INSTITUTE OF CURRENT WORLD AFFAIRS

JBG-53
East Africa High Commission
(8) East African Tsetse and
Trypanosomiasis Research and
Reclamation Organization

Washington, D.C.
October 8, 1954

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Dear Mr. Rogers:

Vast areas of Kenya, Tanganyika, Uganda and Zanzibar are infested with one or more species of tsetse fly. While the exact acreage of potential farmland infested is not known, and much of the area now inhabited by fly is eroded and worn by earlier occupation and cultivation*, a considerable amount of land which is or could be made cultivable is withheld from use by the fly. The amount of potential ranching area denied is much greater, and stretches of land which block access of herds to permanent water are also infested. A single infestation, the western G. morsitans belt of Tanganyika which has now extended into Uganda, alone covers 100,000 square miles of country. The cattle industry of Ankole District, which amounts to some £1,000,000 annually, is threatened by this particular invasion, which had caused by 1951 a considerable rise in cattle deaths. The northward moving fly salient has cut the grazing areas of Ankole in half, forcing less efficient use of the land still safe. The overall problem, of which the Ankole situation is only a small part, involves defense of present holdings as well as reclamation of infested land, and the present widespread distribution of the fly and the disease requires that the problem be tackled not locally and piecemeal but on an interterritorial and even international basis.

Human sleeping sickness, though locally serious, is economically subordinate to the cattle disease. Evacuation of a few areas and the concentration of infected cases in sleeping sickness settlements has proved sufficient to bring the disease under control. Though not an absolute rule, the spread of human disease is nearly always associated (in the prevalent form T. rhodesiense) with the presence of other human cases, rather than transmitted by the fly from domestic animals. With both human and animal trypanosomiasis distributed unevenly throughout such a widespread area lacking modern communications, it is only natural that there should be a lack of basic statistics of the disease. In 1948 a survey to obtain basic figures regarding the incidence of cattle trypanosomiasis was initiated.

The fly, throughout his widespread habitat, is persistent and adaptable. Even the lay visitor to East Africa, when walking through tsetse bush, receives quick impressions of the individual toughness of the fly.

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* It has been a common experience of the writer, when walking through tsetse bush, to come across old stone grain mortars, pottery fragments and traces of semi-permanent huts, often only moderately weathered, indicating recent occupation in shifting agricultural practices.

(The writer has rolled several between thumb and forefinger, and then seen them fly off as though unhurt.) The long scientific search has revealed only a few points of collective vulnerability. Most of these are associated with the fairly critical moisture-balances and temperature preferences of different species under different conditions. If the general environment can suddenly be made very dry the fly tends to dehydrate, and if suddenly made very moist the bodily processes seem adversely affected and the fly does not thrive and reproduce. If either change is gradual, however, the fly may adapt and survive. The selection of pupa depositing sites by females indicates an avoidance of extreme temperatures, and when selective or sheer clearing operations destroy the preferred sites the numbers of the fly decline. Discriminative clearing operations, so far the most successful and economic means, exploit this moisture-temperature sensitivity, and often achieve an effective reduction of fly through cutting only a small fraction of total brush. Another salient point of vulnerability is the reliance, by some species of fly, on large game animals as a principal source of food. The experimental slaughter of game has proved a successful eradicative measure in one area, and has been used as the main practical method of reclamation in Uganda and in Southern Rhodesia.

Though little is known of the trypanosomes carried by the fly and the strains, types, or species have not yet been identified or enumerated, their property of rapid adaptability has been proved in experiments with the new drug Antrycide. The trypanosome disease can recede into cryptic infections during prophylactic (or more correctly suppressive) dosage, with relapses to follow; and virulence varies unpredictably under different conditions. One type of trypanosome has altered considerably in deadliness while being communicated through several animals and humans.

There are several known means of fly control. Sheer clearing of an entire area is a reliable but seldom economic means; discriminative culling of bush followed by properly planned settlement (in which case social and political factors complicate the operation) is the most generally useful; the shooting or driving away of game animals and the use of insecticides has given positive results in local trials and in practice. Some species of fly (G. morsitans) cannot survive in areas settled by humans in peasant-agriculture densities, others can (G. pallidipis, G. palpalis). It is possible for determined settlement to take land infested with G. morsitans though traditional native attachment to cattle is an obvious impediment. But there is no method which can be described as either easy or - except after a quick, dense human settlement of cleared land - absolutely final. The large amount of labor required for clearing and the frequently obstructive native parochialism often makes the problem more social than scientific or technical, and reiterates the hackneyed question,"how much force or coercion could and should a colonial government employ in developing backward populations?"

An introduction to the problems of the tsetse fly and the disease in East Africa would not be adequate without some reference to the widespread belief that the tsetse fly (with the anopheline mosquito) has saved much of the land from misuse, creating reserve for less exploitative cultivation later on. Dr. Worthington, in reviewing the progress of East African central research, cites the prevalence of this idea. Dr. Iester, the former director of the East African Tsetse and Trypanosomiasis Research

and Reclamation Organization (EATTRRO), protested that no such extensive reserve exists, that much of the tsetse-held land has successively been farmed, exhausted, and eroded in recent generations, in a pattern of shifting agriculture, of give-and-take between man and fly.

The Organization Director in the 1951 Annual Report credited the emergence of EATTRRO to the visit of Professor Buxton in 1945. Prior to the year of the visit, 1945, the interterritorial nature of the tsetse problem had been recognized in the institution of an interterritorial standing research committee representing the tsetse-trypanosomiasis interests of the East African territories. Research of interterritorial import on the fly and the trypanosome had been carried on at Shinyanga and Tinde respectively, Tanganyika, under C.D.&W. sponsorship but under particular administrative control of the Tanganyika Government. Early work at these installations had been important in the control of human disease and in application to a number of practical reclamation projects. After Professor Buxton had reported on his 1945 visit, the functions of research and reclamation were divided, and separate directorates were set up, one for research covering tsetse and trypanosomiasis work at Shinyanga and Tinde, another based at Nairobi for reclamation. This change came into effect on 1 September 1946. The two directorates, first under the Governors' Conference, subsequently came under the East Africa High Commission.

In 1948 it was decided to amalgamate tsetse and trypanosomiasis research and reclamation operations into EATTRRO under a single director, whose headquarters would be at or near Nairobi, the purpose being "increased efficiency and closer liaison betwen the different sections."[1] A Director was appointed and the research scientists at Shinyanga and the interterritorial pool of scientists on reclamation work throughout the territories fell under the direction of EATTRRO. The old Interterritorial Tsetse Department, then temporarily housed in Nairobi, was merged into EATTRRO in 1948, and the absorption into EATTRRO of the old tsetse research and reclamation operations at Tinde and Shinyanga was claimed complete at the end of 1950. A scheme for the establishment of a Central Trypanosomiasis Research Institute at Sukulu, Uganda, of which Tinde laboratory would be a subsidiary, came into effect on April 1, 1951. The Central Institute plan called for a core of eight scientific officers with necessary assistant staff. C.D.&W. Scheme R.423 provided the initial capital of £195,000 and half of the recurrent costs for a five year period.

The proposals under Professor Buxton's scheme had come into action five months after the C.D.&W. funds financing the old operations had been exhausted. Expenses during the interim period were provided for under the Buxton Scheme. Since the schemes which came about as a result of Professor Buxton's report were due to terminate in March, 1951, preliminary proposals for the years 1951 to 1955 were drafted in 1949. In 1950 C.D.&W. funds of £200,000 had been gained to support the new scheme (R.452), a separate scheme (R.423) as mentioned above providing for the new Central Institute. Housing for staff and temporary laboratories at Sukulu were nearing completion in 1952.

By 1951 the Nairobi Headquarters, which consists of administrative offices and equipment facilities with only a small laboratory to be used by temporarily resident scientists, was being occupied. The Kenya sub-headquarters buildings were completed at Maseno. Sites were designated for the Tanganyika sub-headquarters at Arusha. In Uganda, where special buildings were thought unnecessary for the time being, a house and small office for the officer in charge were obtained through the Uganda Government.

As one of the research services of the East Africa High Commission, the East African Tsetse and Trypanosomiasis Research and Reclamation Organization answers to that body through the Administrator, in his capacity as the appropriate one of the four principal executive officers. The Director of EATTRRO is the officer responsible to the Administrator for activities undertaken by the Organization. Research has been divided, as indicated by the Organization title, under three headings of Tsetse Research, Trypanosomiasis Research, and Reclamation. Beneath the Director the three lines of activity are supervised by appropriately qualified officers: Tsetse Research by a Chief Entomologist: Trypanosomiasis Research by the Medical Officer in Charge; and Reclamation supervised during 1949-1951 by the Deputy Director, EATTRRO. Other projects and outlying installations are supervised by officers designated on the basis of seniority and specific qualifications.

There has been little mention of staff problems in the annual reports of the organization for the years 1948 through 1951, no complete lists of staff appear in appendices, and there has been no complaint of any general impediment or overall problem due to personnel shortages.

The obvious need for experienced officers has been partly met from local resources, as with the ten personnel including three scientists and one field officer who signed over from the old Tsetse Research Department of Tanganyika. Benefits have been derived from the attachment of researchers working under grants from the UK. However, a post of insect physiologist remained unfilled for eight months in 1948, and the Director of Reclamation complained during the same year that, due to normal leave and the loss of two specialists, there had been "rarely more than one entomologist in the field at one time."[2] Particularly in reclamation, and in the field aspects of tsetse research, the need for longer experience is put forward; veteran field officers become able to recognize the particular clumps of cover likely to harbor particular species of fly, lessening the labor and expense of searching a wider area. As with other agencies, advantages are gained from the employment of personnel willing to spend their active lives in East Africa.

The physical plant of the organization includes administrative offices and housing near Nairobi, laboratories and buildings at Shinyanga and Tinde in Tanganyika and at Sukulu, Uganda, site of the new Central Trypanosomiasis Research Institute. Lesser properties exist at the territorial stations.

Table 1 shows expenditures of EATTRRO for 1948-1950, the latest years for which detailed reports had been published by early 1954. For the period 1951-1956 C.D.&W. assistance amounting to £200,000 has been provided under Scheme R.452. Another C.D.&W. scheme (R.423) provides for the entire capital outlay of £195,000 and half of five years' recurrent costs of a Central Trypanosomiasis Research Institute to be set up at Sukulu, Uganda.

Revenue (from rents, sales of stores, etc.) totalled £24, £4,819, and £2,689 in 1948, 1949, and 1950 respectively.

As indicated by Table 2, 100 percent of capital expenditures on the headquarters for Tsetse Reclamation and EATTRRO and also for two research projects - Antrycide Research and the Investigation into Animal Trypanosomiasis - was provided from C.D.&W. funds. Two-thirds of all other EATTRRO expenditures - for the Director (house as well as recurrent expenditures), the recurrent expenditures and the extraordinary expenditures (not provided for under other C.D.&W. schemes) of Tsetse Research, Trypanosomiasis Research, and Tsetse Reclamation, and for the Interterritorial Reclamation Pool - were also met through C.D.&W. funds, the remaining third being provided by equal contributions from Kenya, Uganda and Tanganyika. Two-thirds of EATTRRO's total net expenditures in 1948 were met through C.D.&W. funds, 78 percent in 1949, and 73 percent in 1950.

Table 1. Expenditures, EATTRRO, 1948-1950 (£)[1]

	1948	1949	1950
Director			
Recurrent (R.126-D)		5,182	4,725
Extraordinary (R.126-D)		173	
House for the Director (R.126B)		4,116	
Total		9,471	4,725
Tsetse Research			
Recurrent	32,539	48,890	39,283
Extraordinary	9,178	595	486
Total	41,717*	49,485	39,769
Trypanosomiasis Research			
Recurrent	5,872	7,340	6,932
Extraordinary	4,686	4,225	
Total	10,557*	11,565	6,932
Tsetse Reclamation			
Recurrent	20,244	28,156	21,746
Extraordinary	5,266	2,788	1,842
Capital - Headquarters(R.673A,R.126A)		18,830	19,034
Total	25,510*	49,775	42,622
Inter-territorial Tsetse Reclamation Pool			
Recurrent (R.673	9,076	12,189	15,520
Extraordinary (R.673)	1,657	179	700
Total	10,734*	12,368	16,220
Antrycide Research			
Recurrent (R.318)		1,007	2,818
Extraordinary (R.318)		1,189	1,360
Total		2,196	4,178
Investigation into Animal Trypanosomiasis			
Recurrent (D. 1127)		1,157	
Extraordinary (D.1127)		400	
Total		1,557	
Total Recurrent	67,731	103,921	91,024
Total Extraordinary	20,787	32,495	23,422
TOTAL	88,518	136,416	114,446

* Total expenditures for the E.A. Tsetse and Trypanosomiasis Research Department and the E.A. Tsetse Reclamation Department (including Tsetse Reclamation Pool), administered separately in 1948, were £52,274 and £36,244 respectively.

Table 2. Sources of Funds, Net Exrenditures, EATTRRO, 1948-1950 (£)

	1948			1949			1950		
Director	CD&W	E.A.	Total	CD&W	E.A.	Total	C.D.&W.	E.A.	Total
Recurrent and Extraordinary (R.126-D)				3,470	1,735	5,205	3,015	1,508	4,523
House (R.126-B)				2,744	1,372	4,116			
Total				6,214	3,107	9,321	3,015	1,508	4,523
EATTRRO (R.126)	57,840	25,920	77,760	58,392	29,196	87,588	45,418	22,709	68,127
Inter-territorial Reclamation Pool - Recurrent and Extraordinary (R.673)	7,156	3,578	10,734	8,071	4,036	12,107	10,605	5,303	15,908
Carital Provision of Headquarters EATTRRO (R.126 C and D.673B)							36		36
Tsetse Reclamation Headquarters (R.673A, R.126A)				18,830		18,830	18,999		18,999
Antrycide Research - Recurrent and Extraordinary (R.318)				2,196		2,196	4,164		4,164
Investigation into Animal Trypanosomiasis - Recurrent and Extraordinary (D.1127)				1,557		1,557			
TOTAI	58,996	29,498	88,494	95,260	36,339	131,599	82,237	29,520	111,757

The operations and advisory functions of EATTRRO during the years 1948 through 1951 reached throughout the whole of East Africa including the island of Zanzibar. One particularly successful project inherited from the pre-EATTRRO organization was completed outside East Africa proper in Northern Rhodesia and resulted in the elimination of Glossina morsitans and G. palpalis from some 600 square miles of country. And the compilation of an all Africa tsetse map and an official visit to the tsetse fly belt indicate the even wider interests and liaison activities. Reclamation projects were undertaken in Kenya, Uganda and Tanganyika with practical as well as experimental benefits, in a program which was, by stages, integrated more thoroughly under the newly introduced central headquarters. Much of the energies of personnel were consumed in the construction of enlarged plant, in the administrative problems of enlargement and centralization and in such initial tasks as the compilation of a map showing all African tsetse belts, but actual research and reclamation operations continued throughout the period of amalgamation.

As a scanning of any of the Organization's Annual Reports will quickly make clear, the geographical spread of research operations has been accompanied by an equally broad range of imaginative improvisations, and a search for useful hypotheses. The researches into the habits of ants who are predatory on the pupa of tsetse, the devising of measures such as the use of DDT-sprayed oxen as poisoned bait and of using screens baited with ox scent, the careful collection and correlation of moisture and temperature data with breeding and feeding habits illustrate the range of the scientific search. And the repeated not always successful trials of such hypotheses bear out the complexity of the problem - the lack of vulnerability and the apparent adaptability to any easily altered aspects of environment of both the fly and the disease.

The operations can be described under the three headings suggested in the name of the Organization, Tsetse Research, Trypanosomiasis Research, and Reclamation. As might be expected in a multi-branch research program aiming in the same direction, these departments overlap. The boundary is particularly nominal between Tsetse Research and Reclamation: in practice it is often impossible to suggest where one ends and the other begins, and efforts of "finding out" and of "doing" are sometimes indistinguishable and are often simultaneously undertaken by an individual officer.

In tsetse research, as distinguished from trypanosomiasis research and the reclamation of infested land, much has been done. As outlined in the section on history, the study of the insect was the first emphasis at Shinyanga, where related research was first instituted in East Africa. During the years 1948 through 1951 work continued in research into the assessment of fly distribution and populations (survey) and into experimental eradication, with a more precise understanding of tsetse habitats being at once an object and a tool of research.

Tsetse research projects concerned especially with determining fly populations included an experiment utilising a fly marking technique enabling capture and release procedures in an isolated half square mile near Kikore, Tanganyika, in 1951; a study of the long term cycle of the fly which indicated an interesting but likely insignificant coincidence with the sunspot cycle; studies of "wing fray" to determine age of flies, and studies of the gestation

period; and a broad series of experiments and surveys in the field out of which was evolved, in 1949, a formula for more precise and uniform survey procedure. To best complete a survey preliminary to discriminative clearing, five laborious steps were found to be necessary:

(1) A grid system of fly rounds 1/2 to 1 mile apart to be laid out;
(2) Each round to be marked into 100 yard sectors;
(3) Descriptive notes to be taken on types of vegetation, soil and topography (arial photographs being increasingly employed to advantage);
(4) Fly catching undertaken and catch figures plotted on maps, if possible with main vegetation plots included;
(5) After location of important fly foci, pupae searches to be made.

Completion of these five steps are prerequisite to discriminative bush clearing, often the most effective and economical attack on the fly. Discriminative clearing is undertaken to eliminate the often small portion of the bush which is most vital to the fly. Particular economy is effected when the amount of hand or machine clearing can be reduced to a minimum through a more exact knowledge of these smaller portions (often breeding sites) of the flies' broader habitat.

In 1950 calculations of the "availability" of flies were made, so that a sampling catch of flies at stations located in a prescribed pattern or "fly round" could provide, under known circumstances, an improved estimate of local fly populations. This counting technique development also made use of a new fly marking system providing for some 25,000 separately recognizable markings, and had the advantage of cheapness, in that it only required four catchers.

Related to the population factor - and in the long run more essential - were the studies of the overall ecology of various fly species. Important differences have been disclosed among the varying species in diverse environments, though shortage of staff did not allow simultaneous pursuit of all attractive lines of enquiry. Research projects tended to emphasize areas of study related to the already known vulnerabilities of the fly. The relationship between mean temperature of a given area and subsequent tsetse population was examined. The atmospheric moisture preferences in relation to fly feeding habits were observed, as were the shade-protected locations selected by the females for the depositing of larvae. The statistical relationship of flies to food hosts is another field of investigation, with researches in 1951 furnishing evidence that 1,163 G. pallidipes were supported by the average single game animal (bushpig and waterbuck) in the particular locality studied, each animal providing some 291 feeds per day. Studies were made of a natural predator of the fly, the pheidole ants who eat tsetse pupae. No means of fly eradication was elicited, however, and it was learned that tsetse pupae are not the favorite food of the ant, which prefers grass seeds.

The relation of the fly and the trypanosomes are being studied, though with considerable difficulty due to the tendency of the fly to react morbidly to conditions of captivity. The fly can be infected with the disease, permitting easier study of the conveyance of the disease by fly to animals under controlled conditions. It was discovered that male flies were more easily infected with two types of trypanosome, and that healthy flies tended to resist infection.

From all field operations further data regarding the fly and its relationship to the disease have been obtained and recorded. With the comparatively recent identification of tsetse (G. austeni) on Zanzibar, the researches on tsetse have been extended physically into the island as well as the three mainland territories and Northern Rhodesia. An officer completed preliminary investigations on the island in 1950, gathering considerable information on the fly and its habitat.

The principal researches into more direct means of eradication of the fly are described below, along with the reclamation projects which create the best means of testing anti-tsetse devices and procedures. Since the emphasis in most practical reclamation experiments is on bush clearing operations, a few of the less passive - if less often successful - devices should be described.

Bait oxen sprayed with DDT were tested in an experiment in Shinyanga in 1946, and at Kikore, Tanganyika in 1951. In the first experiment they were distributed throughout a five square mile area with a density of 68 oxen per square mile, sprayed twice weekly with DDT. In five months a total reduction of 99 percent was achieved in the fly (G. pallidipes) population. In the Tanganyika experiment, which had 20 oxen spread through an area of 1/4 square mile, sprayed twice each week with an insecticide ("rucide"), the first two months caused a reduction of about 99 percent in the male (G. morsitans) fly numbers. Indications are that G. morsitans can be exterminated by this means in about three and a half months' time, and G. swynnertoni in five months.

Another weapon may exist in "Gammaxene" smoke, which in fortnightly applications through September and October 1950 reduced G. swynnertoni in an experimental zone by 98.1 percent. Ten months later the fly were estimated recovered to some 25 percent of their original population, without any intervening suppressive action. Earlier trials of gammaxene smoke, in 1948, had been not so promising.

For de-flying vehicles on roads leading out of tsetse areas, spray guns of a conventional type are used, most often with the vehicle parked inside a drive-in enclosure alongside the road. Railway train de-flying, after some tests with the Todd Insecticidal Fog Applicator, was planned in 1949 to be accomplished on the Mombasa-Nairobi line by the use of that device inside special tunnels. Two de-flying stations were to be installed by the Kenya Tsetse Committee, and the E.A. Railway authorities agreed to build two short tunnels for smoking the trains. This measure had been preceded by successful experiments in deflying trains with an insecticide of pyrethrum in diesoline.

Because of its directness and simplicity, the device of game destruction as a means of fly eradication can be described along with chemical eradicators. The use of this method has met with considerable protest from game conservationists and sportsmen, but after 1950, when the experiment was concluded, there was proof of its effectiveness in fly control. In an area of some 600 square miles, after the shooting of some 7,000 of the larger species of game animals (sparing the smaller Duiker, Steinbok, orabi, dikdik, klipspringer and wild pig), infestations of G. swynnertoni and G. morsitans appeared completely eliminated and G. pallidipes greatly reduced.

As increasing knowledge regarding the fly and his eradication has accumulated, more emphasis has been given to the study of the disease organism itself. On 1 April 1951, with the beginning of a new period of Colonial Development and Welfare Scheme No. R.452, the old Tinde laboratory, seat of trypanosomiasis research in past years, became a subsidiary to a projected Central Trypanosomiasis Research Institute to be established at Sukulu, Uganda. In anticipation of this change and because of the retirement of the senior research officer, Tinde installations had been placed on a care and maintenance basis in 1949, though a principal task of maintaining the T. rhodesiense strain of trypanosome isolated in 1936 was kept up. While plans for construction and staffing of the new Institute were being implemented this work continued at Tinde.

The continued infectivity to humans of the strain was proved on human volunteers, infecting seven out of ten in 1950. Another research finding in 1949 offered one explanation for an apparent inconsistency regarding infectivity of T. rhodesiense, which though known to be carried by game animal hosts had always seemed epidemically associated with proximity of other cases of the human disease. The experiment suggested that infectivity to humans might be reduced in T. rhodesiense in the game animal host through interaction with another strain of trypanosome.

Further experiment dealt with the infectivity of T. brucei and found it infective to rats, rabbits, guinea pigs, and Thompson's Gazelle, and suggested the existence of a greater number of strains of T. congolense than previously thought, complicating yet further the problem of obtaining an adequate enumeration of trypanosome strains. The more intensive program of trypanosomiasis research desired will have to await the completion of buildings and recruitment of staff of the nascent Central Institute.

The research into curative and prophylactic properties of the drug Antrycide, to determine its value in regard to cattle trypanosomiasis, is carried on jointly with the East African Veterinary Organization under C.D.&W. Scheme R.318. This drug, before its limitations were fully assessed, was over-publicized; and subsequent experiments have confirmed doubts held by scientists regarding at first its value as a prophylactic, and later its efficacy as a cure. By 1952 antrycide was described as a suppressive rather than a prophylactic, cryptic infections occurring in cattle which had received periodic prophylactic injections during exposure. Resistant strains of trypanosomes were developed so quickly, and remained resistant for such an extended period (five to seven months), that a general use of antrycide for prophylactic purposes was described as dangerous. The prophylactic use of the drug to allow emergency dry-season shifts of cattle into watered or grassed tsetse areas, advanced in the 1950 Annual Report of the East Africa High Commission and suggested by the EATTRRO report of the same year, has not been repeated.

Investigations in 1951 of the curative qualities of antrycide upheld its general usefulness, but also pointed to marked limitations in the treatment of trypanosomiasis during the chronic stages of the disease. Of fifty chronically infected cattle treated in the later course of the disease, 36 survived treatment. Of these, 22 subsequently relapsed to single-strain and nine to mixed-strain infections, the deduction - reinforced by earlier findings - being that antrycide is useful in treatment but far from infallible as a cure. In 1952 a detailed report on antrycide was published, summarising

the findings of the overall effort, which emphasized the effectiveness of the drug for treatment in early stages; the need for prophylaxis at not more than two month intervals; and that cryptic infections incurred during prophylaxis may become activated by normal anti-rinderpest injections.

The actual reclamation of tsetse infested land, and the most directly related research measures, are covered in the EATTRRO annual reports under the heading "Reclamation." Reclamation of land, in the main, is actually carried on by the tsetse departments of the territories, so that the work of the central organization, even in the instance of a practical reclamation project to be followed by settler occupation, is chiefly oriented towards the gathering or proving of further recordable knowledge of more simple, economic, and effective eradicative procedures and devices. Research and practical work being often indistinguishable, research and practical-works officers are considered interchangeable wherever necessary. The stimulation of the use by the territorial governments of anti-tsetse measures once developed is another important aim of reclamation work; and in addition to projects of experimental reclamation three large schemes of practical reclamation, one to be undertaken in each of the three territories, were in the planning and preparation stages in 1951.

The object of these three pilot schemes is to seek, more systematically than in previous experimental reclamation projects, for facts concerning (1) the minimum costs, in detail, of scientific tsetse and trypanosomiasis control; (2) the extent to which selective clearing can be effected by mechanical means, removing the minimum quantity of vegetation; (3) the cost of mechanical forms of clearing, in terms of a possibly wider application in East Africa; and (4) the effect and costs of systematic anti-tsetse bush burning. These practical aspects would be paramount, but some associated further experimentation also was anticipated. The schemes were to be sited in Kenya to control G. pallidipes and G. swynnertoni in the CisMara area of the Narok District; in Tanganyika to control G. morsitans, G. pallidipes, and G. brevipalpis in the Mkata Plains; and in Uganda against particular infestations of G. morsitans in a part of Ankole. The Kenya scheme was to be coordinated with a larger scheme to be undertaken by the Kenya Government to create additional safe grazing land. The Tanganyika project aims at the freeing of an area of wet season grassland in order to create wider ranching opportunities in an adjacent area. In Uganda the intention is to check the northward spread of G. morsitans and the high cattle mortality rate in Ankole and to make possible an enlargement of the livestock industry. Plans for the three schemes had been submitted to the three territorial governments, the Estimates Committee of the E.A. High Commission, and to the Advisory Committee of the Colonial Office on Tsetse and Trypanosomiasis matters, which considered the scheme worthy of C.D.&W. financial support.

While the implementation of this more systematic program of reclamation awaited approval and preparatory arrangements of the pilot schemes, the more piecemeal work in experimental and practical reclamation continued. The clearing scheme at Abercorn in Northern Rhodesia, which had been in being since 1938 and was inherited at the time of the amalgamation, was reported successfully concluded by 1949. Successive measures of fire exclusion, later combined with discriminative clearing, then discriminative clearing of flat bottomed drainage lines alone, bore out the effectiveness of the latter measure, which was given credit for the practical control of G. morsitans throughout some 300 square miles of country. The fact that not more than 1 percent of the total brush of the area was cut in the operation

illustrated the economy and efficacy of selective clearing.

A number of schemes were in operation in 1948. In Uganda in Masinde district there was an investigation into the possible spreading of fly through long grassed country by "rides" of flies on the bodies and backs of elephant and buffalo. The experiment was closed down after discovery that the fly was permanently infestive in the area. In 1948 the failure of rhus thicket clearing immediately preceded suspension of an experiment begun in 1945 in the Mbararu-Masaka area of Uganda, intended to investigate the effect of discriminative clearing and annual controlled fires on G. morsitans. In the south Kavirondo area from July 1946 through 1947 a hand catching and DDT-trap experiment resulted in a definite but indecisive reduction of G. palpalis. The testing of several field improvisations including the stretching of a DDT screen across a river revealed that the fly could range along forested rivers with extensive isolated clearings for distances as great as 10 miles. In 1949 one of the experimental blocks at Shinyanga was thrown open to settlement, making possible some ecological studies of resettlement in a formerly infested area, and the experimental reclamation schemes operated by the organization were reduced to six, with one each at Tabora and Iringa in Tanganyika, at Samia, Kuja River, and in the Iambue Valley in Kenya, and the South Ankole scheme in Uganda.

The Tabora scheme was started in late 1949. By 1951 the general outlook was reported encouraging and an experimental settlement was being planned to utilize some of the area reclaimed from G. morsitans. At Iringa a local advance of tsetse was reported checked and the settled area of the Image Plateau secured against the same species and G. pallidipes. The Samia area was surveyed, a scheme of control of the G. pallidipes infestation written and handed over to the territorial authorities during 1950. The experimental phase of this operation, under EATTRRO, was terminated in 1951. The Kuja River infestations proved difficult and were also ended in 1951. Blocks could not be isolated for insecticidal spraying in cooperation with the Colonial Insecticide Research Unit, and a verified three and one half mile-ranging ability (through sheer cleared spaces or across water) of G. palpalis threatened rapid reinfestation of any clearings. Activity through 1951 in the Lambwe valley scheme against G. pallidipes was reduced, partly because of difficulties in driving out the game, from broader plans to a program of limited clearing in advance of settlement. Some 60 families arrived in September-October of 1951. Considerable opportunities for observation of fly arose in this area, and more definitive knowledge of the habitat of G. pallidipes was claimed in the effort to discover the foci and to devise the cheapest means of eradication. In Ankole, in 1951, surveys to estimate the cost of the pilot scheme were accompanied by observation and mapping of pertinent vegetation locales and by negotiations to assure that reclaimed land will be promptly followed and secured by settlement or use.

Survey and advisory services are expected to develop further after plant, staff, and facilities become fully operative. Calls upon these services have increased since the amalgamation and in 1951 the subjects dealt with included the outbreak of a few cases of sleeping sickness in the Overseas Food Corporation's installation at Urambo, a tsetse reconnaissance to safeguard against tsetse invasion of, and to determine the limits of the infested area around, Songea; and also assess dangers to the plains and ranching areas along the Ruhuju and Rutikira rivers. The organization also undertook to prepare the map mentioned above, to be printed in England in

1952, showing locations of tsetse belts throughout Africa.

In line with its general mission of assisting in the development of East Africa, the Organization operates cooperatively with other research agencies and undertakes projects or joint or combined research. The important antrycide research program financed by C.D.&W. is shared with the E.A. Veterinary Research Organization. The three pilot schemes in Kenya, Tanganyika and Uganda are each laid out in conjunction with detailed development projects of the territorial governments. The surveys and advisory services of the Organization perform special tasks at the request of territorial authorities, an example being a tsetse reconnaissance in Songea District of Tanganyika Territory in 1951. The significant success in Abercorn district of Northern Rhodesia (though the project was initiated long prior to the inception of EATTRRO) provided experience and contacts beyond the normal geographic purview. Plant ecology surveys in the groundnut areas in Tanganyika, carried out at the request of the General Manager in the Overseas Food Corporation, similarly added to the breadth of experience and to wider acquaintance with other developmental organizations. Officers of the Organization frequently participate in the preliminary investigations of territorial authorities at sites of reclamation projects to be undertaken by territorial units. Since 1951 major interterritorial schemes were to be submitted to EATTRRO for advice and comment prior to implementation, and it was reported for that year that advisory services of the Organization were being used to capacity by the territories.

Sincerely,

John B. George

P.S.

Footnotes

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