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REPORT OF TSETSE FLY PROJECT REVIEW COMMITTEE
Tanga, Mkwaja and Zanzibar Tanzania, July 1978

**A Review of the USAID Tsetse Fly Project
and Possible Future Tsetse Fly Projects**

by

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for

USAID Research Advisory Committee

INTRODUCTION

The research program to develop the sterile male technique for control of Glossina morsitans is now well into Phase III. This project is aimed at controlling a major pest/disease constraint to both man and animals in the development of agricultural areas now limited or denied as habitats for man or animals. The project is designed to contribute to increasing agricultural productivity, to improvement of an integrated crop/livestock farming system and to reduce the need for more expensive pesticide inputs which are also environmentally hazardous.

The adverse effects of tsetse-fly borne disease on animals and humans was underscored during the 1974 World Food Conference in Rome; especially in regard to Africa where the tsetse fly infests more than 10 million Km². Although there may be several approaches to tsetse fly control, the low reproductive potential of Glossina may make this pest vulnerable to control by genetic manipulation. Thus, following the success of SIRM (sterile insect release methods) against the screw-worm fly in the United States, a project on tsetse fly control by SIRM was initiated in 1963.

Research Advisory Committee reports of 1968, 1971, 1974 and 1977 describe the initial difficulties of the project (most of which were not scientific) and made recommendations for improvement. This review, as well as the previous review of January 1977, shows that the project has incorporated most of the recommendations of the previous RAC Committee meetings and is now making excellent progress toward the conclusion of the project scheduled for 1979.

Research competence of the personnel is excellent and they seem well qualified to successfully complete the third phase of the project in 1979 as outlined in the work plan. It should be noted that a PID (project identification document) has been prepared by the Africa Bureau for a proposed effort from 1979

to 1983 for introducing operational control of tsetse using SIRM in Tanzania under natural field conditions which will hopefully lead to a long-range tsetse fly eradication program in Tanzania. This proposed effort is also evaluated in this review report.

REVIEW

1. Objectives and Statement of Problem - The project objectives and the statement of problem seem appropriate and well conceived.
2. Personnel Evaluation - The reviewers were particularly impressed with the capability and dedication of the U.S. project personnel. We were amazed to see the esprit de corps of the personnel particularly in view of the problems and hardships of conducting research in Tanzania. Much of the credit for this is due to Dr. Leroy Williamson who has shown himself to be not only a good scientist but also an excellent project leader of both U.S. and Tanzanian personnel.
3. Project Schedule - The project is basically on schedule in spite of problems with facilities, transportation, and weather. This is because of the dedicated personnel and their willingness to work long hours. The project should accomplish its objectives on time.
4. Cooperation of Tanzanian Government - Although many problems were encountered in the early stages of project after being moved to Tanzania, cooperation is improving and is now quite good. For instance the Tanzanian government now puts about \$140,000 into support of the Tanga facility and program. This has been of invaluable help beyond the dollar value. The project leader,

Dr. Williamson, is well known and respected by officials in the Ministry of Agriculture and other entities such as the University at Dar es Salaam as well as the Agricultural College located at Morogoro, Tanzania.

The Ministry of Agriculture is developing a Training Institute at Morogoro in cooperation with the Agricultural College. This will be a two-year diploma course for Livestock Field Officers, Tsetse. Dr. Williamson is on the committee which is finalizing the curriculum. A copy of the suggested program is attached (Appendix 1). The above factors plus statements by appropriate representatives of Ministry of Agriculture of Tanzania and Zanzibar attest to the long term commitment of the Tanzanian government to control of the tsetse flies as vectors of trypanosomiasis in cattle.

The review team met with Dr. Maeda, Head of the Livestock Management Division of the Ministry of Agriculture in his office (previously met him socially in the home of Mr. B. B. Behrens). Dr. Maeda is supportive of the USAID tsetse project and appreciative of our assistance. He has a tsetse control officer under him and apparently they are gearing up for more of an effort. For instance, they have a prioritized list of provinces in which they would like to begin control work. They have, in fact, discussed financing such a national program with World Bank.

5. Current Conditions and Estimate of Overall Success - The first and second phases of the project have been completed and the third phase is progressing on schedule. Indications are that this last phase will be completed at the predicted time of early to mid 1979.

The first phase of constructing mass rearing facilities and development of techniques for mass-colonization of G. M. morsitans under African conditions, and the second phase of fly colony expansion, studies on

sterilization, packaging, release and ecological studies have been completed. This was accomplished in spite of many problems such as transportation, inadequate materials, lack of sufficient counterpart personnel, etc. It is of great credit to the U.S.A.I.D. staff that these phases were completed in spite of these problems. In spite of similar and additional weather problems the third phase is progressing nicely.

The early delays encountered during the first two years of the Tanga project appeared to be primarily ones of scientific management. Expatriate personnel who are assigned to a remote area such as Tanga should have had either prior satisfactory tropical experience or adequate counseling to insure that they and their families can cope with this environment. If such precautions had been taken, the current level of progress might have been achieved two years ago.

After the second aerial application of endosulfan on the study site at the ranch at the end of 1977, the sterile male release program started. At the beginning of this program, no G. morsitans were evident on the basis of fly-round surveys, but within a few weeks fly counts approximated 10% of those observed prior to control. In the period from early 1978 through July 10, 1978, sterile male tsetse flies have been released twice weekly in ratios about one to five times the estimated normal male flies sampled. The results to date indicate that the G. morsitans population has essentially remained at the 10% level for six months. At the present time, there is not an indication of a downward slope in the tsetse population. However, project personnel anticipate that this will occur during the oncoming dry season. The fact that G. morsitans populations have remained fairly high on the portion of the study site where sterile males were not released indicates that some control of G. morsitans has been effected. However, the question still remains whether this degree of suppression is sufficient

to reduce the level of transmission of trypanosomiasis by G. morsitans among the cattle on the ranch.

It should be pointed out that to overcome these problems the U.S. staff has had to spend long hours constructing buildings, repairing vehicles, etc. which has reduced their time for writing publications (note the RAC concern of lack of publications as mentioned in the July 1977 RAC review).

At the present date, it appears that no scientific papers directly concerning the Tanga project have been published. It is strongly recommended that the U.S. staff be allotted time near the end of the project specifically to write publications. Dr. Williamson provided a list of 25 possible publications which could be written based on this project. This list has been submitted to the AID Project Manager.

One problem which looms rather large in successful completion of the third phase is the breakdown of the barrier. This was largely due to an abnormally high rainfall year (the highest rainfall in 23 years) which resulted in vegetation growing up in the barrier and negating effectiveness of the reinforcing insecticide spraying. Dr. Williamson feels that this can be overcome, however, as they go into the dry season.

The concept of total eradication of a vector species is extremely ambitious, and unless an area is totally isolated, may never be possible to achieve. In the case of the present project, the maintenance of a permanent barrier of 1 km. width has been difficult to achieve, especially due to abnormally high rainfall which accelerated growth of vegetation. Other factors which may produce a residual tsetse population are movement of wild host animals through the barrier, passage of motor vehicles bearing tsetse and actual flight through the barrier by flies. Thus, even if the confined tsetse population is reduced to zero (on the basis of fly-round counts) some G. morsitans may show up due to the above factors and others not mentioned.

A more realistic objective to part III of the study would have been the reduction of G. morsitans populations to such a level that this species was no longer a factor in the transmission of cattle trypanosomiasis (although of course G. pallidipes would still be an important position. Perhaps if A.I.D. had made formal contact with biologists at the University of Dor-es-Salaam early in the project rather than depending upon the Ministry of Agriculture for personnel referrals. In any ration, college-associated individuals are usually a most important resource in the development of counterpart individuals (an example of this was the development of many highly trained counterparts at the SEATO Medical Research Laboratory in Thailand through this mechanism of working with universities, medical schools and a tropical medicine school).

FUTURE AID SUPPORT OF TSETSE FLY PROGRAM

The May 1977 PID from the Tanzania program calls for a FY 1979-80 follow-up tsetse fly program supported by the African Bureau. This seems logical and appropriate with some modifications. Basically, the PID recommends continued use of the Tanga facility, continued effort on the Mkwaja Ranch and a tsetse fly control program on Zanzibar.

1. Use of Tanga Facility

Much effort and expense has gone into the development of the Tanga facility and training of the counterpart staff. This, coupled with increasing concern of the Tanzanian Government of the tsetse fly problem and their increasing commitment, including the development of the two-year diploma training program, makes continued use of the Tanga facility a desirable option. We would thus recommend:

- (a) Use of the Tanga facility for developmental research on adapting advancing technology to African conditions (e.g.: (1) use of membrane

technique in rearing flies, (2) more efficient technique of distributing sterile pupae, (3) more effective fly barrier schemes including possible use of fire, (4) a base for developing a countrywide integrated SIRM strategy, and (5) development of habitat management strategy and techniques.

(b) Use of Tanga facility to maintain G. M. morsitans maintenance colony.

(c) A counterpart training and development base.

The use of the Tanga facility to develop a colony of G. pallidipes for release at Mkwaja Ranch is a desirable goal but would present greater problems than can reasonably be expected to be overcome and still accomplish the other, higher priority objectives. It could become a component, however, in the future, if: (a) G. pallidipes rearing technology develops as expected in Europe, (b) more efficient rearing techniques are adopted to African conditions e.g. membrane techniques, (c) sufficient Tanzanian counterparts developed as hoped for, and (d) sufficient funds become available. One factor which may bear on the relevancy of this rationale is that the owners of the Mkwaja Ranch are extremely desirous of controlling G. pallidipes and may bring pressure to include as control effort in the total project.

2. Zanzibar Subproject

A possible Zanzibar program would have several factors which would enhance its chances of success and have other advantages for U.S.A.I.D.: 1) it has only one species of tsetse fly, G. austeni, and rearing techniques for an S.I.R.M. approach are already worked out for this species, 2) Zanzibar, being an island, has natural barriers to reinvasion, 3) there has been some work on the island in the 50s and 60s and four Zanzibarians who worked on these efforts are still there and might be available for work on a new USAID

sponsored program, 4) the host government of Zanzibar is very desirous of a control project and would be supportive. The Minister of Agriculture, Mr. Rashid, and the Head of the Livestock Division, Dr. Omari Jabba, (DVM from U.K.) would be very helpful in such a project, 5) the British Overseas Agency are currently doing a survey of the island and have a complete 1:10,000 coverage and will have vegetation maps as well.

There would, of course, be some problems such as scattered crop areas intermingled with tsetse infested areas which would make insecticide spray more difficult.

If a program is developed it should include preliminary ecological/survey studies which could determine whether or not the project continued. These studies would include an insect ecology study to determine where and in what densities the flies are located, during the dry season and during the wet season. For instance if the flies only occupy certain vegetation areas during the wet season, control could be timed to be effected during the dry season which would greatly reduce the size of the spray areas. Also included would be parasitology studies (cattle, blood smears, fly dissections, etc. to determine extent of the parasite), spraying studies (to determine type, amount, timing and spray equipment to use in different vegetative types and around agricultural crop areas) and counterpart training. This work could take about two years and would predicate the actual integrated spraying/SIRM efforts.

It is recommended that the parasitological studies be done by Zanzibarians from the Livestock Veterinary Division. These people would have to be furnished microscopes and other lab equipment to do the identification of cattle trypanosomes. They should also have technical assistance provided by a U.S. parasitologist for from six months to one year to train their staff in survey techniques and diagnosis. At that point the

Zanzibarians should be capable of carrying out this part of the project.

A sociological analysis is currently being done on Zanzibar by Dalles Browne under contract to USAID Tanzania. This will provide information on social impacts of a tsetse eradication program on local people and social structures as well as predictions of success of subsequent land management efforts.

There should be no adverse environmental effects of a tsetse fly program on Zanzibar. The spray of insecticide would have to be carefully applied to prevent drift into agricultural areas but this can be done. On areas where endosulfan is used the spray is of such low concentration that other insects have not been shown to be affected. Some would argue that there is a chance that once the flies have been controlled, the land could be abused. This, of course, is a possibility but if that reasoning were followed no progress would ever be made, anywhere.

Once flies were controlled there would be opportunity to implement management of the land, control undesirable brush, reseed to forage plants which once occupied much of these areas and establish an appropriate grazing system. The Minister of Agriculture would be capable of doing this with financial and advisory assistance from FAO and/or World Bank.

Zanzibar is particularly anxious to have this project started. They believe that there is up to 80% infection, however, there is no documentation of this parasitological study. The Zanzibar government is also anxious to have something (any part of the study) start as soon as possible and if AID decides to proceed it is recommended that at least the surveys begin by October 1, 1978.

A rather detailed report and background paper on Zanzibar prepared by one of the Review Team Members, Jon M. Skovlin, is attached. This report gives background for land use planning on Zanzibar as well as

recommendations on the organization and follow up for a control program on the island.

The probability of success of the above mentioned possible efforts at Tanga and Zanzibar is high. Preplanning and careful initial surveys will further enhance probability of success. One item of particular importance to success is the overlapping of replacement personnel. Realizing the long time it takes to recruit highly qualified people, preliminary efforts should start immediately. It is also strongly suggested that some kind of effort (ecological surveys) be started as soon as possible in order to retain the advantage of enthusiastic support of the Zanzibar government which now exists.

If the projects at Tanga and Zanzibar are undertaken by the USAID Africa Bureau as discussed, it is recommended that at least the research components continue to be reviewed and monitored by USAID Research Advisory Committee.