on cattle numbers and productivity 	- 20. and accuracy of MALDM reports	- project reports	
	Intervention logic 3. Rural development - livestock production data gathered by DLPO - livestock keepers with crossbred calves - bull keepers generating income from bulls - livestock keepers producing and selling milk from zero-grazing units - other non-specified rural development activities 4. Institutional strengthening - efficient project management and integration of MALDM and NETRI activities with project active disease surveillance by DVS staff - data on tsetse intestations, tryp's prevalence and prevalence of other diseases and data on cattle numbers and productivity	Intervention logicObjectively verifiable indicators3. Rural development - livestock production data gathered by DLPO3. Rural development - reiable livestock production statistics available in both districts- livestock keepers with crossbred calves - bull keepers generating income from bulls- 12.000 inseminations per district per year - 12000 inseminations per district per year - 40 viable zero-grazing units by end of year 4 and no. livestock keepers milk day sold by the units- divestock keepers producing and selling milk from zero-grazing units- 40 viable zero-grazing units by end of year 4 and no. NETRI activities with project activities- active disease surveillance by DVS staff numbers and productivity- no. of GoK KETRI saff involved in project activities- active diseases survei	Intervention logic Objectively verifiable indicators Sources of verification 3. Rural development - livestock production data gathered by DLPO 3. Rural development - DLPO reports - livestock keepers with crossbred calves - 12.000 inseminations per district per year - project veterinarian's and DLPO reports and farmers by end of year 4 and no. of livestock keepers producing and selling milk from zero-grazing units - 100 grade bulls supplied to farmers by end of project - project veterinarian's and DLPO reports and farmers records - livestock keepers producing and selling milk from zero-grazing units - 40 viable zero-grazing units by end of year 4 and a. Bres milk day sold by the units - project veterinarian's and DLPO reports and farmers records - other non-specified rural development activities - Lastitutional strengthening - no. of GoK KETRI saff involved in project - Al.DSN modes - active disease surveillance by DVS staff - oo, of blood samples processed per month - DVS reports - DVS reports - data on isetse infectations, tryp's prevalence and prevalence of other diseases and data on cattle - no. and accuracy of MALDM reports - project reports

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Activities	1. Tsetse and trypanosomiasis control - initial tsetse and tryp's surveys and on-going- tsetse monitoring and tryp's surveillance	Means 1. Tsetse and trypanosomiasis control - 23 DVS staff. 192 community members and 22 project staff	Costs (ECU) 1. Tsetse and trypanosomiasis control - District salaries, offices and lab: 778,120 (Including GoK salaries)	1. Tsetse and trypanosomiasis control - cooperation of MALDM and NETRI to monitor tsetse and tryp's during and after the project
	- providing sewing machines to women's groups to manufacture traps and community installing and	- 1 equipped office lab and workshop	- Surveys and monitoring: 90.366	- willingness of the community to participate and to continue with tserse control after the project and no
	servicing traps	- I rehabilitated and equipped office lab	- Comrol: 768.597	sabotage of traps
	- use of pour-ons and trypanocidal drugs on caule	- 6 local office stores		 continued availability of inputs at reasonable price throughout project lifetime and attenvards
	- human sleeping sickness surveillance	- 7 vehicles and 16 motorcycles - 68,475 impregnated traps, 238 bicycles, 60 sewing machines and 2,380 litres of pour-on	· · · · · · · · · · · · · · · · · · ·	- continued availability of typ drugs at reasonable, prices throughout project lifetime and atterwards
		- KETRI and MoH staff		
ctivities	2. Education and training - communication of project aims to GoK officials and NGOs through seminars workshops	2. Education and training - 2 project staff, research institute staff, MALDM and NGO and private sector staff involved in 5 sectors and private sector staff involved in 5	2. Education and training - Education and training: 210,134	2. Education and training - willingness of community and livestock keepers to participate in training and attend drama
	- district zoologist and key project staff attending management training course	courses, 265 community training courses and 120 community barazas and 200 field days		- willingness of community members to undergo training in rap making, installation, maintenance and monitoring
	- education and training of MALDM staff. extension workers and NGOs involved in training and project implementation	- I vehicle and mining equipment		- willingness of farmers to be involved in demonstration projects
	- MALDM staff, extension workers and NGO staff increasing awareness of community in project aims through barazas, drama, posters, etc. and educating			
	- training community participants in testse control and training women in trap manufacture	.х		·
	- training by NGOs of farmers participating in demonstration projects			
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Activities	3. Rural development - establishment of efficient livestock recording systems by DLPO	Means 3. Rurai development - 8 MALDM staff, 10 inseminators, 140 farmers and 9 project staff and NGO staff	Costs (ECU) 3. Rural development - Salaries, office and laboratories: 565,107 (including GoK salaries)	3. Rural development - existence of livestock keepers capable of involvement in demonstration projects
	- establishment of the project AI service	- 1 equipped office/lab	- Specified projects: 502,075	- willingness of veterinarians to set up private
	- provision of grade bulls to farmers	- 40 zero-grazing demonstration units	- Consultants projects: 291,045	burchoez in buoleer nier
	- provision of dairy cattle to farmers	- 100 bull pens		
		- 3 vehicles and 40 motorcycles		
		- 50 liquid nitrogen containers		×
		- 112 buils and 40 hearers		
Activities	4. Institutional strengthening	4. Institutional strengthening	4. Institutional strengthening	4. Institutional strengthening

	- modelation set circuing	A Districtional strengthening	+ manufound strengmenting	A Induction and the decime
	- establishing a PMU under the OAU in Nairobi	PMU:	- PML: 861.989	- Gok financial input to , and provision of
	and the MALDM in the districts	- 9 PMU management staff and office equipment		Veterinary and Livestock Production Services
			- Research salaries, offices and lab's: 336,090	during and after the project lifetime
	- upgrading MALDM capabilities facilities lab's to	- 2 vehicles	(including GoK salaries)	
	allow for adequate monitoring of tsetse			
	populations, disease surveillance and monitoring of	Research:	- Research field activities: 125.388	
4	livestock numbers and productivity	- I hostel, lab and office equipment		
1				
	- upgrading KETRI facilities/labs	- 2 vehicles		
1				· ·

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List of abbreviations

АНА	Animal Health Assistants
Λ1	Artificial Insemination
CAIS	Central Artificial Insemination Station
COCTU	Central Organisation for Control of Tsetse in Uganda
dlpo	District Livestock Production Office
DVS	Department of Veterinary Services
ECF	East Coast fever
EDF	European Development Fund
EU	European Union
GOK	Government of Kenya
ICIPE	International Centre for Insect Physiology and Ecology
ILRAD	International Laboratory for Research on Animal Diseases
ILRI	International Livestock Research Institute
KETRI	Kenya Trypanosomiasis Research Institute
MALDM	Ministry of Agriculture, Livestock Development and Marketing
МОП	Ministry of Health
ΝΛΟ	National Authorising Officer
NDDP	National Dairy Development
NGO	Non Governmental Organisation
OAU/IBAR	Organisation of African Unity/InterAfrican Bureau for Animal Resources
ODA	Overseas Development Administration
PARC	Pan African Rinderpest Campaign
PMC	Project Management Committee
PMU	Project Management Unit

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1. SUMMARY

This document provides the details for the Kenya component of the Kenya/Uganda regional proposal entitled "Farming in tsetse controlled areas". The overall objective of the Kenya project is to improve the welfare of the people of the region through sustainable rural development and the project purpose is increased livestock productivity. Increased livestock productivity will be achieved in integrated crop/livestock production systems which will increase food security. Improved animal health, management and nutrition, and the gradual upgrading of the indigenous stock will result in an increase in livestock products.

The programme will be implemented in Western Kenya in three districts bordering Uganda, which have a history of human sleeping sickness. The project districts have fertile soils and receive adequate rainfall and while over 95% of the land is used for agricultural purposes, the majority of this is subsistence farming. Food production in the area can only be improved through intensification of the crop/livestock production systems. Trypanosomiasis has been identified as the major constraint to livestock productivity in the districts, the disease prohibits the use of traction and the efficient production of meat, milk and manure and is a major obstacle to the introduction of improved breeds.

The programme is a rural development programme with an emphasises on livestock improvement which will be achieved through tsetse and trypanosomiasis control. This will result in increased productivity of the indigenous breeds and together with education and training allow for the gradual upgrading of these cattle. No new lands will be opened to livestock, rather the productivity of the existing system will be enhanced.

The tsetse control activities involve the community, particularly women, at all levels and the emphasis will be on the use of traps and synthetic pyrethroids in the form of pour-ons applied directly to livestock. The long term aim of the project is sustainable rural development with tsetse control organised and financed by the livestock keepers. However, at present this is not a realistic goal as the farmers in the area have neither the knowledge nor the means to initiate and sustain tsetse control as their livestock provide little or no income. Education and training in improved land use systems integrating crop and livestock production will be important components of the project. Livestock improvement programmes aimed at a gradual upgrading of the indigenous cattle will be included once some measure of tsetse control is achieved. These involve the establishment of an Artificial Insemination service, a bull scheme and demonstration zero-grazing dairy schemes. Such activities will be integrated with improved animal health, nutrition and water supplies and the increased use of animal traction and manure will ensure more efficient crop production for both human and animal consumption. Surplus income from livestock products and cash crops will provide the means to sustain the testse control activities after the end of the project. The project also aims to fund non specified rural development activities to meet additional felt needs of the community.

The details of these activities, the expected results, the objectively verifiable indicators, sources of verification and assumptions are provided in summary form in the logical framework attached. The first phase of the project will be four years and the contribution from the European Union totals ECU 4,600,000.

Some aspects of the programme will be dealt with, and budgeted for, under the regional component and co-ordinated by the regional co-ordinating unit. These will include environmental monitoring and certain elements of research and training.

2. BACKGROUND

Trypanosomiasis is a major disease in Kenya, and throughout much of sub-Saharan Africa. The disease affects both man and his domestic livestock, and is transmitted by tsetse flies. Trypanosomiasis has played a critical role in the development of the continent and continues to be an important constraint to agricultural development in an estimated 10 million square kilometres. Background information on the disease is provided in Annex 1.

In Kenya the disease is primarily one of livestock and this project preparation study deals mainly with issues related to animal trypanosomiasis. However, in the Kenya-Uganda border area (Annex 2), with which this proposal is specifically concerned, the human disease, sleeping sickness, also exists. The human disease is epidemic in nature with periodic outbreaks presenting a constant threat to the health and economy of the region (Annex 3). Despite enormous expenditure of human and financial resources throughout this century, the control of both the human and livestock diseases continues to be a problem.

Under the auspices of the Organisation of African Unity (OAU) a project was established to integrate activities on either side of the Kenya-Uganda border and a tsetse control programme was started in 1990. The European Union (EU) provides support to the Ugandan Government for sleeping sickness and trypanosomiasis control in south-east Uganda and has now been requested to provide additional funds under a regional programme for both Kenya and Uganda. This document provides details for the Kenya component of the project to be based in Busia and Siaya Districts and that part of Bungoma infested with tsetse fly (Annex 2, Map 2.1).

2.1 Government/sectoral policy

Current livestock development policy in Kenya was specified in Sessional Paper No 1 of 1986. Important components of the policy include (a) improvement in services delivery through gradual privatisation of some aspects of the Veterinary Services, (b) sustainability of services delivery through the introduction of cost recovery, (c) deregulation of milk and beef prices and (d) improvements in the marketing system.

The livestock sector contributes 38%, by value, of the total agricultural output in Kenya (Winrock report). The Government goal of self sufficiency in food production will require

that beef and milk production increase. Sessional Paper No 1 included a proposal for large scale tsetse control operations; this proposal also recognised the importance of regional co-operation and suggested the development of joint control programmes with bordering countries.

The 1994-1996 District Development Plans for Busia and Siaya point to the necessity and potential to increase livestock productivity in the districts. The very low numbers of grade cattle are considered a serious deficiéncy and trypanosomiasis is identified as a major constraint to livestock productivity. Tsetse control is specified under the "Specific Objectives and Targets" in livestock production for both districts.

2.2 Features of sector

The agriculture/livestock sector accounts for over 70% of the total earnings in Siaya District with sugarcane, cotton, beef and eggs cited as the leading sources of income (District Development Plans 1989 - 93). While the sector accounts for a large proportion of total income in the district, the income per household is extremely low. The 1991 estimate was KSh 9,420 (ECU 140 at current exchange rates) per annum per household. Busia District is marginally better off.

Eradication of tsetse flies is not a viable option throughout most of Kenya. Long term, cost effective control using new technologies, with limited use of chemotherapy, is the only realistic strategy. The various tsetse and trypanosomiasis control methods appropriate for this project are dealt with in detail in Annex 4 and Annex 5. The majority of the land is already used for agricultural purposes; the project does not aim to open up new grazing areas but rather to improve the output, in a sustainable manner, from the already farmed land.

If tsetse and trypanosomiasis control is to be effective and sustainable, it cannot depend indefinitely on donors and Government but must depend on the communities whose livestock are threatened and who are the primary beneficiaries of tsetse control. However, given the estimated income from agriculture/livestock outlined above the capacity of the community to contribute at present is clearly close to nil. The accuracy of these figures is undoubtedly questionable but even if a two or three fold inaccuracy is allowed for, a per capita income of KSh 4,000 (ECU 56) per annum to cover housing, clothing, school fees and medical expenses (assuming a self-sufficiency in food) is totally inadequate. The minimum daily agricultural wage in Kenya is less than one ECU per day and these two districts are amongst the poorest in the country.

The single most important factor to be understood in relation to this project is the financial resources of the target group. The assumption that development projects are only sustainable with full cost recovery and that this cost recovery must begin from day one of the project may well be valid in many situations. But the adoption of such a philosophy means that communities which have nothing will continue to have nothing.

Any attempt to achieve sustainable rural development and solve the problems of trypanosomiasis in this region is a very long term task. It must involve not only measures of disease control but also provide education for the community together with opportunities for improved livestock productivity thereby giving farmers the motivation and resources for disease control. The project is seen as consisting of two phases.

Phase 1 (first four years) will aim to improve awareness amongst the community of the important rural development issues in the districts and the benefits of integrated crop/livestock productions systems. Through the project, the veterinary services and OAU/Interafrican Bureau for Animal Resources (OAU/IBAR) will be assisted in their current efforts to introduce the newly developed "appropriate technology" approaches to sustainable tsetse control which have been successful elsewhere in Africa. The potential of indigenous zebu cattle kept free from trypanosomiasis and the benefits accruing from upgrading these cattle will be demonstrated.

In the second phase of the project it is envisaged that the community will themselves begin to take responsibility for tsetse and trypanosomiasis control and the project strategy will be to continue to promote improved livestock practices and more effective land use systems and to enhance agricultural output in an area with high rainfall and reasonable soils (Annex 2, Map 2).

2.3 Beneficiaries and parties involved

The principle beneficiaries of the project, the livestock keepers of the region, are, as indicated above, amongst the poorest in the country. Over 90% of farmers in the area are subsistence farmers and over 50% of households are headed by women who also constitute over 60% of the labour force but rarely hold title to the land they work. Over 90% of the farmed land in both districts is mixed crop-livestock enterprises and in Busia 50% of small holdings produce cash crops. Although the majority of households have some form of livestock, these animals, particularly cattle, are kept as a form of saving for the payment of school fees, dowries etc., rather than for the production of livestock products. Farmers do not have the resources to purchase continual supplies of the therapeutic or prophylaetic drugs required to control trypanosomiasis in livestock and in times of increased tsetse challenge they loose significant proportions of their herds. Under these circumstances very few farmers attempt to upgrade cattle or to produce milk for consumption.

Human and livestock population estimates and details of the two districts together with maps of the tsetse distribution are provided in Annex 2. Only a small portion of the third district, Bungoma, is included in the project area and is similar to that part of Busia which it borders.

2.4 Problems to be addressed

Government policy aims at self sufficiency in food production. In the District Development Plans for the project region, livestock productivity is targeted as one area which can contribute to increased food production.

Land resources in the region are limited and with increasing population pressure the welfare of the poor can only be improved if efforts are made to intensify agricultural production. Livestock plays an important role in this intensification providing traction, manure and increased income per unit land area. As population pressures on land increase, crop-livestock systems become more efficient than systems designed for the separate production of crops and livestock. The costs of producing a tropical animal unit decreases as farming intensity rises. Improved breeds are an essential component of intensification and disease is a major constraint to the introduction of improved breeds into crop-livestock production systems.

Trypanosomiasis has been identified as the most important livestock disease in the project area (Annex 4.4). However, the large scale tsetse control/eradication campaigns of the past are no longer acceptable both because of the high capital requirements and the unacceptable pollution resulting from aerial and ground spraying. With the advent of new, low cost, environmentally benign tsetse control methods vector control is again an option. However, the Government Veterinary Services are no longer in a position to undertake even low cost disease control. The district veterinary offices are ill-equipped and most of what is available, including vehicles, is in a state of disrepair and staff morale is low. Livestock extension services are minimal and attificial insemination virtually unobtainable.

The health of the people and the economy of the region would be greatly improved by a programme designed to control tsetse and trypanosomiasis. Effective disease control together with improved animal husbandry practices will improve the productivity of the indigenous zebu. Following a reduction in tsetse challenge the gradual introduction of improved breeds to selected farms will demonstrate the benefits of enhanced livestock productivity through the production of manure, milk and meat and the availability of animal traction.

2.5 Other interventions

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A number of projects are on-going in Kenya in livestock development and these are listed in Annex 6. All of the programmes listed are in line with the project purpose and the success of several of these programmes will depend on the implementation of tsetse control. Programmes which address tsetse control in the project area will be co-ordinated by the project.

2.6 Documentation available

The GTZ/EC financed "Study for the promotion of Livestock Farming in tsetse infested areas of Kenya." (Lohr and Oloo, 1991) and the GTZ Project Preparation Study entitled "Promotion of livestock farming in tsetse fly-infested areas of Kenya" prepared for the Kenya Ministry of Livestock Development and financed by European Development Fund Project No.5100 35 32 012 (Eschorn, March 1992) were the first documents prepared for this project. Both studies covered all the tsetse infested areas in Kenya. These documents were followed by a number of financing proposals for various areas of the Kenya/Uganda region, culminating in a financing proposal prepared by the EU in Brussels in November 1993. All of these documents are listed in Annex 6

A number of other documents and publications which also provide important background information for this project are also listed in Annex 6.

3. INTERVENTION

3.1 Overall objectives

The overall objective of the project is to improve the welfare, which encompasses both the health and prosperity, of the people of the region. Both districts have high rainfall and adequate soils to support intensification of agriculture and the District Development Plans (1994-1996) state self sufficiency in food production as a development goal. The project can contribute to this goal by increasing the productivity of existing crop/livestock production systems. Increasing livestock productivity will enhance protein intake and provide a surplus of livestock products for sale as well as providing manure and traction for crop production. Improved health will accrue from improved diet. The reduced risk of human sleeping sickness, which in the past has had devastating effects on the people of the region (Annex 3), will further enhance the general well-being of the population.

Reliable Government statistics which could measure the impact of rural development programmes on the welfare of the communities are not available. However, a simple indicator of increased family prosperity is the ability to educate children through secondary school. This particularly applies to female children as secondary education for girls is only considered if the labour requirements of the household are realised and there is surplus income. The objectively verifiable indicator of the overall objective of the project will be the proportion of children, attending secondary schools in the districts, which is female. Current secondary school enrolment (ages 14 -18) in Busia is 1 boy to 0.74 girls and in Siaya is 1:0.68. The primary school enrolment ratio in Siaya is 1:0.98; the comparable figure for Busia is not available.

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3.2 Project purpose

The project purpose is increased livestock productivity. Animal trypanosomiasis is a major constraint to livestock productivity in Busia and Siaya, reducing the productive potential of the indigenous breeds and precluding the introduction of improved breeds. The project aims to increase livestock productivity through improving animal health by control of trypanosomiasis and through the education of the livestock keepers in improved livestock nutrition and management practices.

Once trypanosomiasis control, with full community participation (Annex 5.2), is achieved the project aims to encourage the gradual introduction of improved breeds (Annex 7) together with the necessary education and training (Annex 8) and upgraded veterinary services to ensure the maintenance of these breeds in a healthy and productive state. Through, initially, demonstrating the benefits of improved livestock practices and providing the farmers with the opportunity to obtain upgraded livestock, the project aims to increase farmers' income from livestock. This increased income combined with a heightened awareness of the impact of tsetse and trypanosomiasis will ensure sustainable tsetse control.

There are at present no reliable statistics on livestock productivity in these districts and thus objectively verifiable indicators of the project purpose are not easily obtainable. Furthermore, the statistics available on off-take are complicated by cross border trade with large numbers of Uganda cattle slaughtered in Busia. Limited surveys performed by the Kenya Trypanosomiasis Research Institute (KETRI)/Overseas Development Administration (ODA) project in Busia indicated a cow calf ratio of 4:1 indicative of **a** very poor reproductive rate. Trypanosomiasis frequently results in abortions and its control results in a measurable increase in the calving rate. Also, improved breeds, under **a** good plane of nutrition and disease free, have shorter calving intervals than indigenous breeds. Thus if the project purpose is achieved there will be a significant decrease in the cow:calf ratio.

While the control of human sleeping sickness is not the project purpose in Kenya, as it is in Uganda, the control of tsetse flies will ensure that the risk of the disease is kept to a minimum.

3.3 Results

The objectively verifiable indicators of these results and their sources of verification are specified in the logical framework.

3.3.1 Tsetse and trypanosomiasis control will result in:

A comprehensive knowledge of the tsetse species and their distribution and the trypanosomiasis prevalence in livestock in the project area to establish the baseline data

for the project. Specific targets for tsetse and trypanosomiasis control for each area will be determined once these baseline data are available.

A 90% to 99% reduction in the apparent fly density within two years of the commencement of a control operation in any area and a consequent reduction in trypanosome prevalence in livestock, leading to decreased morbidity and mortality and increased calving rates.

The long term control of human sleeping sickness.

3.3.2 Education and training will result in:

The project and its objectives and purpose being widely understood and supported by Government of Kenya (GOK) officials and relevant Non-Governmental Organisations (NGOs) in Nairobi and at district level.

Three DVS staff and three project staff trained in project management by the end of the first year and eight District Livestock Production Office (DLPO) staff and twelve selected project staff trained in computer use.

DLPO staff establishing effective livestock recording systems and assessing livestock productivity by the end of the first year.

One hundred and twenty community "barazas" (meetings) held in the two districts sensitising the community on issues related to tsetse and trypanosomiasis control.

One hundred and forty four members of the community involved in tsetse and trypanosomiasis control activities and 53 women generating income from trap making by the end of year 2.

Twelve DVS staff trained in new methods of tsetse control.

Ten DVS staff trained in trypanosomiasis surveillance methods.

One hundred and forty farmers running integrated crop-livestock production systems with improved cattle (in the zero-grazing and bull schemes) and an increase in the number of farmers keeping up-graded cattle.

Two hundred field days in the four years in the project area organised by the National Dairy Development Programme (NDDP).

3.3.3 Rural development projects will result in:

DLPO collecting and processing livestock production data and providing reliable estimates of numbers of improved livestock and livestock productivity Increased productivity of livestock farming through improved of take from indigenous breeds and the introduction of improved breeds:

The project Artificial Insemination (AI) service will inseminate 12,000 cattle per year.

One hundred bulls will be provided to farmers under the bull scheme by the end of the first phase (4 years) of the project.

Forty zero-grazing units will be established by the end of the first phase of the project.

A variety of rural development activities to meet the felt needs of the community.

3.3.4 Institutional strengthening will result in:

The establishment of the PMU in Busia and fully equipped offices and laboratories for the DVS in Busia and Siaya to allow effective control and monitoring of tsetse populations and active disease surveillance.

Improved facilities for the DLPO staff to allow effective monitoring of livestock productivity.

Improved accommodation and laboratory facilities for KETRI enabling them to meet the research needs of the project.

3.4 Activilies

The activities required to achieve these results will be:

3.4.1 Tsetse and trypanosomiasis control:

Initial tests surveys will be performed by KETRI in the three districts within the first six months of the project. (Annex 9.1.2). Rehabilitated KETRI vehicles will be used.

Initial trypanosomiasis surveys will be performed by the DVS in collaboration with the project veterinarian within the first six months. Rehabilitated DVS vehicles will be used.

If widespread infestations of G. pallidipes are found, pour-ons will be used for control. The DVS will implement this control programme initially and once significant control is achieved the programme will be handed over to the livestock keepers (Annex 5.3).

Control schemes for G. fuscipes involving the communities will be implemented (Annex 5.2). Women (24 in each district) will be provided with sewing machines and cut material etc. for the manufacture of tsetse traps at local office stores. The community will identify

individuals (72 in each district) to be trained and work as trap attendants. Trap attendants will install and maintain traps and record fly catches in each trap monthly.

The District Zoologist and staff from the DVS (three field assistants in each district), trained in tsetse and trypanosomiasis methodologies, will supervise the community activities and monitor and evaluate the tsetse control programmes through additional monthly tsetse trapping. The DVO of each district and his staff, in collaboration with the project veterinarian, will record the prevalence of trypanosomiasis monthly in selected herds throughout the districts. The project sociologist will assess the response of the community to the control scheme.

A large scale cattle trial using pour-ons for tsetse control together with trypanocides as prophylactics will take place with the collaboration of KETRI (Annex 5.3 and 9.1.4). The impact of the trial on tsetse population density and trypanosome prevalence will be monitored by KETRI. An assessment of the response of the community to the control procedure will be provided by the project sociologist in collaboration with KETRI.

The most appropriate testse control activities for each area will be determined through assessing the willingness of the community to participate and contribute financially to trapping and the use of synthetic pyrethroids and trypanocidal drugs on livestock (Annex 5).

KETRI will implement a semi-active human sleeping sickness surveillance programme (Annex 9.1.5).

3.4.2 Education and training:

Introductory seminars will be held in Nairobi aimed at introducing the project and its purpose to Government officials, other donor agencies involved in related activities and NGOs which operate in the districts (Annex 8.2).

Project/DVS staff, with skills in communication, will be identified and they will introduce the project in the districts through work-shops and seminars. These will be attended by representatives of the District Development Committees, staff and extension workers from all the relevant ministries stationed in the districts and by NGO staff from the districts.

Management training courses will be provided for DVS and project staff. Computer training, particularly in database packages, will be provided for DLPO staff to enable them to collect and compile the data necessary to assess livestock productivity (Annex 8.4).

Training courses will be organised through KETRI and ICIPE (Annex 9.1 and 9.3) for DVS staff in new methods of tsetse control and in trypanosomiasis diagnostic techniques. Junior Animal Health assistants, released through the privatisation of Veterinary Services, will be re-trained in tsetse control.

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Awareness amongst the community of the impact of tsetse and trypanosomiasis will be increased through drama, posters, education and training programmes, with a particular emphasises on women, established with the aid of NGOs, trained DVS personnel and KETRI (Annex 9.6 and 10).

Women's groups will identify women for training in trap making. The community will identify individuals for training in trap installation and trap maintenance.

The project will provide the support necessary to enable NDDP to run animal husbandry courses for farmers, with separate courses for women if required (Annex 7.7).

3.4.3 Rural development projects:

The project veterinarian will be responsible for the implementation of all activities under this section. Land use, water development, animal breeding and rural development specialists will be employed on a consultancy basis as required.

Trained DLPO staff in collaboration with the project management (and in consultation with KARI) will establish a recording scheme to assess livestock productivity. The activities of three selected and trained DLPO staff in each district will be supervised by the DLP Office.

The project will establish an AI service in Busia and Siaya (Annex 7.2)

The project will set up a Bull Scheme in Busia and Siaya (Annex 7.3).

The project will employ a short term animal breeding consultant to advise on the selection of bulls for the AI service and the Bull Scheme.

The project will assist farmers to establish zero-grazing and agro-forestry demonstration units on their farms in Busia and Siaya (Annex 7.4).

The NDDP will provide extension services for the Bull Scheme and the zero-grazing units.

A tural development consultant will be employed and will collaborate with the project sociologist in assessing other felt needs of the community in relation to rural development. Funds have been allocated (Table 3.2, Annex 14) for non specified rural development projects. Possible projects in this area could include some of the following:

• The employment of a land use consultant (or collaboration with the land use expert to be employed in the second phase of the KETRI/ODA project, Annex 9.7) to identify important issues related to land use practices and the possible changes in land use which may accompany tsetse control. The project should support recommended programmes in land use.

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- The employment of a consultant to identify the extent to which water is a constraint to improved livestock production. Support for water development in selected areas through appropriate NGOs involved in water development, should be considered (Annex 13).
- The project veterinarian should assess the requirements for effective control of tickborne diseases in the districts. Dips in selected areas, where the numbers of grade cattle warrant tick control and where the community is willing to finance activities, might be rehabilitated as necessary or support provided to farmers to ensure effective tick control by whatever means are deemed most appropriate (Annex 7.6).
- The International Fund for Agricultural Development (IFAD) have training programmes for farmers in animal traction programme (Annex 7.7), projects in collaboration with IFAD might also be considered.
- Private veterinarians could be offered contract work by the project and thereby be encouraged to set up practice in the districts through participating in the EU (Pan African Rinderpest Campaign) funded veterinary privatisation scheme.

3.4.4 Institutional strengthening:

The PMU will be established in Busia with a sub-office in the Siaya DVS headquarters. The fiaison officer and the procurement officer will be based in the OAU/IBAR office in Nairobi.

To ensure a rapid start up of project activities, DVS and KETRI vehicles will be rehabilitated within the first six months.

The MALDM offices will be equipped with the laboratory equipment, computers and materials necessary to support testse and trypanosomiasis surveillance and livestock production recording systems.

KETRI will be provided with the facilities and capital equipment necessary to enable themto support the research required by the project.

4. **ASSUMPTIONS**

4.1 Assumptions at different levels

These assumptions are listed in the logical framework at the appropriate levels. It is assumed that for the project purpose (increased livestock productivity) to contribute to the overall objective of the project (improved welfare of the people of the region) there will be a sustainable increase in the demand for milk, meat, manure and traction. An increase in the availability of livestock products will require improved marketing facilities. No project inputs are envisaged in this area as it is assumed that market forces through the private sector will ensure the required improvements in livestock marketing.

If tsetse control in Busia and Siaya is to result in Trypanosomiasis control then effective and sustained tsetse control in the bordering areas of Uganda will be required. Furthermore, the control programmes will only result in substantial increased livestock productivity if trypanosomiasis has been correctly identified as the major disease constraint in indigenous livestock in the area.

The effective privatisation of the Veterinary Services and the successful rehabilitation of Government Veterinary Services will be essential in achieving the project purpose.

Improved methods to control other diseases, particularly East Coast fever (ECF), will be necessary to allow the upgrading of indigenous breeds and the introduction of improved breeds into areas where tsetse control has been achieved. The continuing operation of NDDP and other NGOs in the project area will be essential to ensure the training of farmers in improved livestock production practices and a sustained increase in the number of upgraded cattle in the area and the implementation of other rural development projects.

The success and sustainability of the project is based on the assumption that there will be donor finance for a second phase and that the community will be willing to participate in tsetse control activities, that they will be eager to learn and benefit from improved livestock production practices, keep upgraded cattle, use private veterinary services and finally take full responsibility for tsetse and trypanosomiasis control.

4.2 Risks and flexibility

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Political stability, internal security and sustained economic development, the absence of any of these would constitute a major risk for the project.

The main risks envisaged by the project are that Government financial commitments might not be forthcoming. This particularly applies to the Government's continued ability to employ stall and ensure the up-keep of the facilities provided by the project after the end of the project. While it is envisaged that the community will itself take responsibility for tsetse control activities, overall supervision, monitoring of tsetse populations and disease surveillance will continue to be the tasks of the Government.

If the response from the community to trapping activities cannot be sustained provision is made for the introduction of alternative tsetse control measures. The use of synthetic pyrethroids as pour-ons for tsetse control will initially be investigated on a trial basis but this method could replace trapping if community response warranted such.

5. PROGRAMME IMPLEMENTATION

5.1 Physical and non-physical inputs

5.1.1 Tsetse and trypanosomiasis control

5.1.1.(a) Personnel

- MALDM staff: the project will utilise 2 zoologists, 4 veterinarians, 18 technicians/animal health assistants (AHA) and 4 drivers.

- Community: the project will utilise 192 members of the community.

- Project staff: the project will employ, on a full time salaried basis, 1 workshop manager, 2 mechanics, 3 secretaries, 1 mapping officer, 2 accountants, 1 clerk, 5 trap cutters and 7 support staff.

5.1.1 (b) Infrastructure

- Λ fully equipped office/laboratory attached to the Busia DVS office and one equipped workshop, one trap cutting room and a secure storage facility.

- A rehabilitated and fully equipped office/laboratory attached to the Siaya DVS office.

- 6 local office/stores will be established, 3 in each district.

5.1.1 (c) Major inputs

- Attached to the Busia Office/Lab there will be 1.4 wheel-drive vehicle, 3 pick-ups, 8 motorcycles and 1 rehabilitated MALDM Landrover.

- In Siaya there will be a 4 wheel-drive vehicle, 2 pick-ups, 8 motorcycles and 1 rehabilitated MALDM Landrover.

- In Busia and Bungoma, at the community level, there will be 36,300 insecticide impregnated traps, 144 bicycles, 30 sewing machines and 1,440 litres of deltamethrin pour-on.

- In Siaya, at the community level, there will be 32,175 insecticide impregnated traps, 144 bicycles, 30 sewing machines and 1,440 litres of deltamethrin pour-on.

5.1.2 Education and training.

5.1.2 (a) Personnel

- KETRI/ICIPE staff, NDDP extension staff and staff from commercial organisations.

~ The MALDM staff listed (5.1.1 and 5.1.3) will be involved in training the community in tsetse control and improved livestock practices.

- Central Artificial Insemination Station (CAIS) staff.

- Project staff; the project will employ, on a full time salaried basis, 1 training officer and a secretary.

5.1.2 (b) Infrastructure

- The project staff involved with training will use the Busia Office facility (5.1.1 (b)).

5.1.2 (c) Major inputs

- 1 pick-up and the transport listed under 5.1.1 (c)

- Audio-visual equipment and training materials.

5.1.3 Rural development projects.

5.1.3.(n) Personnel

- MALDM staff; the project will utilise 2 District Livestock Production officers and 6 AHAs. The project will utilise 10 technicians/AHAs retrained as inseminators.

- Community; the project will utilise 140 members of the community.

- Project staff; the project will employ, on a full time salaried basis, 1 veterinarian, 2 technician, 1 secretary, 1 accountant and 3 support staff and consultants as required.

- NGO staff from NDDP, IFAD, water development and other agencies.

5.1.3 (b) Infrastructure

- An Office/Lab facility at Busia attached to the DVS office.

- 40 zero-grazing units and 100 bull pens.

5.1.3 (c) Major inputs

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- Attached to the Busia Office/Lab there will be a 4 wheel-drive vehicle, 2 pick-ups and 40 motorcycles.

- Office and laboratory equipment and 50 liquid nitrogen containers.

- 12 bulls in the CAIS, Nairobi and in the districts 40 in-calf heifers and 100 bulls.

- funds for non-specified rural development activities/projects possibly in land use, water development, animal traction, tick borne diseases control etc.

5.1.4 Institutional strengthening (PMU and Research)

5.1.4.i. MALDM - Project Management Unit (PMU).

5.1.4.i (a) Personnel

- MALDM staff; the Director of Veterinary Services and the Chief Zoologist.

Project staff: the project will employ, on a full-time salaried basis, 1 technical assistant/project manager

5.1.4 (b) Infrastructure

- The project staff in the PMU will use the office facilities in OAU/IBAR, Nairobi and the Busia and Siaya offices and laboratories listed under 5.1.1 (b) and 5.1.2 (b).

5.1.4 (c) Major inputs

- Attached to the PMU will be one 4 wheel-drive vehicle and one pick-up.

- Office equipment

The infrastructure and inputs listed under 5.1.1, 5.1.2 and 5.1.3 and costed under tsetse and trypanosomiasis control, education and training and mini projects will strengthen the MALDM.

5.1.4 ii KETRI (Research).

5.1.4.ii (a) Personnel

- KETRI Staff; the Director of KETRI and staff involved in tsetse, trypanosomiasis, human sleeping sickness and socio-economics research will be involved in meeting the research needs of the project.

- Project staff; the project will employ on a full time salaried basis a sociologist, a secretary and a driver. Casual enumerators will be employed for 2,400 man days

5.1.4.ii (b) Infrastructure

- One hostel (simple accommodation facility) at Ahipe.

5.1.4.ii (c) Major inputs

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- A 4 wheel-drive vehicle, a pick-up and a rehabilitated KETRI Landrover.

- Office and laboratory equipment.

- 990 litres of deltamethrin pour-on and trypanocides.

- Support for semi-active human sleeping sickness surveillance.

- Funds for additional research activities.

5.2 Organisation and implementation procedures

5.2.1 Regional organisation.

This project is part of the Kenya/Uganda regional tsetse control programme. The regional programme will be co-ordinated through the OAU/IBAR office in Nairobi. The Ugandan part of the project will be implemented through the Central Organisation for Control of Tsetse in Uganda (COCTU) in Kampala.

5.2.1 Kenyan national organisation: Project Management Unit

It has been agreed between the GOK and EU that the Kenya programme be implemented through OAU/IBAR, Nairobi. The project will be managed and co-ordinated by a special Project Management Unit (PMU) under the Director, OAU/IBAR. The PMU, specifically the Liaison Officer, will ensure liaison between OAU/IBAR, GOK, EU and relevant research institutes. The PMU will be responsible for the preparation of the annual workplan for the project, the procurement of the inputs through the laid down EU and OAU procedures, execution of the project, and timely submission of quarterly financial and technical reports to OAU/IBAR, EU and GOK. It will organise the mid-term evaluation.

Details of the senior staff to be employed in the PMU are provided in Annex 12. The Liaison Officer and the Procurement Officer together with some support staff will be

based in Nairobi at the OAU/IBAR office. The Project Manager and all other staff will be based in the PMU headquarters in Busia.

A Project Management Committee (PMC) will be formed by the Project Manager and will consist of the Director of Veterinary Services or his representative, the Director of Livestock Production or his representative, the Chief Zoologist, the Director of OAU/IBAR or his representative, the EC Delegation representative, the OAU/IBAR tsetse and trypanosomiasis adviser, the regional co-ordinator, the project Liaison Officer' and the project Veterinarian. The Project Manager will also invite, when appropriate, staff members from each of the three research institutes, ICHPE, ILRI and KETRI involved in project activities, to sit on the Project Management Committee and any NGO representative/consultant that the EU Office in Nairobi or the Project Manager may consider appropriate. This committee will meet on a regular basis, will be chaired by the Director of Veterinary Services, or in his absence by the Project Manager, and will be responsible for the co-ordination of all project activities.

Project sub-committees will be formed under the PMC and all work plans, budgeting, monitoring and evaluation procedures will be approved by this committee. The Project Manager will sit on the National Trypanosomiasis Control Council of Kenya. This council has recently been formed to co-ordinate all tsetse control activities in Kenya.

The Director OAU/IBAR will be the Regional Authorising Officer and he will act as the Deputy National Authorising Office (NAO) for the project. Imprest facilities will be provided to the PMU which will be responsible for financial management and the disbursement of funds for operations in the field.

At district level the project will be implemented through the existing MALDM structures and provision is made for the Director of Veterinary Services to visit the districts. The headquarters of the project in the districts will be located within the existing compound of the DVS in Busia with a sub-office located in Siaya. The project veterinarian, who will be based in Busia, will assist the project manager, and deputise as required, in the districts in all matters related to project activities. He will liaise with the DVO in each districts on all matters of disease surveillance and control and the DLPO on all matters related to livestock productivity. The district zoologists will supervise all tsetse control activities within the districts.

The precise nature of the research to be carried out by KETRI or other relevant institutions will be determined by the project manager in consultation with the director of the institute and after the agreement of the PMC. Funds for research will be released by the project manager on the provision of budgets and workplans.

5.3 Timetable

The first phase of the programme will cover four years and recruitment for the PMU will be completed within six months of the signing of the Financing Agreement.

General work programmes and budgets and a specific work plan and budget for the first financial year will be completed within three months of the establishment of the PMU. Budgeting for the rehabilitation of DVS and KETRI vehicles is included for the purposes of ensuring a rapid start of project activities; project vehicles may take some time to arrive.

Activity	Year 1	Yenr 2	Year 3	Year 4
	B S	B S	B S	B S
Introductory seminars	YY			
Educ.& training for DVS stall	Y Y		ΥΥ	
Educ.& training for community	Y Y	ΥΥ	ΥΥ	ΥY
Upgrading DVS	Y Y	- Y		
Upgrading KETRI	Y			
Pour-on trial	Y -	Υ -		
Surveys	Y Y			
Tsetse cont.	Υ-	Y Y	ΥY	Y Y
AI Service	Y Y	Y Y	Y Y	Y Y
Bull project		Y -	Y Y	ΥY
Zero-grazing		'	Y -	ΥY
Rural dev. projects		ΥY	ΥΥ	YY

Table I. Draft implementation timetable for Busia (B) and Siaya (S)

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Note: Activities in Bungoma are considered together with Busia. Tsetse surveys in Bungoma in Year 1 will establish the extent of the tsetse infestation in that district and further work will be based on that information.

It is envisaged that teetse control operations will commence in Busia earlier than in Siaya or Bungoma. At present date the DVS in Busia have some 1,000 traps in the field, this operation should be incorporated into the project activities, thus allowing the immediate involvement of the project in tsetse control in Busia. Furthermore KETRPs on-going activities are centred in Busia. However, the fly belt between Busia and Bungoma and between Busia and Siaya is continuous and tsetse control activities cannot be implemented independently. The same applies to tsetse control operations bordering Uganda.

While education and training in relation to improved livestock productivity practices will commence immediately, the introduction of improved breeds should be gradual particularly in areas where tsetse challenge is high. Some degree of tsetse control and a significant reduction in trypanosomiasis prevalence must be achieved before any large scale introduction of improved breeds is considered. Another essential component will be the support of an improved veterinary service, either private or governmental.

5.4 Cost estimate and financing plan

Detailed cost estimates, in Kenya Shillings, are provided in Annex 14 Tables 1.1 - 5.2 and summary costs in Table 6 (KSh) and Table 7 (ECU). Rounding errors are due to the conversion of KSh to the nearest thousand into ECU. The GOK salaries are not included in the detailed project costs but are shown in the summary tables (Tables 6 and 7). The total project cost is ECU 4,529,433, of which ECU 4,077,955 is the EU contribution. This is divided between national and regional funds as shown in Table 2.

Table 2 : Project components funded from national and regional funds.

Source of funds	ECU	Components of programme	ECU
National funds :	1,500,000	Rural development projects	1,185,104
		Education and training	210,134
		Contingency (7.7%)	104,762
		TOTAL	1,500,000
Regional funds:	3,100,000	Tsetse & tryps control	1,413,925
		Research	406,791
		Project management	862,000
		Contingency (15.6%)	417,284
		TOTAL	3,100,000

TOTAL : ECU 4.6 million

The contribution from the EU, GOK (including salaries) and the community is shown, for each component of the project in Table 3 (KSh) and Table 4 (ECU). Kenya Shillings, to the nearest one thousand shillings, were converted to ECU at a rate of KSh 67 = 1 ECU (exchange rate on 18/5/1995)

PROJECT	YEAR I	YEAR 2	YEAR 3	YEAR 4	TOTAL
COMPONENT	COST	COST	COST	COST	
Tsetse & Tryps					
European Union	25 813	131 790	21 724	15 406	94 733
GOK	2 125	2 1 2 5	3 061	4 6 3 4	11 945
Community	0	80	1 1 2 0	1 840	3 040
Educ & Training					
European Union	6 007	2 701	2813	2 558	14 079
GOK	0	0	0	0	0
Community	0	0	0	0	0
Rural Development					
European Union	21 100	16 446	22 989	18 867	79 402
GOK	1 694	1 694	2 195	3 097	8 680
Community	120	240	940	1 620	2 920
Project Management					
European Union	17 227	13 509	13 509	13 509	57 754
GOK	0	0	0	0	0
Ċommunity	0	Ø	0	0	0
Research	· ·				
European Union	10 283	6 180	6 3 5 0	4 4 4 2	27 255
ĠŌK	751	751	751	751	3 004
Community	0	24	183	453	660
TOTAL	86 996	71 855	· 76 046	68 548	303 472

Table 3 Summary costs (Kenya Shillings '000)

Full cost recovery from the community for all testse control operations is not a realistic goal within the first four year phase of this project. The community in these districts at present have little or no income generated directly from livestock and therefore there is clearly no incentive or capacity to invest in testse control operations.

The rationale of this project is that with improved tsetse and trypanosomiasis control livestock productivity can be improved, initially in the indigenous breeds and later through the use of upgraded cattle. It is estimated that a minimum period of five to seven years will be necessary to ensure that a sufficiently large proportion of livestock keepers will be generating income from livestock to ensure full cost recovery for tsetse control operations.

Furthermore, tsetse control is traditionally regarded as a Government responsibility in these districts. The tsetse fly is associated in the minds of the community with human sleeping sickness and as such the Government has borne the responsibility for fly control throughout this century.

The benefits from improved livestock productivity will be more than sufficient to justify the required inputs for tsetse control. For example the income from the sale of twelve litres of milk will cover the cost of pour-on for one animal for a year.

PROJECT	YEAR I	YEAR 2	YEAR 3	YEAR 4	TOTAL
COMPONENT	COST	COST	COST	COST	
Tsetse & Tryps					
E.U.	385,269	474,478	324 ,2 39	229,940	1,413,925
GOK	31,716	31,716	45,687	69,164	178,284
Community	0	1,194	16,716	27,463	45,373
Education &					
Training					
E.U.	89,657	40,313	41,985	38,179	210,134
GOK	0	0	0	0	0.
Community	0	0	0	0	0
Rural					
Development					
E.U.	314,925	245,463	343,119	281,597	1,185,104
GOK	25,284	25,284	32,761	46,224	129,552
Community	1,791	3,582	14,030	24,179	43,582
Project					
Management			•		
E.U.	257,119	201,627	201,627	201,627	862,000
GOK	0	0	0	0	0
Community	0	0	0	0	0
Research	{		•		
E.U.	153,478	92,239	94,776	66,299	406,791
GOK	11,209	11,209	11,209	11,209	44,836
Community	0	358	2,731	6,761	9,851
TOTAL	1,270,448	1,127,463	1,128,881	1,002,642	4,529,433

Table 4 Summary costs (ECU)

5.5 Special conditions accompanying measures taken by the Government

Trypanocides, in theory, are currently "prescription only drugs" to be purchased and administered by veterinarians. In practice veterinarians sell these drugs to farmers and farmers can also purchase them from unoflicial sources. Often the Government is unable to ensure the supply of trypanocides; an adequate supply of drugs will be necessary in both districts throughout and after the life of the project. The sale of these drugs through the private sector will be encouraged.

The DVS will ensure that the project has the authority to extend the use of pour-ons for tsetse control should this prove the most cost-effective and sustainable method.

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6. FACTORS ENSURING SUSTAINABILITY

6.1 Policy support measures

Kenya Government policy, on tsetse and trypanosomiasis control, in areas where human sleeping sickness occurs together with trypanosomiasis in livestock, is to use both vector and disease control methods. Thus no change in policy is required.

Kenya's national economic programme (1994-1996) links gender issues to development. The goal, according to the new programme, is to encourage female participation in agriculture and rural development and joint family decision making on land use and an equal distribution between spouses of income from agriculture. If women, who provide most of the labour, can also reap the benefits, then agricultural and livestock development projects such as this have a greater chance of sustainability. However, real changes in Government policy in relation to land use, land tenure and inheritance, which are currently all biased against women, must be forthcoming.

6.2 Appropriate technology

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The methods of tsetse control to be employed (Annex 4) will concentrate on the use of simple traps which can be made within the community. The routine servicing and monitoring of the traps will also be undertaken by the community. In areas where insecticides in the form of pour-on are used these will be administered by simple application to the cattle.

The ground spraying programmes operating at present under the DVS will be discontinued.

6.3 Environmental protection measures

The project will involve no spraying of insecticide on the vegetation, soils etc. Insecticide will be used only directly on cloth traps and on livestock. Studies in Zimbabwe and Cote d'Ivoire have shown that the spraying of insecticide on traps (targets) has no measurable effect on non-target organisms.

The necessary issues to be considered in relation to the environmental impact of tsetse control resulting from changes in land use are covered in Annex 9.7. It is envisaged that this aspect of the project will involve input from both ILRI and KETRI and possibly ICIPE (Annex 6).

The funding for environmental monitoring is under the regional component of the project and details are therefore not included here. The detailed budgeting and specific activities for this component of the project will be finalised in the first six months between the Project Managers in Kenya and Uganda in conjunction with the OAU/IBAR office (Nairobi) as the regional co-ordinating office.

6.4 Sociocultural aspects/women in development

Women account for the majority of the work force in the two districts because of outmigration of young male workers. The work force is defined as the 15-59 years age group; 57% of the work force in Busia and 61% of the work force in Siaya is female. In addition half the households in Siaya are headed by women, about double the national average, and women are actively involved in agriculture and livestock husbandry. However, despite laws which technically permit women to own land, they rarely do and almost 100% of the land is registered in the names of male elders.

As women constitute the majority of the work force it is important that the project ensures the full participation of women in all decisions related to community participation in the implementation of the project and that women are also targeted as beneficiaries of project activities. The project will ensure the full participation of women and already established women's groups at the village community committee level. These village community committees will identify community members to work as trap monitors and women to be provided with sewing machines and trained in trap making. The production of traps will provide an additional source of income for women. The village community committee will also be consulted in the identification of furmers to participate in the zero-grazing and bull schemes. Women, who are in a position to directly benefit (Annex 7) will be given priority as candidates to partake in both of these schemes.

The educational and training aspects of the local community will involve established women's group. There are currently more than 1,000 women's groups in Busia and 2,500 . women's groups in Siaya. The introduction of donkeys into the districts once tsetse control has been achieved would free women from burden of carrying water, and sale of water, for example to zero-grazing units (Annex 7), can become an income generating activity. Tree nurseries to supply leguninous species for inclusion in agroforestry/ napier grass forage plots also offer the possibility of income generating projects for women's groups.

6.5 Institutional and management capacity building

The project inputs involve personnel, infrastructure, and various items of capital equipment aimed at institutional strengthening. All project activities will take place within the existing Government structure and equipment and training will be provided for MALDM and KETRI. There will be particular emphasis on management training for MALDM staff.

At district level the emphasis will be on the provision of training and facilities (equipped offices, laboratories and vehicles), to enable MALDM staff to operate effective disease surveillance and control activities and to establish appropriate livestock recording systems. KETRI will be provided with hostel facilities at Alupe to ensure continuing field research activities and their existing laboratory at Alupe will be fully equipped.

6.6 Economic and financial analysis

The economic and financial analyses have been provided in the GTZ Project Preparation Study. Assuming an economic life for the project of 45 years, the estimated economic rate of return was 23%.

The benefits of the project will be in terms of increased livestock productivity, primarily milk and meat, but there will be additional non-quantifiable benefits for crop production through manure and animal traction. While sheep, goats and pigs are not specifically targeted for trypanosomiasis control, further benefits will arise from improved health and productivity of these species.

The project will also have significant impact on the health and well being of the populations at risk to human sleeping sickness, not only in Kenya but also in Uganda. Furthermore, eliminating the possibility of a human sleeping sickness epidemic is financially sound, drug costs alone for the treatment of one case amount to ECU 200.

7. MONITORING AND EVALUATION

7.1 Monitoring indicators

The overall objectives of the project, to improve the welfare of the people of the region, will be assessed by monitoring the percentage of secondary school children which are female. This information will be obtained from Ministry of Education statistics and will also be assessed by the project sociologist.

The project purpose, increased livestock productivity, will be assessed by monitoring the cow:calf ratio. This simple indicator of livestock productivity will be determined by DLPO staff.

Tsetse and trypanosomiasis control will be monitored by the number of tsetse caught in traps and by the prevalence of trypanosome infections in cattle. *Glossina fuscipes* is a relatively difficult tsetse lly to trap, and therefore trypanosomiasis transmission can still occur where there is an apparent fly density of zero, as determined by trap catches. Trypanosomiasis surveillance is therefore a more sensitive method of judging the success of the tsetse control programme than trap catches. Trypanosomiasis control will also result in a measurable reduction in mortality of livestock, increase in calving rates and increase in the numbers of draught animals used in the districts. This information will be collected by DVS, DLPO and KETRL

The education and training programme will be monitored by ensuring that the specified number of participants complete their training courses. At the community level, the impact of awareness raising will be assessed by the number of households aware and supportive of the project aims, and the number of farmers involved in livestock improvement activities. This information will be provided by the DLPO and project sociologist.

The specified rural development projects related to improved livestock production will be monitored by determining the number of, inseminations performed, grade bulls supplied to farmers, crossbred calves born, zero-grazing units established and farmers using animal traction and improved livestock production practices.

Institutional strengthening will be assessed by the number of MALDM and KETRI staff actively involved in project activities. The ability of the DVS to provide active trypanosomiasis surveillance will be indicated by the number of cattle blood samples screened for trypanosomes per month. The number, timely production and accuracy of MALDM reports will indicate the ability of DVS and DLPO to provide an efficient disease surveillance and livestock productivity recording service.

7.2 Reviews/evaluations

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The project will be reviewed at the end of Year 2 and at the end of project by external review; evaluation is budgeted for under the regional component of the project. The PMU will ensure effective monitoring of the project in all areas throughout the project life.

8. CONCLUSIONS AND PROPOSALS

The proposal related to this programme appears under Conclusions and proposals of the relevant Financing Proposal (7th EDF).

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ANNEXES

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Annex 1

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THE AFRICAN TRYPANOSOMIASES Background Information

1.1 Introduction

The African trypanosomiases consist of several diseases affecting man and his livestock. The human disease, sleeping sickness, occurs in 36 countries where 50 million people are at risk and 25,000 cases occur each year. This disease complex has influenced human development throughout an extensive area of Africa for centuries. Few other diseases have shaped or continue to shape human history to the same degree. The trypanosomiases have determined what areas could be settled - precluding human occupation of some while leading to overpopulation and desertification of others. They have excluded the use of animal power and thus greatly retarded agricultural development. At the beginning of this century it was estimated that trypanosomiasis affected livestock production in over 10 million square kilometres of Africa. With the possible exception of Nigeria, the extent of the tsetse infestation remains much the same to-day. By limiting livestock production the disease has played an important part in the protein deficit of a large proportion of the population and has therefore contributed to the high mortality, short life span, and chronic debility associated with malnutrition.

1.2 The parasite

Trypanosomes are protozoan parasites and two different species affect man. Trypanosoma brucet rhodestense, the causative organism of Rhodestan sleeping sickness, occurs mainly in cast and southern Africa while T.b.gambiense, which causes the less virulent Gambian sleeping sickness is mainly found in west and central Africa. Trypanosoma brucet forms also cause a severe syndrome in horses and a milder disease in cattle. The two trypanosome species of major economic importance in cattle are T.congolense and T. vivux. Other trypanosomes are responsible for diseases in camels and pigs.

1.3 The vector

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Trypanosomes are transmitted amongst humans, domestic animals and wild vertebrate hosts by over 20 different species of tsetse flies. Tsetse species are divided into three groups, two of which, the *fusca* group and the *palpalis* group, are mostly found in west and central Africa while the third group contains species which are found across the continent. The tsetse fly is an unusual insect in that the female does not lay eggs but gives birth, at intervals, to a single almost fully developed larva which burrows into the ground and within an hour or two the pupal case has developed. On emergence the adult fly needs a blood meal within 24 to 48 hours. If this blood meal is infected with trypanosomes the parasites pass into the gut of the tsetse fly where they are not digested but instead undergo

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a definite cycle of development. On maturation the trypanosomes invade the hypopharynx of the fly ready for inoculation into another vertebrate host.

1.4 The disease

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In humans infection initially produces headache, malaise, fassitude and irregular fevers. This is followed by a range of symptoms including anaemia and joint pains. When the parasite invades the central nervous system mental deterioration sets in followed by coma and death. *Trypanosoma b.gambiense* infection usually progresses slowly while the *rhodesiense* form of the disease is often more acute, causing severe symptoms and death within a few days or weeks (Annex 3).

In cattle the disease generally results in a chronic anaemia causing a gradual loss of production and wasting. Abortion is commonly associated with infection. *Trypanosoma virax* infection can give rise to an acute haemorrhagic syndrome, with severe internal bleeding, resulting in the death of the animal within a few days. Sheep, goats, camels and horses are also affected, some more severely than others. Sheep and goats appear to be bitten less often but once infected mortality rates can be high. Indigenous breeds are generally less susceptible to infection. A large variety of wild animals also become infected with trypanosomes; they rarely suffer any ill effects but harbour the trypanosomes in their blood and act as reservoirs for infection of both humans and livestock.

1.5 Control

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Drugs are available for controlling both the human and animal diseases but in neither case are the currently available drugs entirely satisfactory. No prophylactic drugs exist for the control of sleeping sickness and the curative drugs available can be toxic and must be administered under close supervision. Furthermore, pressure on national health resources has led to a reduction in surveillance rendering chemotherapy less effective as a control measure. In the case of animal trypanosomiasis no new drug has appeared in over 30 years and the problems of toxicity and resistance associated with existing drugs are rapidly becoming widespread. Immunological approaches to date have yielded little and hopes for a vaccine recede as the biological complexities of the trypanosome are discovered.

The use of trypanotolerant livestock, which have some degree of resistance to the disease, holds some hope for the future but such animals are found in certain areas only and are limited in number. The multiplication and dissemination of these breeds throughout Africa will take several decades. Efforts to locate the genes for trypanotolerance, while fascinating from the scientific view point, will, even if successful, be of little practical value to the livestock keeper in Africa for many years to come.

Vector control in various forms has been used throughout the century and has received' renewed attention in recent years. The history of vector control in the project area and some recent advances are discussed in Annex 4 and 5. However, despite the recent exciting advances in vector control on which this project is based, eradication of the tsetse fly is not a realistic option and there is still no simple solution to the control of the trypanosomiases despite the efforts of thousands of medical, veterinary and scientific personnel throughout this century. In 1925 Ormsby-Gore declared "The ravages of the tsetse fly are the greatest menace to the development of Africa, and constitute one of its most serious problems'. The same could be said to-day. This project must be seen in this context and while new methods of control can and should now be adopted it would be naive to suggest that this most intransigent of problems hampering development on Africa can now be finally solved.

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Annex 2

THE PROJECT AREA

The project area will consist of the districts of Busia and Siaya and that part of Bungoma infested with tsetse flies (Map 2.1). It is estimated that the affected area in Bungoma is approximately 10% that in Busia, and costings have been based on that figure. During the first year of the project precise information on the extent of the distribution and the livestock numbers at risk in Bungoma will be gathered. The tables below provides statistics on Busia and Siaya only.

The source of most of this information is the Busia and Siaya District Development Plans 1994-1996 (Office of the Vice-President and Ministry of Planning and National Development). These documents are available in the EU (Nairobi) Library and copies should be obtained by the project. The Siaya document in particular contains much useful information.

Table 2.1 Busia and Sinya Districts - area and climate.

	BUSIA	SIAYA
Area (sq.km)	1,650	2,520
Rainfall (mm)	900-2000	800-2000
Av. annual temp	(C) 21-23	21-23
Est. area tsetse in	ifested (sq km)	
- G.fuscipes	272	292
- G.pallidipes	250	450

Table 2.2 Agro-ecological zones (% of land area)

	BUSIA	SIAYA
UM I	_	1%
LM I	35%	30%
LM 2 & 3	55%	54%
LM 4	10%	12%
Other	-	3%

Notes: see overleaf

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Notes on Table 2.2

UM 1 - ultra high potential

LM 1 (lumid) - plant growth potential very high, suitable for sugar cane, maize, beans, coffee, sorghum and fruits

LM 2 and 3 (sub-semi humid) - plant growth potential medium to high, suitable for sugar cane, maize, beans, coffee, sorghum, finits, ground nuts, cotton, millet, cassava, vegetables and potatoes.

LM 4 (semi humid) - plant growth potential medium, suitable for cotton, sorghum and ground nuts.

Other: includes LM5 and bare tock

The ecological potential map for Kenya (Map 2.2) shows the project area in Zones 2 and 3.

Table 2.3 Human and livestock population and major crops

	BUSIA	SIAYA
Human population	500,000	750,000
Livestock population		
Cattle - zebu	171,000	457,000
- grade	2,200	2,000
Smallstock	25,000	279,000
Est. no. of cattle at risk to tryps	50,000	140,000
Major crops	Maize	Maize
(ranked in order	Beans	Cassava
of hectares planted)	Cotton	Beans

Notes: 1. Human population figures are projected figures for 1994. The majority of the population in the districts is Luo, Luhya and Teso. Human population density is shown in Map $\mathbf{2}3$.

2. Livestock populations are 1990 estimates for Busia and 1992 for Siaya. Source: District Livestock Production Officer's reports. The smallstock figure for Busia is questionable.

3. Also grown: Sorghum, ground nuts, tobacco, sugar cane, potatoes, millet, coffee and rice.

Water resources are dealt with in Annex 12.





HUMAN POPULATION DENSITY



Map 2.3 Human population domains to a second

HUMAN SLEEPING SICKNESS IN THE REGION

3.1 Introduction

This project is part of a regional programme aimed at addressing the problem of human and animal trypanosomiasis. While human sleeping sickness is not at present seen as a major problem in Kenya, in Uganda the main focus of the project is the control of the human disease. It is hoped that control of the tsetse fly in the border areas of Kenya can contribute to the ongoing efforts in Uganda and ensure the continued control of the disease in Kenya. This annex aims to provide some background information on human sleeping sickness in Kenya and to stress the difficulties inherent in the control of tsetse and trypanosomiasis which this project aims to address.

The history of human sleeping sickness in Kenya since the beginning of the century has been documented recently by Dr. Bruce Wellde (Wellde, 1989), a brief summary is provided here.

3.2 Gambian Sleeping Sickness

A massive epidemic at the turn of the century, centered in Uganda but spreading around Lake Victoria to Kenya and Tanzania, in which over a quarter of a million people died, had an enormous impact on the people and governments of the region. The disease was first recorded in Kenya in 1901 and in Tanzania in 1902. In Kenya this outbreak led to a massive depopulation of the Kenya lakeshore and islands. There is considerable uncertainty about which form of the disease was responsible for this outbreak. At the time it was thought to be Gambian sleeping sickness (Annex 1) and in the early literature it is referred to as such, but some authorities now believe it may have been Rhodesian sleeping sickness.

The first attempts at regional control of human sleeping sickness came with the signing of the Anglo-German Sleeping Sickness Agreement in 1909 designed to control movement of people across the Kenya-Tanzania border. These earlier efforts to control the disease by restricting the movement of people or through encournging them to move away from affected areas were supplemented by the establishment of a treatment eamp similar to one already existing in Tanzania. However, the drugs available at the time were of limited use and infected patients preferred to die at home.

Further epidemics of Gambian sleeping sickness were recorded in Nyanza in the 1920s and more effective drug treatment commenced in 1923. The Sleeping Sickness Commission began work in 1926 and tsetse fly surveys were conducted followed by recommendations , for bush clearing. Trapping and hand catching tsetse flies began in the 1930s and spraying tsetse habitat with 5% DDT commenced in the following decade. Later dieldrin was found be more effective and the incidence of Gambian sleeping sickness in Nyanza fell from 144 cases in 1954 to 21 in 1957. By 1959, 700 miles of river bank and 63 miles of lakeshore had been sprayed and the area covered was extended through the 1960s. Aerial spraying of insecticide was initiated in 1968 in Lambwe Valley, Nyanza.

All of these efforts contributed to controlling the disease and in some cases large areas were cleared of the fly. However, reinvasion was a constant problem even in the islands. Rusinga Island, for example, was sprayed in 1962, 1969, 1970 and 1977.

3.3 Rhodesian Sleeping Sickness

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The earliest reported cases in Kenya of the more virulent form of the disease, Rhodesian sleeping sickness, were from the Masai Mara in 1933. In 1942 the disease first appeared in the Uganda border area and despite many control efforts through the fifties and sixties susporadic disease persisted. In 1964 a sizeable epidemic occurred in Alego (Siaya) with 319 many reases in that year and 249 in the following year. Thirty four cases were reported in the border area in 1967 and 18 in 1977-78. Bush clearing in 470 acres followed and river banks and a strip of lakeshore were sprayed with dieldrin. These areas remained free of the disease for the next ten years until the latest outbreak, in Busia in 1987, which reached a peak in 1990 when 90 cases were treated in Ahipe sleeping sickness referral hospital. This outbreak was essentially an extension of the massive Ugandan epidemic of the 1980s which had spread eastwards via the River Malaba into Kenya.

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3.4 The current Ugandan epidemic

The present Ugandan epidemic started in 1977 and by 1980 8,465 cases of human sleeping sickness were reported. The Belgium Government provided \$1 million for drugs and the German Red Cross assisted in treating the affected population. The government launched an aerial spraying campaign using the synthetic pyrethroid deltamethrin and covering 600 sq.km of Busoga. The prevalence of the disease declined over the next three years and the epidemic appeared to have abated but then the incidence increased again and rose to a peak of 6,674 reported cases in 1987. Active surveillance teams were assisted by the British Overseas Development Administration (ODA) using a network of medical orderlies. Further aerial spraying took place but after two years flies had re-invaded all the sprayed areas. At the same time (1987) Phase 1 of the EC funded programme (Project No:5100.62.42.051) was established. The aim was to provide support for the medical aspects of the control and to establish new simple control techniques using insecticide impregnated tsetse traps.

3.5 The Lambwe Valley - Ruma National Park

In South Nyanza Rhodesian sleeping sickness has persisted in the Lambwe Valley despite enormous expenditure over the years on control measures; 912 cases were recorded between 1959 and 1984. While in Busia and Siaya the occurrence of the discase appears to be associated with outbreaks in Uganda, in the Lambwe Valley the actual focus of the disease is within the Ruma National Park. This park has also been a major focus of animal disease, in 1980/81, at the start of the sleeping sickness outbreak, there was an estimated loss of 5,000 cattle constituting 40% of the cattle in homesteads surrounding the national park.

Thickets within Ruma National Park are the source of tsetse in the Lambwe Valley (see tsetse distribution South Nyanza, Map 2.1, Annex 2). The establishment of a wildlife reserve in 1966 caused the abandonment of a development project which envisaged the eventual eradication of tsetse by bush clearance and subsequent cultivation of the land. The wildlife reserve later became a national park and the park continues as the source of the tsetse problem in the Lambwe Valley. The community derives little or no benefit from the park; there is virtually no infrastructure in place to support tourism and very few people visit the park. The promotion of tourism, whilst the risk of sleeping sickness remains, is extremely questionable. The park contains a number of antelope species, including Roan which, while being rare and localised in Kenya, are relatively abundant in Tanzania.

The park is managed by Kenya Wildlife Services (KWS) who do not at present have a policy on the control of human or animal trypanosomiasis. The park is "owned" by the County Council and the District Development Committee and any change in policy would have to be initiated by the County Council or any of the government ministries involved. While this area is not included in the present project, it will be considered for inclusion in the second phase of the project or in the Kenya/Tanzania border control programme. The area occupied by the park contains some of the best agricultural land in the district and if it were to be made available for cultivation Kenya might finally be free of human sleeping sickness. Funding would be required to assist in the relocation of certain endangered wildlife species.

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Annex 4

TSETSE AND TRYPANOSOMIASIS IN THE REGION - control methods available

4.1 Tsetse species

In the project area two species of tsetse fly are implicated in the transmission of both the human and animal disease.

Glossina fuscipes fuscipes, is a riverine species and is confined to east Africa, where it is found along the shores of Lake Victoria and the river banks of surrounding areas. This tsetse fly generally feeds on reptiles and man-fly and cattle-fly contact is usually restricted to watering places. The tsetse habitat generally extends no more than 100 metres from the river edge. Control campaigns over the years involving bush clearing and spraying with DDT and dieldrin have been highly successful. However, re-invasion of cleared areas has been a constant problem.

In Kenya, up until 1964, *G.fuscipes* was associated only with what was believed to be the milder Gambian form of sleeping sickness, but in that year this vector was responsible for a serious outbreak of Rhodesian sleeping sickness at Alego, Siaya District. During that outbreak the human infective parasite was isolated from cattle. Subsequently *G.fuscipes* has been responsible for several outbreaks of the Rhodesian form of disease in Western and Nyanza Provinces.

Glossina pallidipes were first detected in the Lambwe Valley in South Nyanza in 1910 and the first experimental methods to control the fly through trapping and bush clearing began in 1935. G. pallidipes occupies a much wider range of habitat than G. fuscipes increasing the probability of feeding on man and his domestic livestock. Various control methods have been used over the years and millions of dollars spent on bush clearing, ground spraying and aerial spraying in the Lambwe Valley. Arboticides have been used in attempts to clear thickets and spraying from helicopters for the gullies. Some measure of control has been achieved, sometimes for several years, but eradication has remained a dream; regeneration of the bush and resurgence of the fly has led to a cycle of outbreaks of Rhodesian sleeping sickness, the last being in 1980-84.

Glossina pallidipes is believed to have recently (1989) infested some 350 sq km. in the northern part of Siaya bordering Busia. Human sleeping sickness has not been reported in association with this infestation but there have been many cases of cattle trypanosomiasis (no precise figures available) and significant (but umprantified) mortality.

4.2 Recent advances in tsetse control

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Tsetse locate their hosts by a combination of olfactory and visual stimuli. Initially olfactory stimuli are the more important, but at close range visual stimuli take over. Recent research has provided several alternative methods for the control of *G. pallidipes*. Various components of cattle urine and cattle breath have proved to be powerful attractants for this species. These odoms are used to attract the flies in large numbers to targets (black cloth screen, often with fine netting on either side), sprayed with insecticide, or traps, which encage the fly. Both targets and traps baited with a variety of odours have been successfully tested in Kenya by the Kenya Trypanosomiasis Research Institute (KETRI) and the International Centre for Insect Physiology and Ecology (ICIPE). Research is continuing in Kenya and Zimbabwe on improving and simplifying the design of both largets and traps with the view to decreasing the costs and increasing the efficiency.

Glossina fuscipes responds only to certain types of traps and to-date no odours have been identified which consistently increase trap catches. The control method used for this fly species in Uganda is trapping with insecticide impregnated pryamidal (Lancien) traps. Traps placed along the river banks at a density of 10 per km have been shown to be effective. Other simple types of traps have also been tested in Uganda and a number of community based control operations are in progress. The insecticide of choice for both traps and targets is deltamethin. The tsetse fly is particularly sensitive to even minute quantities of this synthetic pyrethroid.

Synthetic pyrethroids can also be used to control tsetse flics by direct application to cattle. This can be done by dipping the cattle or using a pour-on formulation which is applied along the back of the animal. Tsetse which alight on a treated animal pick up sufficient insecticide to either kill them or result in the fly being "knocked down" which generally also leads to death through predation. It should be stressed that none of the synthetic pyrethroid formulations so far available is repellent to tsetse and eattle must initially be protected from the disease through chemoprophylaxis or chemotherapy until adequate tsetse control is achieved. However, the method is effective against all tsetse species which feed on cattle.

There are several formulations of synthetic pyrethroids available commercially for direct use on cattle but from trials completed to-date deltamethrin appears to be most effective. This compound has been used successfully in dips to control tsetse fly over large areas of Zimbabwe. Recent research in west Africa has shown that certain formulations of deltamthrin persist on cattle for up to three months. Three monthly application will greatly reduce costs and render this simplest of tsetse control methods a sustainable option. The success of synthetic pyrethroids applied directly to cattle depends on the relative densities of cattle and wildlife in an area. If the majority of fly feeds are taken from cattle and all the cattle in an area are treated then dramatic reductions in fly numbers can be achieved quickly. Synthetic pyrethroids can also be applied to other forms of domestic livestock.

4.3 Recent tsetse control in the project area

Both traps and pour-ons have been used recently to control tsetse in the project area. In Busia 1,000 Lancien traps are currently deployed by the Tsetse Control Department of the Ministry of Agriculture, Livestock Development and Marketing (MALDM) to control G. *fuscipes* infestations.

In 1991/92 a pour-on operation using Baticol (Bayer), containing a synthetic pyrethroid, flumethrin, developed to control ticks, was put in place with the support of the OAU to control the *G. pallidipes* infestation in the Samia Hills in Busia extending to the Yala Swamp in Siaya. The tsetse control staff of MALDM claim that *G.pallidipes* is no longer present in the area, however, KETRI dispute this. KETRI also claim to have found *G. pallidipes* in northern Busia. As this species is such an efficient vector of trypanosomiasis it will be a priority of the project to determine whether or not this fly species is present and the extent of any infestations.

It has been the practice in the past for tsetse control stall to carry out ground spraying operations when tsetse numbers increase or human sleeping sickness cases are reported. In addition to the unacceptable levels of environmental pollution that ground spraying involves the effects of these operations are purely transitory. As GOK bears sole responsibility for the cost of these operations they place a continuing and unacceptable burden on the exchequer. Spraying should be discontinued and replaced by the more sustainable, environmentally friendly technologies outlined above.

4.4 Trypanosomiasis control in the project area

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All the major trypanocidal drugs are sold in the project area. However, it is impossible to gauge precisely trypanocidal drug usage in any district. Drug sale figures in an area reflect availability and not use; drugs bought in one district may be used in another and in border areas there is considerable cross-border traffic in veterinary drugs. The data available indicate very limited use of trypanocides (less than 1% of the cattle population treated per annum in Siaya). It appears that only a small proportion of farmers in the district treat their animals with curative drugs and even fewer use prophylactics. There are a variety of reasons for this. The local community are not traditional cattle keeping people; cattle are considered as a form of savings to be sold in times of need, their productivity is of little relevance. In many cases the farmers are unaware of the disease or of how to treat it, yet trypanosomiasis appears to be the major constraint to cattle production in the area. The cattle are generally very small, reaching a mature body size of between 150 and 200 kg. and calving rates are extremely poor with a cow calf ratio of 4:1.

An 18 month KETRI/Overseas Development Administration (ODA) study just concluded has shown that the prevalence of trypanosomiasis in cattle in Busia varied between 10 and 35%. All the three major pathogenic species of trypanosome are prevalent (*T.vivax T.congolense* and *T. brucei*). This study evaluated block treatment of cattle with trypanocidal drugs as a method of eliminating the animal reservoir of the human infective trypanosomes. In Busia and Siaya Districts large wild mammal numbers are believed to be extremely low and reptiles, while an important food source for G. fuscipes, do not provide a suitable environment for the human infective trypanosome. Cattle appear to have taken over the role of reservoir host and while the human infective trypanosomes generally cause a relatively mild disease in cattle the infection can persist for years. Reduction in tsetse fly numbers will reduce the risk of transmission from cattle to man but to ensure sustainable human sleeping sickness control it is necessary to eliminate the parasite from the cattle.

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The farmers involved in the KETRI/ODA study responded very favourably to the treatment of their cattle and reported observable improvement in their health and calving rates. As the project reached its conclusion they provided KETRI with cash to ensure a continuing supply of drugs.

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Annex 5

TSETSE AND TRYPANOSOMIASIS CONTROL *v* - methods appropriate for community participation

5.1 Introduction

Traps or targets as means of isetse control are not sustainable over the long term without the wholehearted support of the beneficiaries. Without the cooperation of the community traps are neglected, vandalised or stolen.

Recently an International Livestock Centre for Africa (ILCA) trial using insecticide impregnated odour baited targets in Ethiopia was abandoned; theft and vandalising of targets became an insurmountable problem despite efforts to increase community awareness. However, even more alarming is the recent apparent failure of the Nguruman community based tsetse control scheme which used locally assembled, simple traps baited with cattle urine and acetone and involving no insecticide. This project has for sometime been considered as the most successful example of such schemes. Many complex factors appear to have contributed to the failure. Nonetheless, this experience indicates that much remains to be learned about ensuring the continued efforts of the community once the initiators/donors move out.

Community based trapping has been successful in Uganda but this may not necessarily be the case in Kenya. In Uganda, the emphasises of the project is human sleeping sickness. There, each and every individual stands to gain equally from tsetse control and a large proportion of the community are acutely aware of the problem following the recurrence of epidemics throughout this century. In Kenya, the livestock owner will be the principle beneficiary; and while the entire community will benefit from reduced tsetse numbers in relation to human sleeping sickness control, the disease is not perceived as a major threat to the human population in Busia or Siaya.

The experienced gained by ILCA in Ethiopia points to a difference in the response of the community to various tsetse control methods. While ILCA abandoned their target operation, a control scheme in a neighbouring area using synthetic pyrethroids on cattle proved highly successful. A similar scheme has now been introduced into the area where the targets failed and aims at full cost recovery within a year of conunencement.

Synthetic pyrethroids administered in the form of pour-ons or as dips, have an immediate and obvious effect on cattle. The farmer sees that his cattle have fewer ticks, are less bothered by all types of flies and consequently spend more time grazing and therefore grow better. The individual farmer benefits directly from his input. Trapping, on the other hand, has an inherently altruistic element, the action of the individual also benefits his neighbours and his efforts are worthless without the rest of the community. Of course, the same argument applies in relation to the impact of pour-ons on tsetse infestation. If only a few farmers are using pour-ons there will be little or no effect on fly density. However, the individual farmer still perceives direct and tangible benefits, irrespective of his neighbour's action.

Pour-ons have recently been shown to be highly effective in controlling G. fuscipes in Uganda in areas where there is a high cattle density (ie. majority of fly feeds taken from cattle). The efficacy of this approach against G. fuscipes has yet to be tested in the project area.

Clearly it would be unwise for the project to rely solely on a single method of control. It is proposed that both traps and pour-ons will be used initially and the willingness of the community to participate and finance the control operations will be monitored. The long term control policy of the project will therefore depend on the effectiveness of the method against a particular fly species and the willingness of the community to sustain the control programme.

Whichever control method is to be adopted a primary goal of the project must be to raise the awareness of the local community to the problems of trypanosomiasis which are complex. KETRI are involved in an assessment of the potential for community participation in tsetse control in Busia. A section on the topic is included in Annex 9.6 and Annex 10. Education and training of the community are dealt with in Annex 8.

5.2 Glossina fuscipes control - tsetse trapping

Once community participation is assured the project aims to deploy Lancien traps at 10 per km. throughout the riperian habitat (or 10 per sq km, where the habitat is not linear). Each village will choose young people to be responsible for the installation, maintenance and monitoring of the traps. A total of 72 selected individuals (trap attendants) will be required in each district which will be divided into six "control zones" with 12 trap attendants responsible for each zone. They will be provided with bicycles, "pangas", rubber boots, notebooks and pencils. Each trap attendants will be responsible for 40 traps which he/she will visit each week. All traps will be emptied once a month and the number of tsetse flies and other insects caught will be recorded. Trap attendants will be paid a monthly composite allowance and the community will be expected to replace the bicycles as necessary after two years.

Trap attendants will be thoroughly trained on site by the project Training Officer and the District Veterinary Services (DVS) tsetse officers who will thereafter take responsibility for ensuring that the trap attendants perform their required tasks satisfactorily. Three tsetse officers, in each district, will be provided with motorcycles and they will be supervised by the Chief Zoologist who will be provided with a pick-up. Each tsetse officer will supervise two control zones with two groups of 12 trap attendants who will operate from a local village office/store. The Chief Zoologist will organise and implement additional monitoring of the fly population using biconical traps.

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Sewing machines will be provided through local women's groups to women selected by the community. These women will be trained in sewing. Traps will be made in the three local offices in each district. Each office will have a team of eight women each operating a sewing machine. Each office will be expected to provide a certain quota of traps per weeks and women will be paid per trap manufactured. Women will be permitted to use the machines, which will remain project property, for other sewing once quotas are filled. Initially trap material will be cut by full time trap cutters employed at the project office in Busia. Material will be supplied weekly, by the District Zoologist, to each local office. Traps will be dipped in deltamethrin at the local offices.

Traps will be replaced every six months. Replacement of traps is more cost effective than repair. Also the deep blue cloth of the traps fades to a pale blue colour which is less visually attractive to the fly.

The response of the community throughout will be carefully monitored by the project sociologist.

5.3 Glossina pallidipes control - pour-ons on cattle

Deltamethrin pour-on will be used for the control of *G. pallidipes*, in the Samia Hills area south towards the Yala swamp, should the initial survey show that the fly is still present (Annex 4.3). This control operation will be organised by the project veterinarian and implemented by District Veterinary Services (DVS) staff commencing in the first year of the project using a rehabilitated DVS vehicle until project vehicles have arrived. Deltamethrin pour-on will be applied at three monthly intervals to 8,000 head of cattle in each district. The budget allows for this control operation to last for two years. Continuation of this control operation will be financed by the community purchasing the pour-on for their cattle. The project sociologist will monitor community response.

Regular trypanosomiasis surveillance in cattle throughtout the districts, organised by the project veterinarian and implemented by DVS, has been budgeted for to ensure effective monitoring of both control operations.

5.4 Glossina fuscipes control - research trial of integrated testse and trypanosomiasis control.

Deltamethrin will also be used by KETRI in demonstration/research trials in the control of *G. fuscipes* in both districts. These trials will be an extension of the already successful KETRI/ODA trial using the block treatment of cattle with isometamidium chloride (Annex 4). The approach taken by KETRI will involve the integration of both tsetse and trypanosomiasis control reducing the risk of both human sleeping sickness and livestock disease. Details are provided in Annex 9.1.4. The response of the community will be carefully monitored by the project sociologist in collaboration with KETRI. After the trial period it would be anticipated that participating farmers would be willing to pay for further treatment, if necessary, and pour-ons themselves. The KETRI trial will be monitored by tsetse trapping and trypanosomiasis surveillance.

OTHER INTERVENTIONS AND DOCUMENTATION AVAILABLE

6.1 Other interventions

A number of projects are on-going in Kenya in livestock development and these include:

Privatisation of Veterinary Services

World Bank Rehabilitation of Veterinary Services

Dutch funded National Dairy Development Programme

Kenya-Finland Livestock Development Project

IFAD Farmers Groups and Community Support Project

Other NGOs active in the districts are listed in Annex 8.

All of these programmes are in line with the overall objective of the project and the success of several of these programmes will depend on the implementation of tsetse control. Programmes which address tsetse control will be coordinated by the project.

It is essential that all of these activities are promoted through local community organizations so that any results are sustainable and led to long-term improvement in the economy of the people of the region. Financing of additional mini-projects (Annex 7,8 and 12) will as far as possible be handled through locally active NGOs.

6.2 Documentation available

The following additional documentation is of relevance to this proposal:

A request to the EEC for assistance to the Eastern African States "Farming system in tsetse infested areas" Project No. 5100.62.42.051 Coordinating agency OAU/IBAR Kenya, Uganda (1992).

Regional Project "Farming in tsetse infested areas" Phase 1 Kenya/Uganda proposal, January 1993 and June 1993.

Draft financing proposal (7th EDF) "Farming in tsetse infested areas". November 1993.

Republic of Uganda. Sleeping sickness and trypanosomiasis control S.E.Uganda. EEC No. 5100.62.42.051. Draft Report: Evaluation and Financial Proposal.

"Proposed research framework for the investigation of environmental, land use and socioeconomic consequences of tsetse and trypanosomiasis control in Kenya." KETRI/ODA report, December 1992.

"Assessment of the socioeconomic factors affecting implementation of community-based tsetse control in Busia, Kenya" UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases funded study KETRI Publications No.51 of 1994.

Wellde, B.T. (1989) Trypanosomiasis in the Lambwe Valley, Kenya. Annals of Tropical Medicine and Parasitology. Vol 1, Suppl.1.

Winrock International (1992) " Assessment of Animal Agriculture in Sub-Saharan Africa".

Republic of Kenya. Siaya District Development Plan 1994-1996.

Republic of Kenya. Busia District Development Plan 1994-1996.

Consultancy report by WHO and FAO for the Government of the Republic of Uganda. 4th - 14th January 1993.

Maudlin, I. (1993) ODA/KETRI Animal Trypanosomiasis Research Project. The epidemiology of T.brucci spp. in livestock in Busia District.

Annex 7

CROSSBREEDING, UPGRADING, AND THE INTRODUCTION OF EXOTIC CATTLE INTO THE PROJECT AREA

7.1 Introduction

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The agricultural potential of much of Busia and Siaya is classified as medium to high. The climate and soils are such that grade cattle could thrive, yet over 99% of the cattle are unimproved indigenous stock with an average mature body weight of 150 kg (Annex 4).

Sustainable tsetse and trypanosomiasis control financed and implemented by the community is the long term goal of this project. However, the reality of the present situation is that the community have neither the incentive nor the resources necessary to do so. The project aims to provide both. The incentive for tsetse and trypanosomiasis control will be livestock which are worth protecting from disease. As there is a limit to the income that can be generated from the indigenous stock, even if the constraint of trypanosomiasis is minimised, improved genotypes must be introduced. Given the resources of the majority of livestock keepers the only realistic option is to subsidise this, upgrading process.

Disease is the major constraint to the up-grading of cattle and while the available data on disease incidence is far from adequate, what information there is points to trypanosomiasis as the most important disease, certainly amongst the indigenous stock. Other important disease are tick-borne amongst which East Coast fever (ECF) is probably the most serious; again reliable data is not available. However, the impact of ECF on the indigenous cattle is possibly small, particularly as these cattle are rarely dipped and have a degree of innate immunity which will be enhanced through exposure in calfhood to infected ticks. This situation of endemic stability is also likely to pertain with the other tick-borne diseases: anaplasmosis, babesiosis and cowdriosis. Thus the assumption that the slow growth rates and poor calving percentage of these cattle could be improved through trypanocides block treatment trial recently completed by KETRI (Annex 9) supports this hypothesis.

Experience from crossbreeding between *Bos indicus* and *Bos tourus* type cattle throughout the tropics points to heat tolerance, nutrition and disease as important factors determining the portion of *Bos tourus* genes which can be introduced successfully in any region. In the project area the climate, in general, is not a constraint and appropriate nutrition for *Bos tourus* breeds can be ensured. However, tropical diseases, to which *Bos tourus* breeds have no innate immunity will be of major importance and both trypanosomiasis and ECF control will be essential.

The introduction of exotic breeds into the project area should be undertaken with care. A gradual improvement in genotypes through artificial insemination (AI) or the introduction

of bulls for crossbreeding will be a more viable option particularly in the first few years of the project. This must be accompanied by training for farmers in the care of improved animals.

7.2 Artificial insemination

The Veterinary Department is fully committed to the privatisation of AI services. However, even with the assistance of outside donors, little progress has been made. In 1992 there were suggestions of handing over the service to the Livestock Breeders Association of Kenya (LBAK) but this never materialised. Co-operatives in the milk producing districts of the country have been encouraged to provide AI services. However, the high capital investment has been a serious impediment to privatisation even in dairying areas. Where eo-operatives are operating they charge Shs 250 to 300 for two services.

The Central Artificial Insemination Station (CAIS) at Kabete is also facing serious difficulties. The government has gradually reduced its grant to the station and with escalating costs the grant is now only sufficient to meet 90% of the cost of liquid nitrogen. The government run National AI Service still operates but the number of inseminations per year per inseminator is less than 50 in many districts.

The provision of AI services in both Busia and Siaya are at present fraught with problems related to provision and storage of semen, communications and transport and the ability of farmers to pay. Farmers have been encouraged to castrate the local bulls and then often have to wait several months to get their cows in calf through A1.

An effective AI service is central to the success of this project; through owning improved livestoek farmers will be provided with both the means and motive to sustain tsetse control from their own resources.

The government policy of privatisation of AI services has been slow and difficult even in areas where large numbers of dairy farmers are willing to pay for semen. The majority of big beef and dairy farmers now import their own semen or have reverted to keeping their own bulls. It is unrealistic to assume that the AI services in Busia and Sinya can be successfully privatised within the next four years without adopting a new approach. The project will therefore establish its own AI service.

The introduction of improved breeds should be gradual, starting with improved *Bos indicus* breeds which are generally hardier and more disease resistant than *Bos taurus* breeds but more productive than the indigenous cattle in the districts. As tsetse control improves and farmers acquire knowledge on animal mutrition and management smaller and hardier *Bos taurus* breeds will be introduced. Thus the initial the emphasis will be on semen from Sahiwal and Boran bulls. The Sahiwal is a *Bos indicus* breed imported from India with good milk production. The Borans from the Kenya Highlands have been selected for beef characteristics and when crossed with East African Zebu will produce progeny suitable for traction. The indigenous cows in the districts are very small and should not be crossed to very large bulls. It will be necessary to supply bulls, purchased by the project, to the CAIS and pay the full cost of their maintenance through the purchase of the semen from the station. It may be necessary to import Sahiwal semen if the number and quality of Sahiwals available from the national stud herd is inadequate. An animal breeding consultant will be employed by the project to provide advice on the procurement of appropriate bulls and semen. The project will transport the semen to the districts and employ five inseminators to be based at the project office in each district. These inseminators will operate on motorcycles using small liquid nitrogen containers and inseminations will initially be at a much reduced rate, Shs 20 in the first year, KSh50 in the second year and KShs 100 for the third and fourth years of the project. The service will be the responsibility of the project veterinarian. In addition, and in keeping with the government policy of privatisation of services, the project will provide frozen semen from dairy breeds, at cost, for purchase by private veterinarians or commercial artificial inseminators for use in existing diary enterprises.

Animal health assistants, employed by the DVO, will be chosen for retraining as inseminators. Field allowances will be paid by the project. The aim will be to concentrate the AI service within a 20 to 30 km radius of the Busia and Siaya project offices.

7.3 Bull scheme

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As with the AI scheme, the project management should initially consider the introduction of Sahiwal or Boran bulls and when some tsetse control is achieved small *Bos tourns* dairy breeds such as Jersey or Guernsey will be introduced. The availability of bulls should be assessed during the first year of the project. To ensure that the breeder rears the bull to maturity it may be necessary to agree to purchase at the birth of the calf. There are many Boran breeders in Kenya. The National Boran Stud at Mutara in Laikipia may be in a position to provide Boran bulls or ILRAD from its ranch outside Nairobi. Sahiwal bulls may be more difficult to obtain as the Sahiwal Stud at Naivasha is in financial difficulties but private breeders do exist (e.g. Kilifi Plantations).

Farmers, identified by the community, will be provided with a bull and training in its management through an appropriate NGO. Farms should be located close to a village watering source and away from tsetse habitat and bulls will be kept under semi-zero grazing conditions. The project should give priority to placing bulls in areas not served by the project AI service. Bulls will be given trypanocidal prophylactics and hand sprayed with acaricide.

As with many other aspects of the project, full cost recovery is totally unrealistic in the first phase. The bull scheme, like the AI scheme, must be seen as an essential means of providing the livestock keepers in the districts with the capacity to sustain tsetse control eventually.

The farmer will be required to make the bull available initially at a charge of KSh20 per cow, for two services. The reduced fee will apply until such time as 100 live progeny are produced. In return for providing the bull at a reduced rate the farmers will be provided

with a bull pen and a forage plot and an initial subsidy of Shs 80 for the first 100 services to assist with labour costs during the initial period. After this the bull keeper will be permitted to charge whatever the market allows. In this way the farmer is encouraged to use his bull as much as possible and the availability of an improved bull at a much reduced cost is ensured for an initial period. (Frequent use of bulls is widely believed to reduce fertility, however, there is little experimental evidence to support this contention). In the second phase of the project the bull scheme will aim at full cost recovery.

The project veterinarian or the private veterinarian when available (paid a fee by the project) will provide each bull keeper with veterinary support. The bull keeper will also allow the project to hold training sessions in animal husbandry at his farm. Training in calf rearing will be provided for all farmers with crossbred calves. The veterinarian or the livestock production officer/assistant will be required to certify the birth of offspring from the improved bulls.

7.4 Zero-grazing

There are currently approximately two thousand dairy cattle in each of the two districts. These animals are kept by relatively wealthy individuals near the major centres of population. Very few are kept by the project target group; the rural poor. It is therefore proposed that zero-grazing demonstration units will be set up in each district, and that these will be used as teaching facilities to demonstrate the requirements and advantages of keeping high potential cows under these conditions. This will begin when the tsetse control operation has had an impact on fly mimbers.

Initially cows will be maintained under trypanocidal drug protection; Img/kg isometamidium chloride at 3 monthly intervals. Individual farmers will be selected by the NDDP in consultation with the community and they will be provided with the materials and technical assistance required to establish a zero-grazing unit and napier grass/Leucaenal Desmodium plot. They will then be provided with an in-calf heifers (purchased by the project with the assistance of an animal breeding consultant), and will receive comprehensive training in dairy cow husbandry. Training of farmers and on-going extension support will be provided by the NDDP. After the initial start-up costs have been provided by the project, the farmers concerned will be responsible for most of the cost of necessary inputs, which can be offset against income derived from milk sales. However, to encourage the adoption of good animal health practices, mineral licks and veterinary drug costs will be phased in with the farmers being responsible for 50% of the costs in their first year of operation and 100% of the costs in year two and thereafter. In exchange for their tabour in building the unit and establishing the forage plot, and for making the unit regularly available for demonstration purposes to local farmers, the unit and cow will become the property of the individuals running the units. However, the first calf born will be returned to the project at weaning, and if it is a heifer will be allocated to a second farmer who will be expected to establish a zero-grazing facility at his own expense. This principle of the first born calf being passed on to another farmer will contimie, thereby providing a means for the beneficiaries to pay for their original cow without having to obtain credit.

The first units will be situated close to existing water supplies, but eventually as the project succeeds in reducing the risk of trypanosomiasis, it will be possible to introduce donkeys to transport water from more distant sources to the zero-grazing units. Currently no donkeys are found in the area, largely because *Trypanosoma brucei* is extremely virulent in equines. For this reason the introduction of donkeys should only be considered in the second phase of the project. Water could then be supplied to zero-grazing units and other consumers as a paid service.

Attempts by IFAD, in these districts, to provide dairy cattle, or other livestock, to groups of people, e.g. women's groups, rather than individuals have previously been unsuccessful. A lack of commitment to the communally owned livestock resulted in an unwillingness to provide the necessary labour for maintenance of the cattle. The NDDP are also wary of providing cows specifically to women, they have found that this actually lowers the status of the women concerned as they provide all the labour associated with the zero-grazing unit, while the men retain income control. Cows are therefore now placed with households and all members of the household are encouraged to share the labour as well as the benefits accruing. NDDP are scheduled to commence operations in Busia District in 1995, and are already active in Siaya where 750 cows have been placed.

An important component of the demonstration units will be cost-benefit analysis, to compare for example the relative profitability of milk production in comparison to alternative land uses, e.g. cotton, tobacco or maize production. It is envisaged that these studies will be carried out by the staff from the district Livestock Production Office in collaboration with the project staff.

7.5 Forage for improved cattle

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A vital component of a zero-grazing or semizero-grazing scheme will be the establishment of forage plots. These will incorporate agroforestry practises such as the interplanting of napier grass with uitrogen fixing leguminous species e.g. *Desmodium discolour*, a shrub, and *Leucaeua* sp., a tree. In addition to improving the fertility of the soil and improving the productivity of the napier grass both these species provide high protein content leaves, thereby improving the overall nutritional value of the forage.

A local demand will develop for napier grass canes, *Leucaena* saplings and *Desmodium* seedlings as components of the forage plots. This represents an opportunity for women's groups to set up nurseries to supply these inputs as an income generating activity; several NGOs are currently active in this area, e.g. Kenya Greenbelt Movement. In addition to their value as nitrogen fixers thereby contributing to soil fertility, *Leucaena* trees can also be sources of fuelwood, timber, shade and green manure. They are also relatively fast growing and do not remove nutrients from the soil to the same extent that *Eucalyptus* sp. do. Crops therefore do better in close proximity to them than they do near to the eucalyptus trees which are currently found in the project area. Employment will also be generated by the need to prepare land and to plant up the forage plots. Because of the

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initial investment required, it is likely that farmers who establish zero-grazing units will be relatively wealthy. However, poorer farmers can benefit by establishing forage plots and selling napier grass and legumes to the dairy farmers.

7.6 Tick-borne diseases control

Siaya District had approximately one hundred cattle dips but almost half of these are in a state of disrepair and only 23 dips are actually in use. The number of cattle dipped in the district in any year between 1979 and 1987 was never greater than 15% of the total cattle population (assuming one dipping per animal per year). Data on dipping frequency is not available but if each animal was dipped monthly then only 1.1% of the district's cattle were dipped in any of these years. There are 76 dips in Busia and their state of repair and usage are similar to those in Siaya.

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Ninety nine percent of the cattle in the districts are indigenous and the use of dips can be taken as an indication that the livestock keepers do not consider dipping as an essential requirement for these cattle. However, with the introduction of improved animals some form of tick control will be essential.

In view of the importance of tick-borne diseases in improved cattle the project veterinarian will assess the facilities for tick-borne diseases control in the districts within the first year of the project. The bull and zero-grazing schemes involve less than 200 animals and tick control will be by hand spraying. However, the AI service and the bull scheme will result in the birth of several thousand crossbred calves and tick-borne diseases control will be required particularly in the case of *Bos tearnus x Bos indicus*."

Funds, allocated under the general rural development mini-projects budget, could be used to ensure effective control of tick borne diseases.

7.7 Traction and land use

There is an IFAD funded animal traction programme in Homa Bay, South Nyanza. This involves components dealing with training and equipment manufacture. It is proposed that the expertise available in this programme is utilised in the project, and that relevant personnel conduct workshops and act as technical consultants; funds are allocated for this purpose.

Funds allocated for general rural development mini projects might be used for a land use consultancy and any recommended activities. Support might also be provided for the land use elements in the second phase of KETRI/ODA project (Annex 9, section 9.7).

Annex 8

TRAINING AND EDUCATION

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8.1 Introduction

Training and education are essential components of the project and are required for both the community and MALDM staff. The project will employ a full time training officer to take responsibility for all aspects of education and training. He will liaise with the project sociologist on appropriate methods for use within the community.

8.2 Awareness raising

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Seminars will be organised at the start of the project involving senior personnel from relevant Ministries and participating NGOs, with the objective of introducing the project aims and the intended mode of operation. Seminars will be held in Nairobi and in the districts.

The project can only succeed with the full co-operation and active participation of the community. It is therefore essential that the community is convinced of the need for the various components of the project, understands their purposes and objectives and is willing to contribute the necessary labour, cash or materials to ensure they succeed and are sustainable. This will require a concerted effort involving "barazas" (community meetings), workshops, drama, and posters. Emphasis will be placed on understanding the impact of trypanosomiasis and the role of the tsetse fly in disease transmission. Livestock keepers will be provided with information on trypanosomiasis control and tsetse fly avoidance.

Training, extension and demonstration materials will be produced by the Agricultural Information Centre, of the MALDM. Existing local groups such as women's groups will provide useful entry points into the community. The District Development Committees will also be fully involved in community training activities. The community will select the trap attendants and women's groups who will make the traps. The participants in these activities will require specific technical training.

8.3 Technical training in the community

Trap monitors will be responsible for the installation, maintenance and monitoring of traps for *Glossina fuscipes*. They will require practical training in trap siting and erection, trap maintenance and record keeping. This training will be done by tsetse control staff from the DVS, and the trainers will go on to serve in a supervisory capacity. The trainers will initially be retrained in the latest methods of tsetse control by KETRI or ICIPE scientific and technical staff. Both institutes have indicated their willingness to be involved with training for the project. Tsetse traps will be made by women who will be trained in both sewing machine use and trap manufacture. Sewing machine training will be done through the private sector and the District Zoologist and his staff will provide instructions on trap assembly.

Farmers will also be trained in general animal production and disease control. Improved livestock husbandry practices in relation to tsetse and trypanosomiasis control will be an important aspect of this training. The emphasis in farmer training will alter slightly once tsetse control activities have started to have an impact and improved breeds are introduced. Training will include calf rearing, husbandry of improved breeds of cattle, improved forage production, agroforestry and animal traction. Farmers chosen for participation in the zero-grazing and bull schemes will be provided with special training (Annex 7). Where possible NGOs and other organisations already active in the districts will be utilised in training. The project manager and the veterinarian will draw up contracts and agree on training schedules with appropriate NGOs as soon as possible.

8.4 Upgrading MALDM capabilities

For senior MALDM staff (Chief Zoologist, District Zoologists) training will consist of short duration, basic management courses. Staff will also receive computer training, in word processing and database management with the objective of ensuring efficient project management and reporting. Technical level staff will receive comprehensive training in tsetse survey and monitoring techniques, trypanosomiasis surveillance and trap manufacture and use from KETRI or ICIPE. District Livestock Production Office staff will be trained in livestock production recording systems and data analyses by Kenya Agriculture Research Institute (KARI); accurate livestock production data is an essential component of the monitoring and evaluation of the project.

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THE ROLE OF THE RESEARCH INSTITUTES IN SUPPORT OF THE PROJECT

9.1 The Kenya Trypanosomiasis Research Institute (KETRI)

KETRI is a semi-autonomous parastatal institute charged with the mandate to carry out research in human and animal trypanosomiasis in Kenya. Specifically the focus of their mandate is "to evolve technologies that would lead to control of human and animal trypanosomiasis and to eventual reclamation of tsetse-infested lands."

A number of KETRI's recent research activities are of relevance and interest to the project. KETRI, in conjunction with ODA, have undertaken a study of the importance of cattle as a reservoir for human infective trypanosomes in Busia (Annex 4 & 5). This has involved detailed studies of disease prevalence and productivity of village cattle followed by an assessment of the effectiveness of various trypanocides.

KETRI, with the aid of funds from Canada, have just completed a four year project aimed at up-dating the tsetse distribution map for Kenya. They have the expertise necessary to carry out tsetse surveys.

KETRI, in conjunction with ILCA and ILRAD, have recently published the findings of a detailed socio-economic study on the factors affecting implementation of community based tsetse control in Busia (see 9.6 below). This study also identified drama and playlets as an effective method of educating the community on matters related to tsetse and trypanosomiasis control. The institute has established a socio-economic unit.

The second phase of the ODA/KETRI project is expected to involve a study of the environmental impact of tsetse control. A consultancy report on this topic is available (see Annex 6 for ref.) ODA will employ a land-use expert to ensure that these important aspects of sustainable tsetse control are given priority.

The National Sleeping Sickness Referral Hospital at Alupe in Busia District is manned by KETRI staff. They have experience in the surveillance and treatment of human sleeping sickness.

It is proposed that KETRI will play a major role in the training and education aspects of the project. Furthermore, as a research institute, it is proposed that they will be in a position to provide support to the project in a number of other areas outlined below. In many cases this would entail the expansion of activities in which KETRI are already involved in the project area. However, it should be stressed that, apart from the staff at the Alupe Hospital, KETRI have no staff or facilities permanently stationed in the project area.

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9.1.1 Training

Routine monitoring of tsetse flies and disease surveillance should be the responsibility of a strengthened District Veterinary Service (DVS). To enable them to perform these activities effectively the necessary resources and facilities must be provided and the skills of the DVS personnel must be improved. KETRI have highly experienced workers in these fields and it is therefore proposed that KETRI provides training in the techniques required for effective monitoring. The project will meet the direct costs of the training programme: disposable equipment, capital equipment, transport, field allowances, while KETRI will meet the salaries of scientific and technical staff involved in workshops/ training courses.

It is further proposed that KETR1 will assist the project in formulating the best methods of raising community awareness prior to any tsetse control operations, educating the community in relation to the disease and ensuring meaningful community participation in decision making related to project activities.

The zero-grazing and bull scheme mini-projects will be run with the assistance of appropriate NGOs in the districts. KETRI will be requested to provide training in tsetse and trypanosomiasis control for NGO staff if required.

9.1.2 Initial surveys

An essential requirement, prior to any tsetse control operation, is to determine the extent of the fly infestation. The precise distribution of tsetse flies in the project area is not known. This is particularly so for Bungoma where there is no district zoologist and no trapping has taken place. Also the existence of *G. pallidipes* in Busia and Siaya is in dispute (Annex 3). The data on trypanosome prevalence in livestock throughout the districts is also inadequate. It is well recognised that the disease may persist in areas where the apparent fly density is zero; the role of mechanical vectors must also be considered. Thus both tsetse and trypanosome surveys are essential components of successful tsetse control.

Although in the long term it is envisaged that the Department of Veterinary Services (DVS) will be responsible for routine monitoring of both tsetse and trypanosomiasis, it is recognised that the department currently has limited capacity in this regard. In view of this, and to facilitate a rapid start-up, it is proposed that KETRI carry out the initial tsetse surveys in collaboration with the project manager.

9.1.3 Socio-economic research

This project aims at full community participation and envisages eventual full cost recovery from the community of all tsetse and trypanosomiasis control activities. Community participation in tsetse control is a relatively new idea and to-date there is no completely successful model which can be followed. It is proposed that KETRI's socio-economic unit

will collaborate with the project sociologist in research aimed at assessing the tsetse control methods best suited to community involvement and sustainability.

9.1.4 Integrated tsetse and trypanosomiasis control

It is proposed that KETRI will collaborate with the project in investigating the use of synthetic pyrethroids in the form of pour-ons for tsetse control together with the use of trypanocidal drugs as a means of controlling the animal reservoir of human infective trypanosomes in Busia. The KETRI/ODA trial recently completed (Annex 4 & 5) showed that three monthly treatment with isometamidium chloride maintained cattle virtually free of circulating trypanosomes, including a potentially human-infective form. The cattle-flyman route of infection can therefore be effectively disrupted by this approach. The initial trial involved 300 cattle associated with one village in Busia District and treatment with trypanocidal drugs took place over six months. The proposed project field trial will involve 3,000 animals over two years, treated at three monthly intervals with isometamidium chloride will be discontinued once tsetse challenge has declined and trypanosome prevalence rates are significantly reduced. The trial will include evaluation of the communities response (see 9.1.3 above).

This approach will involve the integration of both tsetse and trypanosomiasis control reducing the risk of both human sleeping sickness and livestock disease. After the triat period it would be anticipated that participating farmers would be willing to pay for further treatment themselves. A phased introduction of full cost recovery is envisaged and depending on the success of this initial demonstration pour-on programmes will be introduced into other areas where cattle densities are sufficient.

The project will provide the transport, field allowances, disposable equipment and capital equipment necessary for the study. KETRI will be responsible for the salaries of the scientific and technical staff required and will be provided with improved laboratory and office facilities and hostel accommodation at their Alupe field station.

9.1.5 Human sleeping sickness surveillance

Sleeping sickness incidence is currently at a low level in Kenya with no new cases being reported from the two districts during 1993 and 1994. With the introduction of a tsetse control programme it would be expected that this situation will continue, and it is therefore not proposed that the project should include a major sleeping sickness surveillance component. However, it is possible that existing surveillance procedures under-estimate the true situation. Passive surveillance, the detection of suspected cases reporting to health care facilities, will continue as now. Active surveillance, i.e. screening the entire population of selected villages, would only be necessary if cases started to be detected by, for example, passive surveillance. Sleeping sickness surveillance within the project will therefore be confined to semi-active surveillance involving screening of all patients reporting to selected health care facilities irrespective of symptoms. This will provide a sample of the general population, biased in favour of sick individuals, at relatively little cost.

9.2 International Laboratory for Research on Animal Diseases (ILRAD)

ILRAD, shortly to merge with International Livestock Centre for Africa (ILCA) and become International Livestock Research Institute (ILRI), will continue to research better methods for the control of trypanosomiasis. The results of this research will benefit the livestock keepers in the project area.

In addition ILRAD has a major programme on the control of tick-borne diseases particularly East Coast fever (ECF). While removal of the tsetse challenge may enhance the productivity of livestock in the project area, tick-borne diseases and particularly ECF will remain constraints. Data from KETRI (Annex 4) indicate that trypanosomiasis is the most common disease of indigenous cattle in the area. However, there are some data from the MALDM to suggest that ECF is the most important disease of improved dairy cattle in these districts. The main focus of ILRAD's tick-borne diseases programme is to produce an antigen based vaccine for ECF.

ILRAD's research, as it stands, is clearly in support of the project purpose. But mention should be made of some specific aspects of their trypanosomiasis research of particular interest to the project. The institute has been involved in the development of new and improved diagnostic techniques for trypanosomiasis. These diagnostics tools are to be passed on to the end user through FAO/IAEA (International Atomic Energy Agency) and KETRI staff have been trained to ensure the availability of these techniques in Kenya. Improved methods of detecting the presence of trypanosomes and distinguishing between different species is particularly important in monitoring the progress of a tsetse control campaign. Furthermore, where the human and livestock diseases co-exist an ability to distinguish between different trypanosome species is crucial. Infections in livestock with Trypanosoma brucei (forms of which may be human infective) are often non-pathogenic and as such may remain undiagnosed clinically. Furthermore, using the standard parasitological techniques, this parasite is frequently confused with *T.congolense* (Annex 1). It will be of utmost importance in this project to have reliable methods of diagnosis which are highly specific. ILRAD's diagnostic techniques for trypanosomiasis are constantly being improved and the siting of this institute in Nairobi will provide the project with the opportunity to avail of these new techniques as and when they become available. A close association between the project technical experts and ILRAD scientists should be encouraged.

A further component of ILRAD's research with particularly bearing on the project is environmental monitoring of the impact of tsetse control (9.7 below). Their capabilities in the area of Geographic Information Systems (GIS) and the processing of satellite imagery, specifically for the purpose of monitoring changes in land use in relation to tsetse control, are of considerable interest and should be further explored. The present project is regional and issues related to regional development fall under the mandate of ILRAD as a Consultative Group for International Agricultural Research (CGIAR) institute. ILRAD may then be in a position to play a more active role in the project and it is suggested that this would be in the area of environmental monitoring. The funding for environmental monitoring is under the regional component of the project. As this is an extremely specialised area involving expensive equipment and personnel the funds set aside are unlikely to ensure adequate or meaningful coverage of this element of the project through the hiring of international consultants. The presence in Nairobi of a facility already active in this area must not be ignored.

ILRAD (ILRI) is currently negotiating an IFAD funded project entitled "An integrated approach to the assessment of trypanosomiasis control technologies and their impacts on agricultural productivity, human welfare and natural resources in tsetse-affected areas of Africa." International Centre for Insect Physiology and Ecology are one of the proposed partners in this project. It is understood that the proposal could be expanded if further funds were available. The inclusion of Busia and Siaya as a site to be studied in the ILRAD/IFAD programme would greatly enhance the aims of the present project and provide a significant contribution to the understanding of the impact of tsetse control in sustainable agricultural development in Africa. It is strongly recommended that the EU investigate this possibility at the carliest possible opportunity.

9.3 The International Centre for Insect Physiology and Ecology (ICIPE)

ICIPE is based in Nairobi and have a large field station at the Mbita Point in South Nyanza. ICIPE's activities are divided into four research programme areas: crop pests, livestock pests, locusts, and medical vectors and a fifth section named institutional building, interactive research and information. The livestock pests programme concentrates on tsetse and ticks. The former includes work designed to improve trapping strategies. ICIPE have recently been awarded a ECU 6 million grant for "Interactive development and application of sustainable tsetse management technologies for agropastoral communities in Africa." The project document lists six specific objectives that will be addressed during the five year lifetime of the project:

The development of improved trapping methodologies for *G. pallidipes*, *G.fuscipes* and *G.morsitans sp.* for both survey and control purposes in different agro-ecological zones using kairomones, allomones and larviposition pheromones;

The development of cost-effective strategies for maintaining *G. pallidipes* populations at ultra-low levels through barrier traps and allomones;

Classification of some factors influencing the dynamics of trypanosomiasis transmission at low levels of tsetse challenge,

To study the socio-economic aspects of the trap and to determine its costeffectiveness and sustainability; The evaluation of the potential of certain biological agents: a virus, tsetse-specific bacteria and the fungus *Beanvaria bassiana* as biocontrol agents of tsetse;

Wide dissemination of information on tsetse control strategies developed and the research carried out to interested governments, organisations and institutions throughout Africa and elsewhere.

All of these topics are of relevance to the goals of the present project and close contact between the project and ICIPE scientists should be developed.

Of particular interest to the project will be research on odour baits and improved trap design for *G.fuscipes*. The odours which increase trap catches of *G.pallidipes* and *G.morsitans*, acetone, octenol and certain phenols, have no significant effect on *G. fuscipes* catches. However, ICIPE have shown recently that hippo dung and monitor lizard urine increase trap catches of this species (hippo and monitor lizards are preferred hosts for this fly). The components of these attractants are being characterised and tested. By the end of 1994 ICIPE hope to identify compounds which can be used in the field to enhance trap catches. Such attractants could lead to reduced traps densities, thereby resulting in significant cost savings and contributing to the sustainability of trapping programmes.

ICIPE is also actively involved in training, at all levels from the professional to the farmer. Training courses are run both in Nairobi and at Mbita Point. The latter facility is of particular interest since it is close to the Siaya and Busia Districts and is in an area of *G.fuscipes* infestation. It would be a suitable base for training in trapping and monitoring techniques for this species of tsetse. The field station has extensive facilities including accommodation. Budgetary allocations have been made within ICIPE's EC grant for training, and it is possible that training for the present project could be incorporated into this programme. Alternatively, specific training courses could be organised.

ICIPE also has experience of involvement in tsetse control at the community level through its ODA-funded project in the Lambwe Valley, South Nyanza; the Kwale-Kilifi Adaptive Research Project; and at Nguruman, Kajiado District. The institute also has a GIS facility and is a partner in ILRAD's IFAD proposal (9.2).

9.4 Kenya Agricultural Research Institute (KARI)

KARI has a mandate for all agriculture research apart from trypanosomiasis. Its activities related to research in the control of other livestock diseases particularly tick-borne diseases are of relevance to the project. KARI financed by ODA, are involved with the establishment of computerised recording systems for livestock productivity and epidemiological data. The project manager should liaise with this section of KARI in relation to the choice and establishment of appropriate livestock recording systems for the DLPO in the districts. KARI can provide training for the DLPO staff.

9.5 Research requirements of the project

Apart from the research needs identified herein it is anticipated that as the project proceeds further areas of research will be recognised. What these may be is not predictable but it is likely that either KETRI, ILRI, ICIPE, KARI or locally recruited consultants will be in a position to assist the project. Provision is made under the research budget to meet these requirements which might be in any area of rural development.

9.6 Community Participation in Tsetse Control

(This section was contributed by the socioeconomics section of KETRI)

9.6.1 Introduction

The problem of sustainability of tsetse control techniques used in different countries has not been fully addressed and community participation in tsetse control is regarded as a possible solution. However, the level of community participation in different tsetse control programmes has been highly variable. In some cases, community involvement during trypanosomiasis epidemics has included activities like reporting new cases in both human and animals and passing information to other community members. For tsetse control, people have been asked to contribute local labour for cutting paths and erecting traps and targets. More often than not, the enthusiasm disappears once the acute problem is solved. In other situations the communities have been requested to participate at a closing down of donor aided control projects and this approach too has not been sustainable.

In addressing the issue of community participation in tsetse control, it should be remembered that communities are heterogeneous and therefore participation activities are contingent to specific local conditions. Consideration must be given to community awareness of the diseases and the vector, socio - economic impacts of past disease outbreaks and local leadership and community organisational capacity.

Due to the wide range of participation activities that communities can get involved in, a general definition of the terminology becomes difficult to achieve. However, in a 1992 World Health Organisation (WHO) publication (TDR/SER Resource paper No 1 of 1992), various definitions have been attempted which give a comprehensive insight of the issue. One definition given includes the active involvement of those who are recipients of the programme: "Community participation is a social process whereby specific groups with shared needs living in a defined geographical area actively pursue identification of their needs, take decisions and establish mechanisms to meet these needs".

Community participation in vector control programmes is not equivalent to communitybased health programmes, although the two may be interdependent. Community-based necessarily implies that decisions, activities, resources, and programme organisation
emanate from the community. This is not always the case in community participation for the control of vector-borne disease.

Four major paradigms of community participation have been characterised WHO.

1. Active participation in which inputs are provided by both the government and local population for the elimination of the disease.

2. Active income-linked with economic participation in which control programmes are linked with economic improvements and increased incomes for people.

3. Active incentive linked participation which ensures that the community or key individuals will benefit not only from the programme but also from extra income. This may sustain their interest over a longer period.

4. Passive participation which includes complete co-operation of part of the community in the implementation of the programme, to achieve the objectives and targets set for the programme, but does not ask of community contributions in terms of resources, cash or labour.

The above paradigms are considered in the following discussion on community participation for the EEC tsetse control programme involving some of the Western districts of Kenya: Busia, Siaya, and Bungoma. At present KETRI can only give its preliminary findings on study carried out in some villages in Busia.

9.6.2 Busia

Busia residents like most of the communities living in tsetse endemic areas of Kenya have not been actively involved in tsetse control activities. The government has been fully incharge during past trypanosomiasis disease outbreaks. It has provided money for ground spraying and trap purchase and maintenance, free treatment of sleeping sickness patients and subsidised treatment for livestock. Free treatment has further been extended for animals involved in specific KETRI projects. In such situations where people are used to free facilities, and in this case free tsetse control services, active community participation on voluntary basis becomes a difficult thing to achieve.

However, during 1993/94 KETRI assessed the socio-economic factors affecting implementation of community-based tsetse control in Busia. The study, done in collaboration with ILCA and ILRAD, received financial support from the WHO. Contingent valuation technique was used to assess people's willingness to contribute resources towards tsetse control. One of its important findings was that the community are willing to contribute labour time more than cash money. This information is important in identifying the type of community participation that is feasible in Busia. The average amount per month that people wanted to contribute was 18 Kenya shillings (ECU 0.26). Phase 2 of this study aims to implement a community-based tsetse control programme to give people the opportunity to actualise their pledge of resources towards tsetse control. The initial stages of the study has already commenced and it is hoped that by the end of the year, results of the feasibility of community-based tsetse control in Busia will be available. See Annex 10.

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In 1991 KETRI installed baited insecticide impregnated targets to control G. fuscipes in the southern part of Siaya along the shores of Lake Victoria. The ground spraying which normally took place in the area was suspended for the course of the trial. The targets had no demonstrable effect on tsetse numbers which possibly increased over the trial period. However, this trial was not properly executed and thus its failure can be attributed to a variety of reasons and no valid conclusions can be drawn about the effectiveness of the control technique. Unfortunately the one effect which the trial did have was convincing the community that the methods used were ineffective against the fly. In any new approaches to the community in this area the project will have to be aware of the impact of this previous experience.

9.6.4 Lambwe Valley, South Nyanza

The Lambwe Valley is not included in the first phase of the project. However, given the long history of human sleeping sickness and animal trypanosomiasis in the area and the variety of control methods adopted over the years the community there are more aware of the problems of tsetse and trypanosomiasis than any other community in Kenya. During the 1980/81 outbreak enormous livestock losses were recorded in the homesteads surrounding the valley (Annex 3). In recent years several effort have been made by the Government Veterinary Services, KETRI and ICIPE with funding from different donors, to involve the community in tsetse control. The project should liaise with the various scientists who have participated in these projects as they have considerable experience in the problems of community participation in tsetse control.

9.7 Environmental impact of tsetse control

The role of the tsetse fly in the development of Africa is an intensely controversial issue with scientists, conservationists and developers taking entrenched positions over the years. In 1860 the explorer, Richard Burton, questioned why "this plague was placed in a land so eminently fitted for breeding cattle and for agriculture" and suggested that some time in the future "the tsetse may be exterminated by the introduction of some insectivorous bird, which will be the greatest benefactor that Central Africa ever knew". Others view the tsetse fly as the saviour of the African environment and warn of the loss of biodiversity and the land degradation that they claim will be a direct consequence of tsetse eradication.

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The impoverished African farmer struggling to keep his family alive in the face of famine and disease would no doubt agree with Burton. Conservation, biodiversity and land degradation are important concerns for the future of our environment but the majority of Africans have yet to solve the problems of to-day: "where will the next meal come from ?". It is unreasonable to expect a people to be concerned about future generations when their own day to day survival is in jeopardy. Many of the popular issues voiced in the press of the developed world have little or no relevance to the poor of the Third World. The notion that the tsetse fly should be protected is an anathema in areas where people die of human sleeping sickness and starve because their cattle die of trypanosomiasis. Other ways of preserving wildlife and guarding against land degradation must be found.

The overall objective of this project is to improve the welfare of the people of the Kenya/Uganda border region and the project purpose is to increase livestock productivity. The tsetse control methods to be adopted are environmentally benign; insecticide will be used only on traps and directly on cattle. The area is intensely farmed, there is little wildlife and it is not the aim of the project to open up new grazing lands through tsetse control or to increase livestock numbers. Rather it is envisaged that the productivity of the existing herds can be improved and new and upgraded livestock be gradually introduced to replace the indigenous cattle.

The tsetse species of most importance in the area is the riverine species G. fuscipes (Annex 4). The land adjacent to the lake shore and the rivers in the two districts is sparsely populated and little utilised. The lake shore land is at a lower altitude with less rainfall that the rest of the districts. But these areas are also avoided because of the presence of the fly and the association in peoples mind of the lake and the rivers with both the human and animal disease. The effective control of the disease vector may well alter this situation and the possible changes in land use, particularly river banks, and in the management of natural resources which may follow are of concern.

A recent KETRI/ODA consultancy report addressed these issues and Busia was one of the proposed sites for further studies on the environmental, land-use and socio economic consequences of tsetse and trypanosomiasis control. The second phase of the KETRI/ODA project due to commence this year proposes the employment of a land-use specialist; the collaboration of the project with KETRI/ODA on land use issues would be beneficial. The prospect of ILRAD being involved in the environmental monitoring aspects of the project has been discussed (9.2 above). The possibility of KETRI providing the on-the-spot monitoring and ground truthing while ILRAD concentrates on the development of appropriate data bases including satellite imagery should be considered. It is important that the project maintains close links with both institutes.

Such studies, by their very nature, are long term but must be initiated at the beginning of the project if meaningful information is to be gathered. Furthermore, if sustainable livestock productivity is to be ensured issues related to land use and resource management must be addressed as education issues. Thus, the education and training aspects of the project must emphasise the importance of proper land use practises and careful management of natural resources.

Annex 10

ASSESSMENT OF THE SOCIO-ECONOMIC FACTORS AFFECTING IMPLEMENTATION OF COMMUNITY-BASED TSETSE CONTROL IN BUSIA, KENYA

(Extracts from a paper presented by D.Kamara at the ISCTRC meeting in Kampala, October 1993. The full text of the paper can be found in the proceedings of the 22nd meeting of ISCTRC, OAU/IBAR PubL)

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SUMMARY

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The use of baited traps and targets to control the tsetse fly has the potential for successful and sustainable trypanosomiasis control by local communities. However, with community-based programmes, community organisational capacity, incentives needed to initiate and sustain programmes, and intracommunity distribution programmes become important issues. A multi-disciplinary study in a sleeping sickness foci in Busia district. Kenya is investigating this and other issues, using participatory, focus group and formal survey methods. Findings to date indicate the existence of a complex set of linkages between human health and animal trypanosomiasis and human health, subsistence and nutrition, resulting in multiple social and biological impacts on local populations. Various factors including ownership and use of livestock, beliefs and attitudes concerning trypanosomiasis, and the length and degree of exposure to the disease and control programmes appear to be important determinants of the willingness of both the communities and individuals to participate in control activities.

INTRODUCTION

The use of baited traps and targets to control the tsetse fly has the potential for successful and sustainable trypanosomiasis control by local communities. At present there are many examples of programmes involving tsetse control by community involvement (Dransfield et al., 1991 for Kenya; Lancien, 1989, and Okoth, 1991 for Uganda; Leak, 1991 for Ethiopia; Laveissiere, 1989 for Cote d'Ivoire; and Gouteaux et al., 1989 for The Congo. However, not all have progressed smoothly. The problems encountered have caused some authors to realise that communities in which they work are not homogenous, and to suggest that some input from the social sciences is essential (Laveissiere, 1989; Grundler and Douati, 1991). Difficulties in preventing theft and damage to traps and targets in the field (Opiyo, 1990; Leak, 1991) have led to the general conclusion that the success and sustainability of these techniques depends crucially on practical involvement of the beneficiary communities (Oendo and Otieno, 1989; Laveissiere et al., 1989). To date, there is little published work designed to comprehensively assess the feasibility of community participation in tsetse control. We believe that ex-ante economic and social studies have been under used in this field, and can offer insights into the behaviour, aspirations and motivation of both individuals and communities during attempts to involve them in tsetse control, in order to provide recommendations leading to appropriate design and improved implementation.

The general objective of the study is to examine the socio-cultural and economic bases of support for community participation in tsetse control in Busia District. Western Province of Kenya. Specific objectives are:

- i) To determine the extent of community knowledge and understanding of tsetse and trypanosomilasis and the socio-economic importance attached to these diseases by various individuals and communities in Busia.
- ii) To identify the factors, eg health, economic, social, political, which influence individuals' and communities' willingness to contribute time and/or money to tsetse control programmes.
- iii) To understand the relative importance of these factors in forming attitudes towards support and participation in such projects.
- iv) To assess the possibilities for community participation in testse control in Busia.
- v) To evaluate and contrast different methods for collecting information to evaluate the local support for tsetse control programmes that can be used in other similar situations.

The purpose of this paper is to report on the qualitative data collected during the first phase of the study, the sequence and methods of data collection.

SUMMARY OF RESULTS

Community participation programmes conducted in Uganda and Kenya seem to suggest that local communities can carry out their own tsetse control provided they have access to expertise and initial seed money and have the leadership and organisation to facilitate local involvement (Dransfield et al., 1991). The general objective of this study was to examine the socio-cultural and economic basis for local support for tsetse control among the two dominant tribes, Teso and Luthya, in Busia District, Kenya. In order to achieve the above objectives, investigations were conducted both at the community and individual levels. From qualitative data analysis: key informant Interviews, community profiling, focus groups and transect walks, the following conclusions can be drawn:

- In the study area, men are usually the heads of households. As such they are responsible for making day to day decisions regarding the running of the family and farming activities. The implication here is that for the success of community-based tsetse control, men have to be "formally" involved from the beginning. Formal involvement here is figuratively used to depict the respect accorded to heads of households as makers of important decisions, particularly in terms of the amount of cash and/or labour each household head would like to contribute towards tsetse control. However, women also play important roles in making practical decisions about participation in tsetse control. The changing of men's traditional roles as the sole decision makers was emphasised in two focus groups, both Teso and Luhya.
- Participation in group and community activities is a good indicator of whether people can work together as a group. This is important because tsetse control is a group activity and will require the co-operation of all of the beneficiaries. Some of the groups considered in this study are women's groups, religious groups, cultural groups, men's groups, school committees and land dispute committees.
- Mortality of livestock, particularly cattle, during previous trypanosomiasis outbreaks was said to have a negative effect on agricultural production, household incomes and social activities, eg payment of dowry.
- Most of the focus group members seemed to relate tsetse with transmission of trypanosomiasis. However, frequency of the mention of witchcraft and other supernatural phenomena, eg evil spirits, stepping on cursed objects, as causal agents of disease limits the ability to infer that villagers believe in a scientific explanation.
- Tsetse fly identification was vague among those interviewed during focus groups and disease symptoms were also not clear. A good knowledge of what transmits trypanosomiasis is attributable to the educational programme that was launched by the investigators, using drama and posters that depicted the cause of trypanosomiasis, disease symptoms of both human and animal trypanosomiasis and the possible benefits that could accrue from the control of the disease.

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- Stories about the origin of tsetse and trypanosomiasis varied from village to village. In most cases however, explanations of the disease causality were based on beliefs. The livestock disease was mostly recognised in the 1980s through contact with veterinarians. From the analysis, there appears to be a relationship between the experience that the residents have had with both the disease and tsetse fly and tsetse and trypanosomiasis awareness.
- An ethnoveterinary study (Gaughan, 1993) of the two ethnic groups was performed to assess the importance of trypanosomlasis in comparison to other diseases. Results show that Teso group overwhelmingly felt that trypanosomlasis was an important livestock disease: 61% as contrasted to only 15% of the Luhya responses.

Directions for further research

A household survey was undertaken to investigate some of the issues raised in the qualitative surveys and to analyse the willingness of individual households to contribute labour and money to a testse control operation. To achieve this objective the contingent valuation technique was used. The technique proved to be useful for determining the willingness of households to contribute and for assessing the level of contributions that households might be willing to make. The results of the contingent valuation survey show that over 95% of respondents were willing to make monthly contributions of money, time or both. The results also show that more residents are willing to contribute labour than eash. This observation may be instrumental in designing future testse control programmes in the area.

To gauge the effectiveness of these responses, one would need to re-survey the area after the actual control programme has been implemented and efforts made to involve the community. Potential contributions could then be compared with actual behaviour. Only in this manner can the reliability of the contingent valuation technique and other qualitative methods be fully assessed.

In view of this, a proposal to carry out a pilot study for a community-based tectse control programme in the areas surrounding one of the study villages has been submitted to WHO/TDR. If funded, the research will facilitate a more holistic study of the feasibility of community-based tectse control in Busia District.

Annex 11

NON GOVERNMENTAL ORGANISATIONS

10.1 Introduction

A number of NGOs are currently active in the two districts, or plan to start in the near future or are active in neighbouring districts. NGOs, especially those already active in the region, offer the potential for cost-effective inputs to the project, with the added attraction that they are likely to be active after the lifetime of the project thereby contributing to its sustainability. Where possible it is intended to involve some of these organisations in relevant aspects of the project, especially in training and extension activities. Although not NGOs, the Dutch funded National Dairy Development Programme (NDDP) and the Kenya Finnish Livestock Development Project, both operated through the MALDM, are also involved in the promotion of improved dairy practises, and plan to start operations in Busia in 1995.

10.2 NGOs in Siaya

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The NGOs currently operating in Siaya, with relevant activities:

Young Men Christian Association (YMCA): agricultural development projects,

Saradidi Rural Health Programme: agriculture,

Care International in Kenya: agro-forestry,

CPK Diocese of Maseno West: community mobilisation,

Kenya Greenbelt Movement: agroforestry tree nurseries,

World Vision International: agriculture,

Siaya Community Orientated Development Programme,

International Fund for Agricultural Development (Farmers Group and Community Support Programme): tsetse control, ox traction.

In addition there are over 2,000 registered women's groups in the district.

10.3 NGOs in Busia

The NGOs currently active in Busia, with releast activities are:

Kenya One World Link Forum: soil and indigenous tree conservation,

Mazingira Institute: promotion of small scale businesses,

Kenya Energy and Environment Organisations: agroforestry, environmental management, sustainable land use practises, community tree nurseries, education,

Kenya Woodfuel Agroforestry Programme: agroforestry,

Nangina Hospital (Catholic mission): training of community health workers,

International Fund for Agricultural Development: due to start activities in Busia in July 1994,

Lake Basin Development Authority: not an NGO, but involved in integrated development projects in the agriculture and livestock sectors,

In addition there are over 1,000 registered women's groups in the district.

PROJECT MANAGEMENT UNIT STAFF

The Project Management Unit (PMU) will be based in Busia with a sub office in OAU/IBAR in Nairobi. The senior staff to be employed full time by the project will be as follows.

Project Manager

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An expert will be appointed for a period of four years to act as technical assistant and to manage the Kenya component of the project. The individual will have at least 10 years experience of the African trypanosomiases with knowledge of epidemiology and control of the human and animal diseases. The applicant will ideally be an entomologist familiar with modern methods of tsetse control. Applicants should have proven man-management skills and be conversant with budgeting and financial management. Applicants should be fluent in English and a knowledge of Swahili would be an advantage.

Project Veterinarian

The project veterinarian will be the counterpart of the EC appointed technical assistant. While it is envisaged that the Project Manager will be an entomologist specialising in tsetse research and control with a knowledge of human sleeping sickness, the Project Veterinarian will be a specialist in livestock disease research and control. The candidate will be recruited locally by the Project Manager, if possible seconded from MALDM, KARI or KETRI or some other local institute and employed full time for the first phase (four years) of the project. The candidate should have a postgraduate degree (MSc or PhD) specialising in trypanosomiasis and a minimum of ten years experience in trypanosomiasis research or control, preferably at project management level. The ideal candidate will have experience of working with the MALDM, be familiar with computers and the analyses of data and have a proven ability in report writing.

Liaison Officer

Liaison Officer will assist the Project Manager and will be responsible for liaison between the project and GOK Ministries and research institutes. The appointee must have previous experience in running major projects and in be conversant with Government procedures and familiar with the research activities of the institutes based in Nairobi. Ideally the liaison officer should have postgraduate qualification in entomology and experience of tsetse control.

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Project Sociologist

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The Project Sociologist will be responsible for the execution and co-ordination of all socio-economic aspects of the project. This is a vital component of the project, as an accurate insight into the perceptions and attitudes of the community is a prerequisite of a sustainable project. In particular the sociologist will assess which methods of tsetse control are most suitable for community management. The sociologist will ideally have a postgraduate degree in social science and will be experienced in community based projects. Knowledge of tsetse control and trypanosomiasis and familiarity with the project area would be advantageous.

Procurement Officer

An expert in accounting/banking/business administration will be employed as a procurement officer for the project. The appointee should have a special knowledge of the organisation and implementation of procurement and accounting (including cost accounting). He/she should be familiar with EU, OAU and GOK rules and procedures. The procurement officer will assist with the formulation of budgets, organise the importation of inputs and ensure the timely distribution of inputs to the districts.

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Annex 13

WATER DEVELOPMENT

12.1 Introduction

Local indigenous cattle are currently watered at the lake shore, rivers, and seasonal water points. These are the habitats where there is the greatest risk of exposure to *Glossina fuscipes*. Provision of water away from these habitats would reduce the risk of cattle becoming infected with trypanosomes. Adequate provision of water is also essential if zero- and semizero- grazing systems are to be successfully introduced. Although the zerograzing units will include a rain water collection and storage component, the quantities involved are relatively small; at best they will constitute a few days emergency reserve supply.

12.2 Water requirements of improved cattle

To minimise the risk of exposure to disease and to maximise production exotic cattle kept under zero- or semizero- grazing conditions never leave the farm. Water must therefore be available in the vicinity of dairy zero-grazing units and farms where grade bulls are kept. A single dairy cow requires more than 100 litres of water a day for drinking and for the cleaning of milking receptacles.

12.3 Water development in Siaya and Busia

In Siaya at present only 4.5% of the population is served by piped water, and the various water supply schemes are plagued by major operational problems such as lack of diesel, vandalism, frequent pump breakdowns and pipe bursts. Water supply is better in Busia with 32% of the population served by piped water schemes, and a further 40% served by communal water points. However, the northern and southern ends of Busia district are relatively poorly served due to a lower potential for ground water in these areas (Source: Busia and Siaya District Development Plans 1994-1996).

Siaya has a project funded by the Government of the Netherlands under the Lake Basin Development Authority entitled "Rural Domestic Water and Sanitation Programme". This programme encourages sponsors to participate in water development in the district. Busia is one of the districts covered by Kenya Finland Western Water Supply Programme, a large scale water development programme underway for several years in Western Province. Other NGOs are also involved in water development programmes and both districts already have the implementation capacity for water development in several regional centres.

Water development should therefore be given priority amongst the general rural development activities of the project. A suitable consultant should be employed to

determine: to what extent water is a constraint to the development of small-holder dairying in the two districts, to recommend the most suitable sites for the demonstration zero-grazing units and bulls with regard to water availability, to investigate the potential for watering free-ranging cattle away from tsetse habitats and to advise on how best to ensure effective use of project funds in support of the already existing water development programmes.

BUDGETS

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	BUSIA S	ALARIES, OFFIC	IES AND LABORATC	RY (Kenya Shill			
SECTION	ITEM	UNIT COST	YEAR 1 COST	YEAR 2 CCST	YEAR 3 CCST	YEAR 4 COST	TOTAL
TSETSE CONTROL Busia					میں ہے۔ میں اور		•
Salaries	Workshop Manager (m)	40,000	480,000	480,000	480,000	480,000	1,920,000
	2 Mechanics (m)	29,000	360,000	480,000	480,000	480,000	1,800,000
	5 Frap cutters (m)	5,000 -	225,000	300,000	300,000	200,000	1,025,000
	Admin. secretary (m)	40,000	360,000	480,000	480,000	480,000	1,300,000
	<pre>Secretar7 (a)</pre>	30,000	270,000	360,000	360,000	360,000	1,350,000
• •	Mapping Officer (m)	25,000	225,000	300,000	300,000	300,000	1,125,000
	Accountant (m)	30,000	270,000	360,000	360,000	360,000	1,350,000
	Clerk (a)	25,000	225,000	300,000	300,000	300,300	1,125,000
	2 Drivers (m)	29 ,000	360,000	480,000	480,000	480,000	1,300,000
	Watchman (m)	6,000	54,000	72,000	72,000	72,000	270,000
	Cleaner (D)	4,000	36,000	48,300	48,000	48,000	180,000
Investment - Office	Office building	1,2 50, 000	1,200,000	0	0	0	1,200,000
	Storage building	155,000	165,000	-0	0	0	165,000
	Equipped workshop	520,000	500,000	0	0	0	500,000
	Trap cutting room	130,000	100,000	0	0	0	100,000
	Furniture	250,000	200,000	a	0	٥	200,000
· · · ·	Computer/printer	296,000	206,000	. 1	0	0	206,300
	Computer/laser print	236,000	286,000	0	- 0	0	286,000-
	Photocopier	460,000	400,000	. 0	0	Û	400,000
	Facimile	55,000	55,000	0	0	0	55,000
	Cartographic mater.	50, 000	50,000	0	0	0	50,000
	Global Position. Ins	40,000	40,000	0	0	0	40,000
Investment - Lab	Freezer	35,000	35,000	0	0.	0	35,000
· · · · ·	Fridge	30,000	30,000	. 0		0	30,000
مى بىلىغانى ئەتلەر يېڭى ئەتلەر يېڭى ئەتلەر يېڭى ئېڭى ئېڭى ئېڭى ئېڭى ئېڭى ئېڭى ئېڭى ئ	General lab. equip.	50,000	50,000	0	50,000	0	100,000
ر این کار و مدین کار این کار با می این کار با میشد. می در مدین می می کار می کار می کار می کار می کار می کار می	Microscope	360,000		0.2	0	0	360,000
C. Market and the second sectors of							

PROJECT COMPONENT TSETSE and TRYPANOSONTASIS CONTROL

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	PROJEC BUSIA	T CCHPCNENT SALARIES, CFFI	TSETSE and T CES AND LABORATO	TSETSE and TRYPANCSCHIASIS CONTROL ND LABORATORY (Kenya Shillings)				
SECTION	ITTM	UNIT COST	YEAR 1 CCST	YEAR 2 CCST	YEAR 3 CCST	YEAR 4 COST	TCTAL	
	Centrifuge Generator Computer/printer	76,000 150,000 206,000	76,300 150,300 206,300	0 0 0	76,000 150,000 0	0 0 0	152,000 300,000 206,000 100,000	
Investment- Venicles	Furniture 4 Wheel-drive	100,000 2,100,000	100,000 2,100,000	0 0 0	0 0	0 0	2,100,000 3,560,300	
·	Pick-up 125cc Motorcycle Rehab DVS Vehicle	1,220,000 2 30 ,000 2 00 ,000	1,120,000 200,000	0 0 0	1,120,300 0	0 0	2,240,000 200,000	
Recurrent costs - Off/Lab	Off/Lab supplies Elect/ph/water (m) Servicing equip. (Y	10,000 25,000 100,000 2,000	60,000 150,000 0 12,000	120,000 300,000 100,000 24,000	120,000 300,000 130,300 24,300	120,300 300,300 100,300 24,300	420,300 1,050,300 300,300 84,000	
- Vehicle - Chief Joologist	Historianeuts (d) Pick-up (km) Travel & allow. (m)	2,000 16 10,000	240,300 120,300	240,300 120,000	240,000 120,000	240,000 120,000	963,000 480,000	
TOTAL	•	5 * - 4	14,736,800	4,564,000	5,960,000	4,464,000	29,724,000	

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Table	1.2	
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PROJECT COMPONENT TSETSE CONTROL BUSIA FIELD ACTIVITIES - MONITORING AND SURVEILLANCE (Kenya shillings) · • ·

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SECTION	ITEN	UNIT COST	YEAR 1 COST	YEAR 2 COST	YEAR 3 COST	YEAR 4 CCST	TOTAL
INITIAL TRYPS.SURVEY Recurrent costs	Disposable sumpl.(a) Trypanccide dose (a) Miscellaneous(a) 4 Wheel-drive (km) DVS allowances (d)	20 45 10 23 1,500	120,000 67,500 60,000 103,500 45,000	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	120,000 67,500 60,000 103,500 45,000
TRYPS SURVEILLANCE Recurrent costs	Disposable suppl.(a) Eartags (a) Diminazene dose (a) Miscellaneous (a) Crushes 4 Wheel drive (km) DVS allowances (d)	20 12 45 10 4,000 23 1,500	48,000 4,200 27,000 24,000 16,000 82,300 36,000	96,000 480 54,000 48,000 16,000 165,600 72,000	96,000 480 37,800 48,000 16,000 165,500 72,000	96,000 480 21,500 48,000 16,000 165,500 72,000	336,000 6,240 140,400 168,000 64,000 579,600 252,000
rserse WCNIFCRENG Investment Recurrent costs	Bicon.traps & odcurs Miscellanecus equip Pick-up (km) EVS allowances (d)	2,000 500 16 720	80,000 20,000 115,200 34,550	20,000 5,000 230,400 69,120	40,000 10,000 230,400 69,120	20,000 5,000 230,400 69,120	160,000 40,000 306,400 241,920
ICTIL			884,360	776,600	785,400	744,200	3,190,560

INITIAL TRYPS. SURVEY of 6,000 cattle (30 days) by DVS team (1 vet, 4 technicans, 1 driver) using rehab. 4WD. Covering Busia and southern Bungoma. Assumed 25% cattle infected and treated with prophylactic trypanceide.

TRYPS SURVEILLANCE by DVS team (as above). Community will build crushes and provide labour for animal handling. Tryps. prevalence measured in 4 groups, each of 100 cattle, every month (6 months in Year 1) Assumed 25% cattle infected and treated with curative trypanocide in Year 1 and 2; 10% thereafter.

TSETSE MCNITCRING: All control (Lancien) traps are monitoring traps with additional monitoring by DVS staff with baited biconcial traps. DVS team: 1 zoologist, 1 assistant, 1 driver. Trapping 8 days/month (6 months in Year 1)

Table 1.3

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PROJECT COMPONENT TSETSE CONTROL BUSIA FIELD ACTIVITIES - CONTROL (Kenya Shillings)

SECTION	ITEN	UNIT COST	YEAR 1 _COST	YEAR 2 COST	YEAR 3 COST	YEAR 4 CCST	TOTAL	
CONTROL G.fuscipes Investment	Sewing machine Traps (Lancien) Trap immeg. facility Insecticide (litre) Trapping tools Miscelláneous Bicycles Local office/store	6,500 350 20,000 6,500 1,200 500 5,000 20,000	$\begin{array}{c} 156,000\\ 2,310,000\\ 120,000\\ 71,500\\ 36,400\\ 36,000\\ 360,000\\ 60,000\end{array}$	0 4,€20,000 0 143,000 86,400 36,000 0 0	39,000 3,465,000 110,500 86,400 36,000 360,000 0	0 2,310,000 0 71,500 86,400 36,000 0 0	$195,000\\12,705,000\\120,000\\396,500\\345,500\\144,000\\720,000\\60,000$	
Recurrent costs	Pick-up (km) Motorcycle (km) Trap attendants (m) DVS allowances (m)	15 4 900 24,300	240,000 225,000 388,800 148,300	480,000 450,000 777,600 297,600	432,000 405,000 777,600 267,340	360,000 337,500 777,600 223,200	1,512,300 1,417,500 2,721,600 937,440	_
Control G. pailidipes Recurrent Costs	Crushes Pour-on dose (a) 4 Wheel-drive (km) EVS Allowances (d)	4,000 45 23 720	40,000 1,440,000 276,000 92,160	40,000 1,440,000 276,000 92,160	20,000 720,000 92,000 23,040	20,000 720,000 92,000 23,040	120,300 4,320,300 736,300 230,400	
ICTAL.			6,050,660	8,738,760	6,334,380	5,057,240	26,681,040	

G.fuscipes control using insecticide impregnated Lancien traps. Trap density halves after 2 years. Traps replaced every 3 months. Assumed loss rate 10%. Cost of trap includes material and Labour.Traps made by 3 teams of 3 women, with 24 sewing machines in 3 local off/stores.Traps installed and maintained by 72 attendants on bicycles. Bicycles replaced Yr.3 by community. Supervision by 3 DVS staff on motorcycles.

G.pallidipes control with deltamethrin pour-on for 8,000 cattle every 3 months in Yr.1 and 2. DVS team: 1 vet, 1 technican, 1 driver and rehab.4WD in Yr1. Community to build crushes and Yr 3/4 to fund control with 4,000 cattle.

Table 1.4

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PROJECT COMPONENT	TSETSE and TRYPANOSOMIASIS C	CNTROL
SIAYA SALARIES, OFFICES	AND LABORATORY (Kenya Shiii)	ngsj

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SECTION	ITEM	UNIT COST	YEAR 1 COST	YEAR 2 COST	YEAR 3 COST	YEAR 4 CCST	10TAL
TSETSE CONTROL Siaya Salaries	Accountant (m) Secretary (m) Driver (m) Watchman (m) Cleaner (m)	30,000 30,000 20,000 6,000 4,000		360,000 360,000 240,000 72,000 48,000	360,000 360,000 240,000 72,000 48,000	360,000 360,000 240,000 72,000 48,000	1,080,000 1,080,000 720,000 215,000 144,000
Investment - Office -	Cffice rehabilitate Furniture Computer/Printer Photocopler	200,000 100,000 206,000 - 200,000	0 0 0	200,000 100,000 206,000 200,000 55,000	0 0 0 0	0 0 0 0	200,000 100,000 206,000 200,000 55,000
Investment - Lab	FacSimile Freezer Fridge General lab. equip. Microscope Centrifuge Generalar	50,000 50,000 50,000 360,000 76,000	0 0 - 0 0 0	50,000 35,000 50,000 360,000 76,000 150,000	0 0 0 0 0	50,000 76,300 150,300	35,300 100,000 360,000 152,000 300,300
Invesment -Vehicles	4 Wheel-drive Pick-up Hotorcycles Rehab. DVS vehicle	2,100,000 1,220,000 280,000 200,000	0 1,220,000 0 200,000	2,100,300 1,220,000 1,120,300 0	U 0 0 0	0 1,120,000 J	2,440,300 2,240,300 200,300
Recurrent costs - Cff/Lab	Cff/lab supplies (m) Elect/ph/water (m) Servicing equip. (M) Miscellafecus (m)	7,000 15,000 100,000 2,000	0 0 0 12 000	84,000 180,300 100,300 24,000 240,000	84,000 180,000 100,000 24,000 240.000	34,300 180,300 100,300 24,300 240,300	252,000 540,300 300,200 72,300 768,300
- Vehicle	910x-up (Xm)	10	40,000 1,468,000	7,630,900	1,708,000	3,104,000	13,910,000

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