PN-ABK-570
75889

Vector Biology
and Control Project

Environmental Assessment of the Bolivian Chagas' Disease Control Program of the Community and Child Health Project (511-0594)

August 1, 1991

by

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VBC Report No. 82236

Managed by Medical Service Corporation International • Sponsored by the Agency for International Development
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Acknowledgments

The author would like to thank the staff members of the USAID Community and Child Health (CCH) Project and especially those of the Chagas' Disease component, who helped in every way. Special thanks are due to Drs. Fanor Balderrama and Hernan Bermudez, who provided a great deal of information and guided me in the field, and to Patricia de la Riva for preparing the draft of this report.

Preparation of this document was sponsored by the Vector Biology and Control Project under Contract No. DPE-5948-C-5044-00 to Medical Service Corporation International, Arlington, Virginia, USA, for the Agency for International Development, Office of Health, Bureau of Science and Technology.

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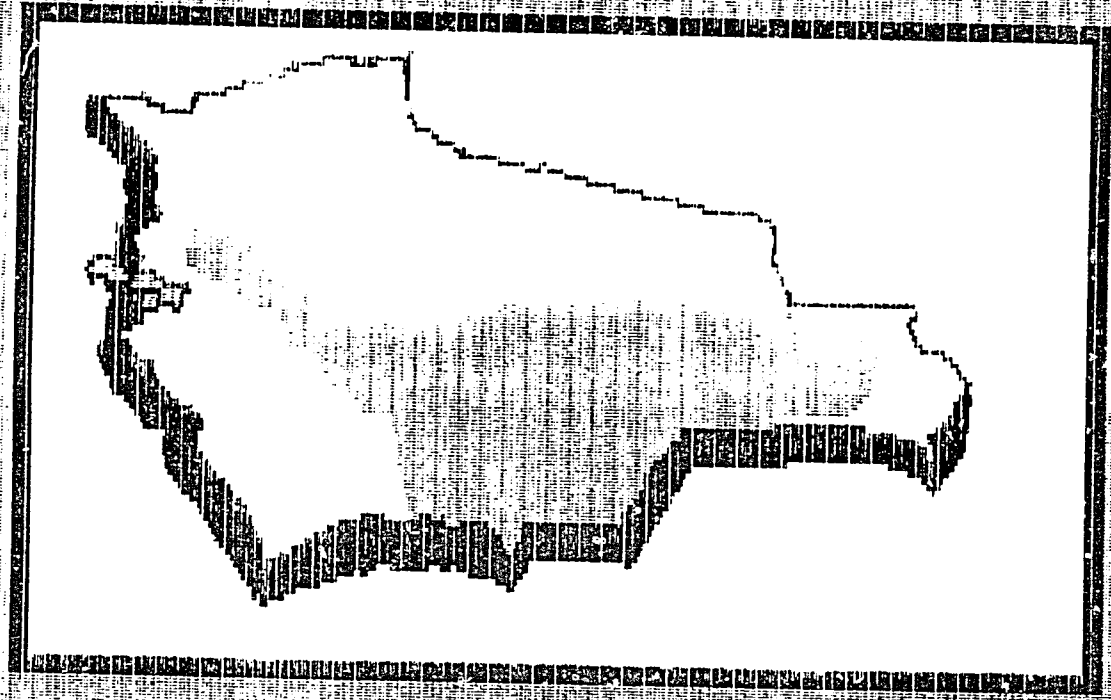
AREA CHAGASICA EN BOLIVIA



Zona CHAGASICA

1. Executive Summary

USAID/La Paz is supporting Chagas' disease control measures in Bolivia as a component of the Community and Child Health Project (511-0594). USAID's assistance will include funds for purchasing limited quantities of insecticides to be used as part of an integrated vector control program.

The Chagas' disease control program is based on improving rural housing through community participation, supported by a strong health education component. The interruption of contact between humans and Chagas' disease vectors resulting from housing improvement will be maintained by spraying the insides of the houses with insecticides. The balance provided by the environmental (housing modifications), education and vector control components meet Agency for International Development (A.I.D.) criteria for integrated programs.

Before this pilot program began, the Government of Bolivia had no systematic process for screening candidate insecticides to control Chagas'. The program has strengthened the entomological laboratory in Cochabamba to fulfill this need. Nine candidate insecticides registered by the U.S. Environmental Protection Agency (USEPA) or under USEPA review have been selected for screening. These include three organophosphates, one carbamate and five pyrethroids. Appropriate protocols have been provided for screening these compounds in the laboratory and the field.

Biological control is not a feasible alternative for vector control. There are also no suitable chemotherapeutic agents for treating all stages of Chagas' disease. Therefore, reducing transmission at the source -- housing -- is the most feasible means of control.

Approval should be granted for procuring and testing the candidate insecticides (Table 1) through the procedures and protocols developed by the program. The most appropriate compounds, based on efficacy, safety to humans and the general environment, and economies of use, will be purchased by USAID for operational use in the program.

Operational use of the selected insecticide(s) in the control program will require careful monitoring. It is recommended that the health

education component of the program include more material about safe use of pesticides. If organophosphate compounds are selected for operational use, protective clothing should be provided for workers and a facility for measuring cholinesterase depression should be established.

Once an insecticide has been selected for operational use, all of the 10 to 12 spraymen in the program should be given refresher training through a two-day workshop supervised by the program entomologist and epidemiologist. This workshop should be repeated annually.

Based on the relatively small quantities of insecticides to be employed in this program, the manner of use (intradomiciliary application **only** after reinfestation), and the carefully planned testing being developed, any negative environmental impact of insecticide spraying would be minimal and would be offset by the benefits derived from housing improvements and reduced disease transmission.

2. Sumario Ejecutivo

USAID/Bolivia ha decidido dar soporte a las medidas de control para la Enfermedad de Chagas en Bolivia, como un componente del Programa Comunitario y de Salud Infantil (511-0594). Dentro de las actividades de asistencia de USAID se incluirán fondos para la compra de una cantidad limitada de insecticidas que serán usados como parte de un programa integrado de control de vectores.

EL proyecto en general está fundamentado en el mejoramiento de la vivienda rural a través de la participación comunitaria, con un fuerte componente en educación sanitaria. La interrupción del contacto hombre-vector, como resultado del mejoramiento de la vivienda, será mantenido a través del rociado intradomiciliario de insecticidas. El balance proveniente de los componentes de medio ambiente (modificaciones en la vivienda), educación, y control de vectores, satisfacen los criterios de la Agencia para programas integrados.

Previo a este proyecto el gobierno de Bolivia carecía de un proceso sistemático para el estudio y selección de los insecticidas candidatos a ser usados en el control del mal de Chagas. Esta necesidad ha sido llenada con el fortalecimiento del laboratorio entomológico en Cochabamba. Los insecticidas candidatos que han sido seleccionados para el estudio son nueve, los cuales están registrados por USEPA o bajo revisión por EPA. Este grupo incluye tres organofosforados, un carbamato y cinco piretroides. Protocolos apropiados han sido provistos para el estudio de estos productos tanto en el laboratorio como en el campo.

El control biológico no es una alternativa factible para el control del vector. Tampoco existen medicamentos adecuados para ser usados en el tratamiento de todos los estadíos de la enfermedad.

Por lo tanto, la reducción de la transmisión en la fuente de origen (la vivienda) es el medio más factible de control.

La aprobación para la obtención y el estudio de los insecticidas candidatos (Tabla No. 1), a través de los procedimientos y protocolos desarrollados por el proyecto, debe ser concedida. Los compuestos más apropiados (en base a los criterios de eficacia, seguridad a humanos y medio ambiente en general, y economía en el uso) serán luego comprados por USAID para el uso operacional en el programa.

El uso operacional del(los) insecticida(s) en el programa de control requerirá de una supervisión cuidadosa. Se recomienda que en el componente de educación sanitaria del proyecto se incluyan más materiales relacionados con el uso seguro de los pesticidas. Si los compuestos organofosforados son seleccionados para el uso operacional, se deberá de proveer de ropa protectora adecuada a los trabajadores así como de las facilidades para medir una baja en los niveles de colinesterasa.

Cuando un insecticida sea seleccionado para el uso operacional, todos los 10-12 rociadores del programa serán sometidos a un programa de dos días de entrenamiento y refrescamiento supervisados por el entomólogo y el epidemiólogo del proyecto. Este entrenamiento deberá hacerse anualmente.

En base a las pocas cantidades relativas de insecticidas que serán empleados en el proyecto; la forma de uso (aplicación intradomiciliaria **solamente** si se comprueba reinfestación); y el estudio que ha sido cuidadosamente desarrollado, cualquier impacto negativo de las actividades del proyecto en el medio ambiente es considerado mínimo y es compensado por los beneficios derivados del mejoramiento de la vivienda y la reducción de la transmisión de la enfermedad.

3. Applicable Environmental Procedures

3.1 Project Initial Environmental Evaluation (IEE) and scope of this Environmental Assessment (EA)

When the Community and Child Health (CCH) Project (Bolivia 511-0594) was approved in 1988, the IEE (Annex A) recommended a negative determination, excluding the need for an EA.

At the time of the Project Paper (PP) approval (1988), Chagas' disease control was not a component of the CCH Project. It was added in March 1990, with a sum of US$ 500,000 from CCH funds supplemented by US$ 2.5 million from P.L.-480 for two years. Recognizing that addition of this Chagas' disease control component, including housing improvements and limited use of insecticides for vector control, had not been foreseen when the PP and IEE were prepared, USAID/La Paz asked the Vector Biology and Control Project (VBC) to conduct this EA for the additional activities planned.

3.2 Scoping process

The scope of this EA was to review the environmental soundness of the housing improvements and especially the use of insecticides to maintain reduced human-vector contact and reduced transmission of Chagas' disease. The insecticides were reviewed for 1) safety in use to applicators and the general population; 2) effects on potential non-target species; and 3) compliance with the conditions outlined under A.I.D. Reg. 22 CFR Part 216.

The Chagas' disease control component of the CCH Project is a pilot program. It is an integrated effort to evaluate the efficacy of the methods being developed (health education, housing modification through community participation, and vector control) to reduce the transmission and prevalence of Chagas'. If these methods prove practical and sustainable at low-cost through community participation, there is a strong possibility that other donors, NGOs and PVOs will join USAID in supporting a national Chagas' control program.

Research on the use of insecticides for vector control is particularly significant because few have been used against the triatomine vectors in Bolivia in a systematic fashion. Few trials have been conducted and none of the newer pyrethroid compounds have been evaluated in laboratory trials or against the vectors under Bolivian field conditions. On this basis, the activities being carried out could be granted an exemption to an EA under provision 22 CFR Part 216.2(c):

"Research activities which may have an effect on the physical and natural environment but will not have a significant effect as a result of limited scope, carefully controlled nature and effective monitoring."

USAID/La Paz has requested, however, that a full EA be conducted at this stage to ensure that all precautions are being taken to ensure human and environmental safety and that this program, as a fully integrated disease control effort, meets the highest standards and expectations of the Agency.

3.3 Goverment of Bolivia pesticide legislation

The Goverment of Bolivia issues a list of insecticides authorized for use in agriculture but has no comparable listing or legislation governing insecticides used in public health. Insecticides for controlling vector-borne diseases are selected by the Ministry of Health.

No specific regulations regarding environmental impact or the worker health and safety aspects of pesticide use are known to exist in Bolivia.

4. Conduct of Environmental Assessment

This environmental assessment was requested by USAID/La Paz to ensure that proper environmental concerns have been identified and appropriate safety measures taken in the development of the Chagas' disease control component of the Community and Child Health Project (# 511-0594).

The assessment was performed by Dr. Andrew Arata (see section 9 for qualifications). It consisted of a 20-day in-country visit (Aug. 4-24, 1991), including briefing and debriefing sessions with USAID and GOB officials. A second debriefing will be held in Washington with staff from AID/S&T/H and VBC, and AID/LAC Health and Environmental Officers.

The in-country trip included interviews with the staff from the Chagas' disease control program in La Paz and Cochabamba and the U.N. Commission for Human Settlement (HABITAT), and with collaborating groups in Cochabamba and Sucre, Chuquisaca. One week was spent in Cochabamba and Chuquisaca reviewing housing improvement activities, insecticide storage facilites and general environmental conditions. The entomological laboratory in Cochabamba where the insecticide testing is being conducted was a major point of the visit in that area.

5. Analysis of Alternatives to the Proposed Action

5.1 Proposed actions

a. **Housing improvements.** Between one and two thousand houses are being improved with local materials through community participation. Animal shelters (corrals) are being rebuilt and moved away from the houses to prevent reinfestation by vectors.

b. **Vector control.** Spraying of houses and animal shelters when reinfested (**not** on a regular cycle as in malaria control) is proposed to reduce human-vector contact. Various insecticides are to be screened in the laboratory and the field under this program. Only the most effective, safe insecticides will be considered for future program use (see 6.0-6.12).

c. **Health education.** Both housing improvements and vector control are being supported by an extensive health education program that addresses the environmental and personal safety aspects of insecticide use. The education component fosters an improved style of life for the rural population and is coordinated with the general health service to establish a horizontal approach to improved health delivery.

d. **Epidemiological and entomological monitoring.** At the initiation of the program, an extensive baseline survey was conducted. The database of baseline survey results, which includes demographic information, is the most comprehensive ever collected on Chagas' disease in Bolivia, and will be used to monitor the effects of program interventions throughout the life of the program.

5.2 Use of alternative methods of control

The Chagas' component is designed as a fully integrated disease control program. Housing improvements are a vector source reduction method, eliminating harborage and breeding sites. No biological

control approaches are currently feasible (see section 7.9). There are no other known methods for reducing human-vector contact than those employed in this program.

5.3 Chagas' control through chemotherapy alone

There are no suitable drugs for the advanced stages of Chagas' disease. Although drugs are available to treat the early acute phase of the disease, their application requires early diagnosis not currently available or sufficiently accurate. Chemotherapy for Chagas' disease also requires close medical supervision, which is not available in most rural areas where the disease occurs. Therefore, chemotherapy alone is is not a viable alternative.

5.4 No action

As described in section 3, this program is the first organized approach to Chagas' disease control in Bolivia. Financed under the CCH Project, it is a component of the national child survival effort. In other ways, through community participation and coordination with rural health services, the program clearly furthers Agency policies.

To reject the multiple benefits to be obtained from this program would not be a reasonable alternative.

5.5 Conclusion

Based upon consideration of currently available options, the CCH Chagas' disease control component, which plans to use limited, rationally planned insecticide applications to supplement community-based housing improvement and health education, is the most balanced approach to environmentally acceptable, economic and efficient control of this disease.

6. Program Description

6.1 Background

The World Health Organization (WHO) estimates that there are more than 25 million cases of Chagas' disease in Latin America, representing about 8 percent of the total population. Approximately 850,000 new cases occur each year. It is believed that Chagas' morbidity and mortality are higher in Bolivia than anywhere else in Latin America. The chief vector in Bolivia is *Triatoma infestans*, an almost exclusively domestic and peridomestic triatomine bug. *T. infestans* is a highly efficient vector and infections transmitted by this parasite are considered to be more severe than those transmitted by other triatomines elsewhere in Latin America.

Chagas' disease occurs in three phases:

1. The **acute** phase, recognized primarily in children, causes about 8 percent mortality from severe myocarditis or meningoencephalitis.

2. The **latent** phase -- an intermediate phase, possibly lasting 10 to 15 years, in which there are no symptoms. Patients in this phase generally have a low-level parasitemia and are capable of transmitting the infection via vectors, blood transfusion or placental transfer. Congenital transmission is common, and severe, in Bolivia.

3. **Chronic** infection develops in 10 to 30 percent of infected patients some 10 to 15 years after the acute phase. Heart muscle damage and sudden death due to cardiac arrest are not uncommon. Chagas' disease is said by WHO to be the most common cause of congestive heart failure in Latin America. In some areas the infection affects a person's gastrointestinal tract, causing severe swallowing and digestive disorders.

In Bolivia, Chagas' disease occurs in the valleys, plains and forests between 300 and 3.500 meters altitude. Approximately 83 percent of Bolivian territory is in this zone, placing more than 3 million people at risk. Serological survey results show that infection rates in some areas are as high as 70 percent, with a national average of 40 percent seropositive (i.e. showing antibodies indicating a prior infection). The risk of transmission through blood transfusion is a major concern because blood banking and screening facilities are not well developed in Bolivia.

Chagas' is a disease of poverty, poor understanding and inadequate housing. Infestation rates of vectors in Bolivian houses can be summarized as follows:

Urban	20-40% infested
Periurban	40-60% infested
Rural	70-100% infested

Rates of the pathogenic agent (*Trypanosoma cruzi*) infection in captured (domestic) vectors average 40 to 50 percent positive, but rates of 70 to 90 percent have been found in the departments of Cochabamba and Chuquisaca, where this program will be active.

6.2 Program components, goals and outputs

Recognizing that sustainable control of Chagas' disease can only be achieved by reducing contact between humans and vectors in the poor, rural areas of highest endemicity, USAID and the GOB initiated the Chagas' disease control program in 1990 as the fourth component of the Community and Child Health Project (CCH). Its objective is to develop cost-effective procedures for prevention of Chagas' disease, emphasizing house modifications with local construction materials through community participation, limited vector control, and health education.

Actions to be taken include:

- o identifying methods and materials to improve rural housing, reduce vector-human contact, and motivate and educate people on how to maintain a vector-free environment;

- o promoting an effective, affordable Chagas' disease control system in endemic areas based on community participation;

- o developing a health education system to promote awareness of the cause and effects of Chagas' disease and the community and individuals actions necessary to prevent it;

- o establishing a national nucleus of expertise in 1) epidemiology and entomology to continue program interventions and evaluate their effectiveness, and 2) in health education and housing construction/improvement to sustain the benefits derived.

Four pilot areas have been selected in:

- o Chuquisaca,
- o Tupiza,
- o Tarija and
- o Cochabamba.

The operational structure of the program includes the following units:

- o housing contruction/improvement,

- o health education,

- o economic assessment,

- o epidemiology and evaluation, and

- o entomology and vector control.

6.3 Economic considerations

The debility and premature death caused by Chagas' can be devastating in an essentially rural country such as Bolivia. The lack of a national control program is costing the country millions of dollars in absenteeism and medical care. Although good economic studies have not been conducted in Bolivia to calculate such costs, a comparison with its neighbor Brazil is instructive. In Brazil, where

Chagas' disease seroprevalence is about 4 percent compared to Bolivia's 40 percent, the estimated annual cost of medical care due to the disease is US$ 250 million. Brazil loses an additional US$ 5 billion a year because of absenteeism due to Chagas' disease.

6.4 Other donors

A number of relatively small projects in Bolivia were involved in Chagas' control through housing improvements prior to the development of this USAID-sponsored activity. Several (such as the Proyecto Social Boliviano Británico "Cardenal Maurer" in Sucre, Chuquisaca) have joined forces with USAID, which provides some operational funds as well as access to epidemiological and entomological expertise. The USAID program has profited from some of the earlier experiences of these groups in housing construction and community participation and from their knowledge of the local areas. These projects have used only a few insecticides (pyrethroids) in small quantities, as described in section 6.1.

USAID/La Paz and the CCH anticipate that the results of this pilot Chagas' disease control program will stimulate other major bilateral donors to join forces and establish a long-term program to control Chagas' and other vector-borne diseases in Bolivia.

Currently the program is collaborating with the World Food Program (PMA, or Programa Mundial de Alimentos) in several program areas.

WHO, through its Special Programme for Research and Training in Tropical diseases (TDR), is sponsoring a small supportive research project through the MOH. In the past, TDR has sponsored insecticide application systems (impregnated paints and canister fumigants) in Argentina and Brazil. These systems need to be tested in Bolivia using insecticides that meet USEPA standards.

The compounds likely to be provided or used by other agencies, their USEPA status and toxicological attributes (tables 2, 3 and 4) are discussed in section 6.1 (also see Annex E).

7. Pesticide Use Assessment

Several vector species transmit Chagas' disease in Bolivia, but by far the main vector and target for control is *Triatoma infestans*. This species occurs primarily in the southern and central parts of South America. With one exception, near Cochabamba, Bolivia, this species is found exclusively in or near human habitations. Therefore, insecticides will be applied only in houses and adjacent animal quarters. The latter will eventually receive reduced spraying because part of the housing improvement program involves moving animal shelters and corrals away from the houses.

The preliminary work to be conducted requires laboratory testing of candidate insecticides for efficacy against *T. infestans*. The candidate compounds have been chosen based on the literature and experience in other countries, particularly Venezuela, Brazil and Argentina, where control programs have been in place for some time.

This section addresses the questions listed in A.I.D. Regulation 216.3 (b) (1) regarding the use of insecticides. Its focus is on the selection of one or more insecticides to be used in the Chagas' disease control program in Bolivia. As no systematic testing of insecticides for efficacy against *Triatoma infestans* has been conducted in Bolivia, the program plans systematic screening in the laboratory and field (Annexes F, G and H). Insecticidal control of the triatomine vectors is secondary to the housing improvements being carried out, and after the initial spraying, will only be repeated if houses are reinfested.

7.1 USEPA registration status of the selected insecticides

The USEPA registration status of the compounds selected for testing is summarized in Table 1.

Organophosphate (OP) compounds

Malathion and **fenitrothion** are two compounds widely used in A.I.D.-sponsored vector control programs. Malathion is used in Bolivia for *Aedes* (dengue and yellow fever) control. Both are

packaged as 40 percent or 50 percent water dispersable powders formulated for residual wall spraying.

Malathion and **chlorpyrifos** have recently been formulated through impregnation into latex-based paints and will be tested in this form. Both are USEPA registered for household use.

Carbamates

Bendiocarb (FICAM[R]) was approved as a residual house spray for malaria control in the USAID-sponsored program in El Salvador in 1989.

Pyrethroids

Five pyrethroid compounds have been selected for testing in Bolivia (Table 1). Four have USEPA registration numbers and are used for household pest control in the United States. The fifth, deltamethrin, is currently under review by USEPA and registration is expected in 1992. It is widely used in Latin America and elsewhere for malaria control under WHO/PAHO sponsorship.

- **Permethrin** has been used successfully for many years in pest and vector control programs, including A.I.D.-sponsored programs. It is the recommended insecticide for impregnating bed nets, an increasingly popular method of malaria control. It is also used to impregnate the clothing of the U.S. Armed Forces in areas where vector-borne diseases occur.

- **Cypermethrin, lambda-cyhalothrin** and **cyfluthrin** are newer pyrethroids of low mammalian toxicity that have been used in agriculture and pest control (U.S. mosquito abatement districts) in increasing quantities. They have not been used in A.I.D.-sponsored vector control operations but are commonly used in agriculture in developing countries. As with most pyrethroids, toxicity is high for fish (see section 6.5), but low for terrestrial vertebrates. Normal precautions to avoid contamination to food and delicate membranes (eyes) are recommended. Washing hands,

exposed areas of skin and clothes with soap and water are recommended after use. All these compounds are registered by USEPA (Tables 1, 2 and 4).

7.2 Basis for selection of insecticides

Bolivia has no previous experience in systematic screening of insecticides to control the vector of Chagas' disease, *T. infestans*. A laboratory has been established in Cochabamba with a *T. infestans* colony containing examples from the various sites in the country where control work is to be conducted. A literature survey and the advise of expert consultants indicated the insecticides that have been used in countries (Venezuela, Brazil, Argentina) where Chagas' disease control programs are in effect. WHO test kits for susceptibility/resistance have been obtained from WHO/Geneva and initial pretrials have been conducted to familiarize program personnel with the techniques involved.

Protocols have been drafted (Annexes F, G and H) to guide all steps of the testing process. As Bolivia does not have legislation regulating public health use of insecticides, only compounds registered for use in the United States are being entered in the testing system (deltamethrin is expected to be registered by USEPA shortly).

Following laboratory trials, the most promising compounds will be tested side-by-side in houses in the field (see protocol, Annex F). Assessment will be made by bioassay with 5th stage *T. infestans* from the laboratory colony.

The compound(s) finally selected for operational use will be determined according to efficacy, safety to the human population and the general environment, and cost of application.

All insecticides entered in the testing program have been approved by USEPA for indoor use. No labels in the United States refer to the various genera and species of triatomines as target organisms. Closely related bed bugs and bat bugs are considered target organisms on most labels. Section 2 ee in the Provisions of FIFRA (p. 13) allows for use on similar species if the application of the insecticide is in a site (i.e. house) approved on the label (Annex B).

Very few cases of Chagas' have been reported from the United States (about 10 from California and Texas during the past 25 years). The few triatomines that occur in the United States are not agricultural or household pests, hence no control is practiced.

7.3 The extent to which the proposed insecticide use is part of an integrated vector (pest) management system

The insecticide(s) selected for field use after screening in the laboratory will be part of an integrated control program. Improved housing, reinforced by a health education program, is the major control measure. Houses will be sprayed only to control reinfestation, which occurs largely through passive introduction with infested clothes and other household articles. Entomological monitoring will occur monthly, eventually being replaced by continous monitoring by the community as the health education component advances. Training materials being developed for use through schools and village health promotors will facilitate the education process. Annual epidemiological (serological) monitoring will assess disease transmission.

Unlike malaria control programs, which spray all houses on three- or six-month cycles, the Chagas' pilot program will respray houses only when they become reinfested with *T. infestans*. Some early experience in Tupiza showed that only 4 percent of houses required respraying after two years.

7.4 Application methods and equipment

Houshold spraying will be done with eight-liter Hudson X-Pert hand-sprayers, which are often used in malaria control programs. Application will be at the USEPA approved rates on the label, or below them if trials indicate efficacy at lower dosages.

Impregnated paints (chlorpyrifos and malathion) will be applied by the methods and at the rates indicated on their labels.

7.5 Acute and long-term toxicological/environmental hazards

Acute hazards -- organophosphates

Malathion or fenitrothion carry a risk of acute intoxication if they are improperly handled. When properly handled by trained applicators, however, they pose a minimal risk, particularly when applied in small quantities, as in the Chagas' control program. If either of these organophosphate compounds is selected for operational use, the required amount for the first year will be 1.6 to 2.0 tons (depending on whether 40% or 50% wettable powder is purchased). If liquid emulsifiable concentrate (EC) compounds are selected, the equivalent would be approximately 400 liters for the first year (Table 5). The same quantity probably will be used during the second year of the program depending on the number of houses improved.

In section 8 (Impact Mitigation Plan) an annual training workshop is recommended, including training in the use of cholinesterase-testing methodology (Lovibund) if OP compounds are to be used.

If OP-impregnated paints are employed (around baseboards, rafters and eaves - the walls will **not** be painted completely), acute toxicological problems would be minimal because the quantities of insecticide would be very small and no aerosol effect would be generated.

Acute hazards -- pyrethroids

If one or more pyrethroids are selected for operational use, the risk of acute intoxication would be low because of their low toxicity to mammals. As the program emphasizes moving animal shelters away from the houses, potential effects on domestic animals will be reduced.

If pyrethroids are selected, the quantities also will be low. An example of quantities required for cypermethrin is given in Table 5. A total of 404 liters would be required to treat more than 1,000 houses.

Long-term hazards

No long-term environmental hazards are foreseen in the use of either OP or pyrethroid compounds. Indoor house spraying of small quantities of insecticide will not result in significant "leakage" into the general environment. Houses in the program area will **not** be resprayed regularly but only if they are reinfested. Therefore, the **amount** of insecticide used **per house** in the program areas will decrease each year. In one early study in Bolivia, reinfestation rates were only 4 percent after two years. This is unlike malaria programs, which work on 3 to 6 month cycles, spraying all houses.

The program sites are in a xeric zone (see Figure 3). There are few running streams. Pyrethroids raise a particular environmental concern because they are very toxic to aquatic fauna, especially fish. If these compounds are used, special instructions (especially regarding rinsate) will be given. However, there is little aquatic fauna in the program areas so the risk is not great.

7.6 Efficacy of selected insecticides for triatomine control

As described in 6, 6.1 and 6.2 above, the first phase of this program will determine efficacy because there are no previous data from Bolivia upon which to select appropriate insecticides.

A great deal of the food crops raised in the Chagas' endemic areas are grown on a subsistance basis. These are mostly corn and wheat, temperate-zone fruits (apples, peaches, figs) and small vegetable crops for home use. Insecticide use is low and sporadic due to the cost. As part of its surveillance program, the entomological team is gathering information on previous and current insecticide use in agriculture to monitor for potential development of insecticide resistance (see Annex C).

7.7 Compatibility of the proposed insecticides with target and non-target ecosystems

Insecticides will be used only in houses and adjacent structures (animal houses or corrals) until these structures are placed an adequate distance from the houses. Target *T. infestans* populations in houses are

subject to predation by several insect and spider species, but these do not markedly reduce vector populations. *T. infestans* has a high reproductive rate largely influenced by: a) the poor conditions of the houses, which afford harborage for the vectors, and b) the availability of blood from humans and domestic animals.

Indoor house spraying, at rates no higher than used for malaria control elsewhere, will have little impact on the adjacent ecosystems. Rain and running water are scarce in the areas to be treated, so there is little chance of insecticide runoff into adjacent areas (see Figure 3). Domestic animals are part of the cycle of *Trypanosoma cruzi*, the parasite that causes Chagas' disease. Part of the housing improvement section of the program will require that animals and their protective structures be moved some distance from the houses. This public health measure will also reduce the likelihood of the animals being exposed to insecticide.

T. infestans is found in "natural" settings some distance from human habitations near Cochabamba -- the only place in South America where this is known to occur. The extent of these *T. infestans* populations is unknown but will be studied as an operational research component of the program. There are no plans to conduct control operations against sylvatic vectors. Their role in transmission of the human disease is not known, but there is no doubt that the houses are the major site of transmission.

No endangered or protected species (vicuña, condors) occur in or near the areas to be treated by insecticides. There are no national parks or reserves near the areas to be treated.

7.8 Conditions under which insecticides are to be used

The conditions under which insecticides will be used are described under sections 4.1 and 6.5 above. In brief, insecticides will be applied indoors at or below prescribed USEPA dosages in houses that have been renovated. Respraying will occur **only** in houses that have been reinfested.

7.9 Availability and effectiveness of other insecticides and/or non-chemical control measures

The first objective of this program's activities regarding insecticides is to determine which of the candidate compounds are effective. Laboratory and field trials have been designed (**Annexes F, G, H**) to screen insecticides that will meet USEPA and A.I.D. regulations (**See Table 1**).

Housing modification and health education are the main methods of controlling Chagas' disease in this program. The overall objective is to reduce human-vector contact by improving housing and educating people to maintain a vector-free environment in their houses. Chemical control of the vectors will supplement these major non-chemical approaches to vector control.

A number of biological control approaches to the control of the triatomine vectors have been studied but none are operational. The entomopathogenic fungi *Metarhizium* and *Beauvaria* are effective in laboratory trials, but preparations are unstable and do not provide predictable results under field conditions. Generally they require very high humidity to achieve adequate control, a condition seldom found in houses infested with triatomines.

Spiders and some other predators of *T. infestans* exist under natural conditions and feed upon triatomines, but their presence in places with high vector populations indicates that they do not play a major role in supressing these populations. Certain telonomid wasps are parasitoids, laying their eggs on triatomid eggs and destroying them. Several studies indicate, however, that these wasps do not have a major impact on vector populations under natural conditions.

7.10 Ability of Government of Bolivia to regulate and control the distribution, storage, use and disposal of pesticides

As indicated in section 2.3, The Goverment of Bolivia has no legislation on the use of insecticides for public health, although it does recommend pesticides for agricultural use. Its policy on insecticides

is also deficient concerning human and environmental safety. By far the largest quantities of insecticides used and the greatest need for regulation are in agriculture.

In the program under review, the small quantities of insecticides used will be under the control of the Chagas' national team, currently funded and supervised by USAID. There will be no need for central storage because the team can easily use its own transport to distribute insecticides to the three (of four) sites that will require them. The author has visited two of the field storage facilities and found them quite adequate. Annual supplies per field site would not exceed 160 liters per year of a pyrethroid insecticide or 800 kg per year of an organophosphate WP, so storage is not a major problem. Because of these small quantities, there will be a rapid turnover of insecticide stores from year to year so there should be little waste or need for special disposal facilities.

USAID should use this program as an example for the Government of Bolivia in the selection of appropriate insecticides, careful use, and integration of chemical and non-chemical means of control, and should express the need for better governmental policies and regulations.

7.11 Provisions for training insecticide users

Insecticide applicators in this program will have been seconded from, or trained by, the national malaria control program. PAHO and USAID provided training to the malaria workers in 1987 through the VBC Project. In 1985, USAID sponsored a radio program to educate people about the uses and hazards of insecticides (Annex D).

Training should be expanded. It is recommended (see section 8) that an annual training workshop be conducted for all people involved in insecticide handling and application in the Chagas' control program. It is also recommended that USAID review the radio messages developed earlier and consider using them or revised versions in the areas where Chagas' control measures are being conducted.

7.12 Provisions for monitoring the use and efficacy of the selected insecticides

In addition to the selection process described in section 6.2, provisions for monitoring the use and efficacy of the insecticides include monthy monitoring of improved houses by the program's entomological team. This is an essential part of the program because houses are to be resprayed **only** after reinfestation.

An additional monitoring system has also been established. A baseline epidemiological survey was conducted in the four sites and serological results are expected in October 1991. Continued monitoring of seroconversion to measure rates of disease transmission will provide the best possible measure of efficacy -- reduction in disease transmission.

8. Environmental Impacts of the Proposed Action

The following section highlights the probable impact of the Chagas' disease control program. Further discussion on this subject is found in sections 6.5 and 6.7.

8.1 Unavoidable adverse environmental impact

Because of the contained nature of intradomiciliary application and the fact that only vector-infested will be sprayed, the impact of insecticides on the outdoor environment should be negligable. Indoor spraying may effect the environment if arthropods killed by the sprays are eaten by domestic animals or predators. Sweeping and burying insects killed by insecticides should minimize this possibility.

Contamination of water with rinsate from mixing buckets and tanks will be minimized if rinse water is buried in a hole away from water sources.

Spraypeople will receive some contamination: this is unavoidable. Methods for reducing such exposure are described in section 8.

8.2 Positive environmental aspects

Any program using insecticides, even in small quantities as in this program, poses a minimal risk, but the use of chemicals is not the major control measure. Housing improvements are the primary method being developed to decrease human-vector contact. Therefore, the program will achieve an overall benefit in the quality of the human environment.

8.3 Relationship between short-term impact and long-term productivity

Major benefits would accrue as a result of this program if Chagas' disease was suppressed (see section 5.1). Eradication is not a feasible short- or long-term goal at this time because of the economic status of the country and the association of the vector and the disease with poor

rural housing conditions. Development of community participation activities to improve individual housing and reduce the level of disease in the areas that are part of the program will be a major short-term impact. A possible long-term impact on productivity will be a decrease in absenteeism and premature death due to Chagas' disease in rural populations.

8.4 Irreversible or irretrievable commitments of resources

This program will result in the irretrievable consumption of petrochemicals in the form of pesticides and motor fuel. The quantities of insecticides are small, however, and the regular visits of program health workers and promotors to rural areas will have a positive educational and community development impact over and above the specific work being conducted.

9. Environmental Impact Mitigation Plan

The Chagas' disease control program is designed to produce an environmental change -- improving the housing conditions of rural populations to reduce Chagas' disease transmission. The housing improvements are to be carried out through community participation based on a strong health education component. The results of these components of the program will have positive environmental effects -- improved health awareness, community participation and improved living standards.

Because of these environmental benefits, there is no mitigation plan for this program. What is essential, however, is that the program be monitored carefully as it is expanded to improve each component so that the results become self-generating and cost-effective.

The role of insecticides in the program is maintenance. Insecticides are to be tested, selected and employed to keep improved houses free of *T. infestans* reinfestation. Houses will be treated **after** improvements are made and retreated **only** if reinfested. Therefore, great importance should be placed on selection of the safest and most effective insecticide.

9.1 Priorities

- Systematic, careful testing of the insecticides, as discussed in section 6-6.12.
- Adapting field safety procedures to the compounds selected.
- Training insecticide applicators in field safety procedures.
- Providing protective clothing and establishing a cholinesterase depression monitoring system if the compounds selected are organophosphate insecticides.
- Including awareness of pesticide hazards in the program's health education component.

- Carefully monitoring continued insecticide efficacy and any adverse environmental effects that may occur.

9.2 Safety protocols

a. Applicators

All persons handling and applying insecticides should be provided appropriate written and illustrative materials on the safe use of the compounds they are applying.

There will not be more than 10 to 12 applicators in the program. Each should be provided protective clothing (overalls, gloves, boots and masks). These could be similar to those provided to the rural professors in Chuquisaca.

Examples of detailed protocols for the use of malathion and fenitrothion have been left with the Mission in La Paz. Although the small quantities of insecticides proposed for use in this program diminish the risk of major environmental damage, the risk to individual operators remains the same.

b. Household occupants

The program is developing educational material to inform and encourage the population to undertake housing improvements. Information on safe use of insecticides and their hazards should be included and emphasized, particularly the following:

- remove all items from houses before spraying;
- keep people and animals away from a house when it is sprayed;
- after spraying, close all doors to prevent entry but open all windows to hasten ventilation and drying;
- prohibit reentry for one hour;
- sweep the floor and bury sweepings in a hole away from the house;

- o post house cards to record visits, inspections and sprays; and

- o **never** store insecticides in houses or near food supplies. Always keep them in a separate shelter.

9.3 Safety training

- o The program has scheduled meetings and workshops in each of the intervention sites. These should be expanded to include information on insecticide safety.

- o A two-day refresher training session should be held once a year for program spray personnel. It could be added to one of the previously scheduled workshops on housing improvements at minimal cost.

9.4 Monitoring program performance and compliance

The program design includes good monitoring systems. In the early stages of insecticide testing, bioassays will be conducted monthly in houses to determine the residual effect of the insecticides. Subsequently, entomological monitoring will occur monthly. However, close supervision will be required to ensure that these activities are done properly.

Spraymen should also be monitored carefully. Records should be kept by each person on the number of pump charges plus the compound and formulation used per week.

Finally, each of the hospitals in the program areas should be informed of the insecticides being used in the program and given instructions and supplies to render aid if required. Although this may not be necessary, it will encourage similar practices in the agricultural sector.

10. Preparer of this Environment of Assessment

Arata, Andrew A. (b. 1932, U.S. citizen) Ph.D., University of Florida: currently Deputy Director, Vector Biology and Control Project, A.I.D./S&T/Health (1985-to date) and Adjunct Professor of Tropical Medicine, Tulane University. Formerly Scientist/Ecologist; WHO/PAHO Center for Human Ecology & Health (México); Chief, WHO/PAHO Center for Research & Training in Vector Biology and Control (Venezuela); Chief, Vector Genetics & Bionomics and Chief, Ecology Unit, WHO/Geneva (WHO staff member 1968-1985). Areas of expertise include ecology, vector biology and control, pesticide safety, research and training in the above areas. Numerous publications in above areas, including training manuals.

11. People Contacted

1. USAID/LaPaz

Mr. Charles Lewellyn, Project Manager, CCH
Mr. Paul Hartenberger, Chief, HPN
Dr. Joel Kuritsky, TACS, CCH Project

2. CCH Project

Dr. Alvaro Muñoz, Director, CCH
Dr. Jorge Velasco

3. CCH Project/Chagas Component

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Dr. Hernan Bermudez
Dr. Faustino Torrico (University Cochabamba)
Lic. Juan Carlos Lea Plaza
Lic. Fernando Camargo (Architect)
Lic. Antonio Gomez
Lic. Mario Salvitierra

4. Ministry of Health

Dr. Roberto Vargas, Director, Division of Epidemiology

5. Projecto Boliviano - Britanico (Sucre)

Dr. Daniel Rivas
Ms. Ruth Zenzano

6. HABITAT (U.N. Commission for Human Settlements)

Dr. Irene Vance
Lic. Mauricio Muñoz

7. Rotary International (Cochabamba)

Dr. Gaston Pol

8. VBC and CCH Chagas' consultants (in-country)

Dr. Joáo Carlos Pinto Dias (Brazil)
Dr. Silverio Gonzalez Téllez (Venezuela)
Lic. Mauricio Phelan (Venezuela)
Dr. Ralph Bryan (CDC, Atlanta)

12. LAC Bureau Approval of EA

This EA was reviewed by the USAID environmental officer for South American countries and the LAC Bureau environmental office, which approved the document contingent upon adoption of the mitigative actions recommended. Comments and details of mitigative actions are provided in Annex I.

Table 1
Insecticides to be tested for efficacy against *Triatoma infestans* vector of Chagas' disease in Bolivia.

Insecticide	Manufacturer		EPA Reg. Nos.*
Organochlorine:	None to be tested		
Organophosphates:			
50 WP Malathion	American Cyanamid	EPA Reg.	N°241-208AA
40 WP Fenitrothion	Sumitomo Corp of Amer.		N° 39398-9
Impr. Paint Chlorpyrifos	Insecta Corp. (Florida)		N° 45600-1
Carbamates:			
40/20 WP Bendiocarb (FICAM)	Nor-Am Chem. Corp.		N° 45639-1
Pyrethroids:			
Pounce 25 WP Permethrin	FMC Corporation or Fairfield American	Tech.	N°279-3013 279-3051
Cynoff EC/25 Cypermethrin	FMC Corporation or ADAPCO		N°279-3081
Commdore (US) Lambda-Cyhalothrin ICON (UK)	ADAPCO (ICI)		N°10182-96
Tempo 20WP Cyfluthrin	Mobay U.S. (Bayer)		N°3125-380
K-Otrin Deltamethrin	Roussel Bio (France & Bolivia)	EST	N°97805

* Most compounds have multiple EPA REG. Nos. depending on formulation: Those listed are those appropriate for testing.

Table 2. Toxicity of Selected Pesticides

Name	Oral LD50 mg/kg (Rat)	Dermal LD50 mg/kg (Rat)
Malathion	2,800	4,500
Fenitrothion	504	3,500
Chlorpyrifos	135	> 3,000
Bendiocarb	403	1,000
Permethrin	>450	> 4,000
Cypermethrin	251-1,000 (depending on solvent)	1,600
Cyfluthrin	600	5,000
Lambda-cyhalothrin	243	
	>5,000 (quail)	
Deltamethrin	122	> 5,000

NOTE : OP compounds are used at dosages of 1-2 g/m2 when used as a wall spray : bendiocarb is used at 0.4 g/m2 : pyrethroids are used at much lower concentrations from 0.025-0.05 g/m2

Table 3

Summary of Toxicological Attributes of Malathion and Fenitrothion

PESTICIDE	LD^{50} ORAL[1]	LD^{50} DERMAL[1]	CUMULATIVE EFFECT	CUMULATION	INHALATION	CARCINOGENECITY	TERATOGENECITY	NEUROTOXIC
Malathion	2,800	4,500	Depressed cholin. levels.	Does not accumulate in body tissues.	No information	No effect	Teratogenic in chick embryos.	No nerve damage
Fenitrothion	504	3,500	Depressed cholin. levels. Severe may require 30 days recovery.	Does not accumulate in body tissues.	Depressed cholin. levels. 7 days recovery.	No effect	No effect	No nerve damage

[1]Rat, mg/kg.

SOURCE: WHO Data Sheet on Pesticides No. 30.

Table 4. Descriptions and Use Characteristics of Selected Insecticides

Common Name/Basic Producer

CYFLUTHRIN/Bayer — Baythroid, Solfac, etc.

Cyfluthrin is registered for control of numerous species of household, industrial, stored product, turf and ornamental, and hygienic pests. A non-systemic foliar insecticide to control chewing insects on a variety of crops such as corn, cotton, deciduous fruit, peanuts, potatoes, vegetables and others.

Tempo (EPA Reg. No. 3125-352) is registered to control adult mosquitoes, certain hemipteran bugs (plant bugs), flies, ticks and mites.

CYHALOTHRIN and LAMBDACYHALOTHRIN/ICI Agrochemicals — Karate, Grenade, etc.

According to recent conversations (7/91) with the EPA Product Manager, Cyhalothrin has been replaced by Lambdacyhalothrin. These materials are used to control cockroaches, flies, spiders, ants, and other household pests. They are also used for animal ectoparasites such as cattle lice, sheep keds, etc. Karate is used to control agricultural and horticultural insect pests.

Commodore WP (EPA Reg. No. 10182-282) is registered to control flies. Icon (not registered in the U.S. lists mosquitoes (both larvae and adults), Triatomids, and flies in it's literature.

PERMETHRIN/Roussel Bio Corp., Fairfield Am. Corp., Wellcome, etc. — Pramex, Permanone, Coopex, Perigen, Qamlin, Ectiban, etc.

Permethrin, a 3rd generation pyrethroid, is registered to control of a variety of insect pests on a large number of agricultural sites such as vegetables, (lettuce, cole crops, cabbage, etc.), fruits (apples, cherries, peaches, pears, etc.), nuts (almonds, filberts, walnuts, etc.), field crops (cotton, corn, soybeans, etc.), ornamentals, conifers (including pine seed orchards), etc. Some indoor uses for plant pests in greenhouses, indoor landscaping and home gardens.

Common Name/Basic Producer

BENDIOCARB/NOR-AM Chem. Co.

Many products

Bendiocarb is registered to control a broad spectrum of soil and foliar pests of turf, ornamentals, nut/fruit/citrus trees, and horticultural crops. It is also used as baits, dust and ULV formulations for grasshoppers and locusts.

Ficam and Ficam Plus are registered to control mosquitoes, termites, ants, cockroaches, crickets, silverfish, wasps, etc. in foodstores, houses, and other buildings by professional applicators and service personnel. Ficam ULV is used for mosquito control in cold ULV ground applications only.

MALATHION/American Cyanamid, Rhone Poulenc, Sumitomo, others.

Many products

Very broad spectrum insecticide of agricultural, public health, livestock, home & garden pests. Used to control practically every kind of household and garden insect. It is used to control head, body and crab lice on humans and it commonly appears in flea powders for dogs cats and other domestic animals. It is commonly used to control aphids, cockroaches, spider mites, scale insects, and other sucking, chewing insect pests of fruit, vegetables, ornamentals and stored products.

FENITROTHION/Bayer India Ltd., Sumitomo Chem. Co.

Insecticide and selective acaricide (has some low ovicidal activity) used to control chewing and sucking insects. Residual contact material used in public health programs for mosquitoes, flies, cockroaches, etc. as well as in agriculture on a wide variety of crops - cereal, cotton, orchard fruits, rice, vegetables and forests. Also used to control grasshoppers and locusts.

CHLORPYRIFOS/Dow Elanco

Many products

Broad spectrum insecticide which has become the most frequently used product in homes, apartment buildings, restaurants, and within nonfood areas of industrial, institutional, and commercial buildings including hospitals, stores, manufacturing plants and warehouses for controlling household pests including ants, ticks, cockroaches, spiders, etc.; pests controlled on outside surfaces and around buildings include flies, fleas, mosquitoes, ants, and many others; also used for ornamental pests including some hemiptera (close relatives of Reduviids), pests, fire ants, turf & soil insects. It is now the most commonly used termiticide.

Some products (Insecta, Inc.) are impregnated in crystaline form into paints for control of household pests. Chlorpyrifos is registered for control of lice and horn flies on beef cattle and keds on sheep. Also used as soil and foliar treatments to control many pests of ot a variety of crops such as alfalfa, cotton, corn and fruit trees as well as stored product pests.

Table 5

Determination of the Quantity of Insecticide to be Used: Example Given for Cypermethrin for One Thousand Houses

Area de Trabajo	Número de Viviendas	Promedio superficie a rociar por casa m2 *	Total superficie por área m2	Cypermethrin rociado 1ml/m2	Cantidad Cypermethrin requerido
Tarija	280	557,50	156.100	1	156,10 litros
Chuquisaca	410	270,50	110.905	1	110.90 litros
Cochabamba	327	418,67	136.905	1	136.90 litros
Total	1.017	-----	403.910	1	403.900 litros

* Promedio superficial a rociar por casa incluye: el 100% de las paredes interiores, más superficie de techo interior y tumbado, más un estimado equivalente al 40% para paredes exteriores, peridomicilio y factor de pérdida.

Figure 1. Adobe Bricks and Roofing Tiles Made From Local Materials

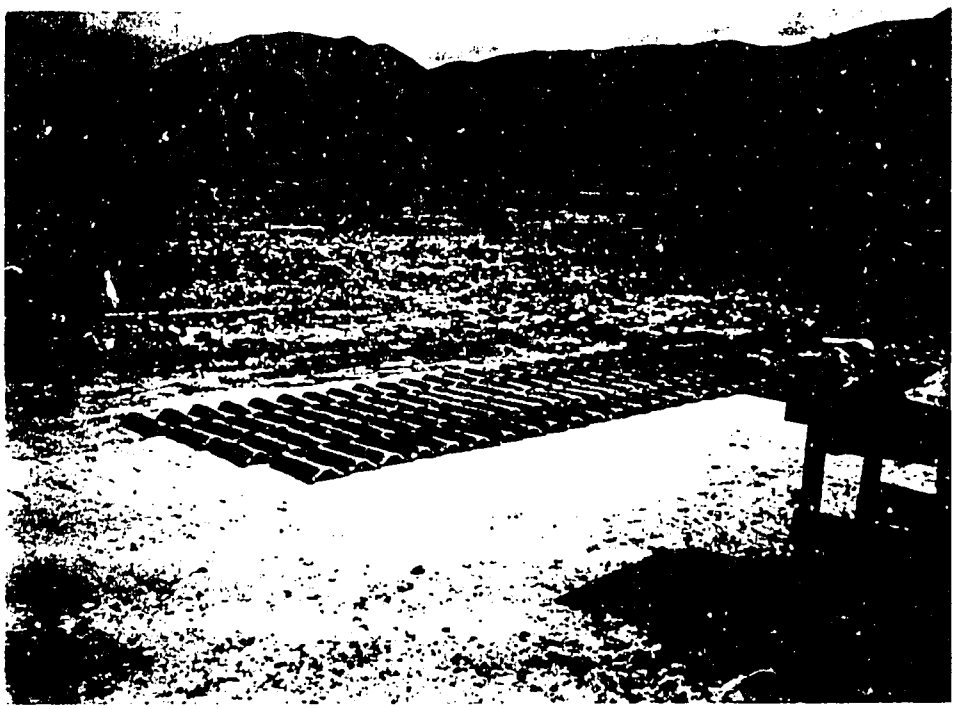

Figure 2. Phases of House Improvement Through Community Participation:

Adding Tile Roofing

Smooth Adobe Finishing (window frame to be inserted)

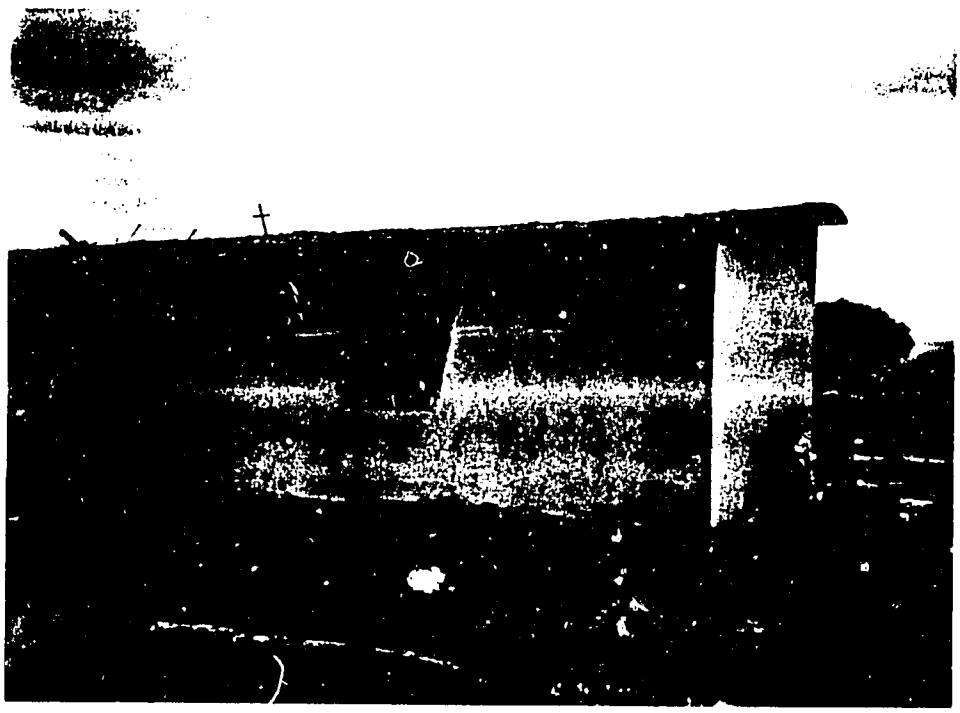

Figure 3. Xeric Landscape of the Pilot Area in Cochabamba, Bolivia

Annex A

Initial Environmental Assessment of Community and Child Health Project: Annex O of Original Project Paper (Bolivia 511-0594:1988)

ANNEX [illegible]

INITIAL ENVIRONMENTAL EXAMINATION

1. BASIC PROJECT DATA

PROJECT LOCATION	:	BOLIVIA
PROJECT TITLE	:	COMMUNITY AND CHILD HEALTH
PROJECT NUMBER	:	511-0594
FUNDING	:	FY 88 $ 2.7 million FY 89 $ 3.0 million
LIFE OF PROJECT	:	$ 15.0 million
IEE PREPARED BY	:	Raymond F. Victurine Environmental Officer USAID/Bolivia
DATE PREPARED	:	January 20, 1988

RECOMMENDATION FOR THRESHOLD DECISION

USAID/Bolivia finds that this project is not a major action wh have a significant negative effect on the human environment an is an action for which neither an Environmental Impact Stateme Environmental Assessment will be required. A negative determi recommended.

G. Reginald van Raalt
Director USAID/Bolivi

Date: 11 Feb 88

0631L

IMPACT IDENTIFICATION AND EVALUATION

NOTE: The following symbols have been used:

N	No environmental impact	U	Unknown environmental impact
L	Little environmental impact	+	Beneficial impact
M	Moderate environmental impact	-	Negative impact
H	High environmental impact		

A. Land Use

1. Changing the character of the land through:

a. Increasing the population	L +
b. Extracting natural resources	N
c. Land clearing	N
2. Altering natural features	N
3. Foreclosing important uses	N
4. Jeopardizing man or his works	N
5. Other factors	N

B. Water Quality

1. Physical state of water	L +
2. Chemical and biological states	N
3. Ecological balance	N
4. Other factors	N

C. Atmospheric

1. Air additives	N
2. Air pollution	N
3. Noise pollution	N
4. Other factors	N

D. Natural Resources

1. Diversion; altered use of water	N
2. Irreversible; inefficient commitments	N
3. Other factors	N

E. Cultural

1. Altering physical symbols	N
2. Dilution of cultural traditions	N
3. Other factors	L

UNCLASSIFIED

STATE 224799

AID AMB DCM ECON

VZCZCLPO140
OO RUEHLP
DE RUEHC #4799 1951906
ZNR UUUUU ZZH
O 131906Z JUL 88
FM SECSTATE WASHDC
TO RUEHLP/AMEMBASSY LA PAZ IMMEDIATE 6030
RUEHPE/AMEMBASSY LIMA 0397
BT

REC'D 7/14

FILE: PD&I

LOC: 255 133
13 JUL 88 1900
CN: 25910
CHRG: AID
DIST: AIDS

UNCLAS STATE 224799

ACTION: PD&I
INFO: D/DD
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AIDAC LA PAZ FOR MCINTYRE, LIMA FOR REHS SA, H: CLARK

E.O. 12356: N/A
TAGS:
SUBJECT: IEE FOR BOLIVIA COMMUNITY AND CHILD HEALTH PROJECT (511-0594)

REF: LA PAZ 7750

REPLY DUE 7/18

ACTION TKN

1. REQUEST FOR NEGATIVE DETERMINATION FOR IEE FOR SUBJECT PROJECT APPROVED BY DEPUTY ENVIRONMENTAL OFFICER ON JULY 11, 1988.

2. COPY OF APPROVED IEE (NUMBER 88-20) BEING POUCHED TO MISSION FOR INCLUSION IN PROJECT FILES. WHITEHEAD
BT
#4799

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STATE 224799

Project Development and Implementation
14 JUL 1988

45

Annex B

Section 2ee Provisions of FIFRA

Section 2ee Provisions of FIFRA

The Federal Insecticide, Fungicide, and Rodenticide Act as Amended
(Revised October, 1988)

Section 2 DEFINITIONS

For the purposes of this Act —

(ee) To Use Any Registered Pesticide in a Manner Inconsistent With Its Labeling

Paraphrased —

A pesticide must be used in strict accordance with the label except that:

1. the pesticide may be used at any dosage, concentration or frequency less that that specified — unless deviation is specifically prohibited.

2. the pesticide may be used against any target pest not listed on the label if the application is to the crop, animal, or site specified on the label — unless treatment for control of such pests is specifically prohibited.

3. the pesticide may be applied by any method not prohibited by the labael — unless label specifically states method which must be used.

4. the pesticide may be mixed with fertilizer if such mixture is not prohibited on the label.

5. the pesticide may be used in conformance with section 5 (Experimental Use Permits), section 18 (Emergency Exemptions), or section 24 (Authority of States/Special Local Needs).

   These sections allow use outside the normal section 3 registration channel.

6. the pesticide may be used at the discretion of the Administrator.

onditions of use for the article, or that is an animal feed within he meaning of section 201(x) of such Act (21 U.S.C. 321(x)) bearing r containing a new animal drug.

(v) PLANT REGULATOR.—The term "plant regulator" means any ubstance or mixture of substances intended, through physiological ction, for accelerating or retarding the rate of growth or rate of naturation, or for otherwise altering the behavior of plants or the roduce thereof, but shall not include substances to the extent that hey are intended as plant nutrients, trace elements, nutritional hemicals, plant inoculants, and soil amendments. Also, the term plant regulator" shall not be required to include any of such of hose nutrient mixtures or soil amendments as are commonly nown as vitamin-hormone horticultural products, intended for imrovement, maintenance, survival, health, and propagation of lants, and as are not for pest destruction and are nontoxic, nonoisonous in the undiluted packaged concentration.

(w) PRODUCER AND PRODUCE.—The term "producer" means the erson who manufacturers, prepares, compounds, propagates, or rocesses any pesticide or device or active ingredient used in proucing a pesticide. The term "produce" means to manufacture, preare, compound, propagate, or process any pesticide or device or ctive ingredient used in producing a pesticide. The dilution by inividuals of formulated pesticides for their own use and according the directions on registered labels shall not of itself result in ich individuals being included in the definition of "producer" for e purposes of this Act.

(x) PROTECT HEALTH AND THE ENVIRONMENT.—The terms "protect ealth and the environment" and "protection of health and the enronment" mean protection against any unreasonable adverse efcts on the environment.

(y) REGISTRANT.—The term "registrant" means a person who has gistered any pesticide pursuant to the provisions of this Act.

(z) REGISTRATION.—The term "registration" includes reregistraon.

(aa) STATE.—The term "State" means a State, the District of Combia, the Commonwealth of Puerto Rico, the Virgin Islands, uam, the Trust Territory of the Pacific Islands, and American amoa.

(bb) UNREASONABLE ADVERSE EFFECTS ON THE ENVIRONMENT.—he term "unreasonable adverse effects on the environment" eans any unreasonable risk to man or the environment, taking to account the economic, social, and environmental costs and enefits of the use of any pesticide.

(cc) WEED.—The term "weed" means any plant which grows here not wanted.

(dd) ESTABLISHMENT.—The term "establishment" means any lace where a pesticide or device or active ingredient used in proucing a pesticide is produced, or held, for distribution or sale.

(ee) TO USE ANY REGISTERED PESTICIDE IN A MANNER INCONSISNT WITH ITS LABELING.—The term "to use any registered pesticide a manner inconsistent with its labeling" means to use any regisred pesticide in a manner not permitted by the labeling, except at the term shall not include (1) applying a pesticide at any

dosage, concentration, or frequency less than that specified on the labeling unless the labeling specifically prohibits deviation from the specified dosage, concentration, or frequency, (2) applying a pesticide against any target pest not specified on the labeling if the application is to the crop, animal, or site specified on the labeling, unless the Administrator has required that the labeling specifically state that the pesticide may be used only for the pests specified on the labeling after the Administrator has determined that the use of the pesticide against other pests would cause an unreasonable adverse effect on the environment, (3) employing any method of application not prohibited by the labeling unless the labeling specifically states that the product may be applied only by the methods specified on the labeling, (4) mixing a pesticide or pesticides with a fertilizer when such mixture is not prohibited by the labeling, (5) any use of a pesticide in conformance with section 5, 18, or 24 of this Act, or (6) any use of a pesticide in a manner that the Administrator determines to be consistent with the purposes of this Act. After March 31, 1979, the term shall not include the use of a pesticide for agricultural or forestry purposes at a dilution less than label dosage unless before or after that date the Administrator issues a regulation or advisory opinion consistent with the study provided for in section 27(b) of the Federal Pesticide Act of 1978, which regulation or advisory opinion specifically requires the use of definite amounts of dilution.

(ff) OUTSTANDING DATA REQUIREMENT.—

(1) IN GENERAL.—The term "outstanding data requirement" means a requirement for any study, information, or data that is necessary to make a determination under section 3(c)(5) and which study, information, or data—

(A) has not been submitted to the Administrator; or

(B) if submitted to the Administrator, the Administrator has determined must be resubmitted because it is not valid, complete, or adequate to make a determination under section 3(c)(5) and the regulations and guidelines issued under such section.

(2) FACTORS.—In making a determination under paragraph (1)(B) respecting a study, the Administrator shall examine, at a minimum, relevant protocols, documentation of the conduct and analysis of the study, and the results of the study to determine whether the study and the results of the study fulfill the data requirement for which the study was submitted to the Administrator.

(gg) TO DISTRIBUTE OR SELL.—The term "to distribute or sell" means to distribute, sell, offer for sale, hold for distribution, hold for sale, hold for shipment, ship, deliver for shipment, release for shipment, or receive and (having so received) deliver or offer to deliver. The term does not include the holding or application of registered pesticides or use dilutions thereof by any applicator who provides a service of controlling pests without delivering any unapplied pesticide to any person so served.

SEC. 3. [136a] REGISTRATION OF PESTICIDES.

(a) REQUIREMENT OF REGISTRATION.—Except as provided by this Act, no person in any State may distribute or sell to any person

Annex C

Form Used to Collect Information on Use of Insecticides for Public Health and Agriculture in Areas Where Chagas' Control Project is Active

HISTORIA DE UTILIZACION DE INSECTICIDAS

Depto:.....Prov:.....Distrito.....Localidad.....

1.- En salud pública

A) ADULTICIDAS

Pesticida	DDT	BHC	Dieldrin	Malathion	Propoxur	Fenitrothion	Permetrin					
Año 1ª utilizacion												
Formulación												
Dosis empleada												
Frecuencia												
Año última utilización												
Total de rociamientos												

B) LARVICIDAS

Pesticida	DDT	BHC	Dieldrin	Malathion	Propoxur	Fenitrothion	Permetrin					
Año 1ª utilización												
Formulación												
Dosis empleada												
Frecuencia												
Año ultima utilizacion												
Total de rociamientos												

2.- En agricultura

Pesticida	DDT	BHC	Dieldrin	Malathion	Propoxur	Fenitrothion	Permetrin					
Año 1ª utilización												
Formulación												
Dosis empleada												
Frecuencia												
Año ultima utilizacion												
Total de rociamientos												

OBSERVACIONES: _____

_____

_____

Annex D

Title Page of Evaluation of USAID/La Paz-Supported Radio Pesticide Safety Campaign. Full Document and Materials Available at Mission

COMMUNICATIONS SUPPORT PROJECT

BOLIVIAN RADIO PESTICIDE SAFETY CAMPAIGN

FINAL EVALUATION

JUNE 1986

Conducted by

Danielle Rodriguez Schneider
Institute for International Research

Funded by the U.S. Agency for International Development,
Bureau for Science and Technology, Education Division,
through the Communications Support Project
(AID-DPE-1109-C-00-4081-00)
Project Monitor: Dr. Clifford Block

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Annex E

Environmental Considerations and Criteria Review For Alternative Insecticides Not Covered in this EA

Should it become necessary under this program to provide A.I.D. funds for the procurement or use, or both, of pesticides, not specifically approved in this EA, an amended EA must be prepared by USAID/La Paz and approved by the LAC Bureau Environmental Coordinator prior to their procurement or use.

The selection and use of pesticides by A.I.D.-supported programs are covered under A.I.D. Regulation 22 CFR Part 216, Environmental Procedures. A model procedure for the future selection of pesticides to be used in the Bolivian Chagas' control program is presented below:

1. Is the proposed product or its use exempt under Reg. 22 CFR 216?

   (Note: Pesticides are generally **not exempt**; however, in some cases (e.g., controlled experimentation exclusively for the purpose of research and field evaluation that are carefully monitored might be [216.2 (c) (iii) (2) (ii)]. In all cases of exemption questions, approval should be received from the appropriate A.I.D. Environmental Officer(s).

   Exempt

   Yes ___ No ___

   If the intended use of the pesticide is not clearly exempted under 22 CFR 216 and appropriate approved, the Pesticide Procedures of 22 CFR.216.3 (b) (1) should be carefully addressed. (Note: It is advisable to assume that the operational use of pesticide is **not exempt**.)

   Subject to regs.?

   Yes ___ No ___

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The factors that must be considered under 22 CFR 216.3 (b) (i) are as follows :

- The USEPA registration status of the requested pesticide. _____
- The basis for selection of the requested pesticide. _____
- The extent to which the proposed pesticide use is part of an integrated pest management program. _____
- The proposed method or methods of application, including availability of appropriate application and safety equipment. _____
- Any acute and long-term toxicological hazards, either human or environmental, associated with the proposed use measures available to minimize such hazards. _____
- The effectiveness of the requested pesticide for the proposed use. _____
- Compatibility of the proposed pesticide with target and non-target ecosystems. _____
- The conditions under which the pesticide is to be used, including climate, flora, fauna, geography, hydrology, and soils. _____
- The availability and effectiveness of other pesticides or non-chemical control methods. _____
- The requesting country's ability to regulate or control the distribution, storage, use and disposal of the requested pesticide in strict adherence to the label. _____

- The provisions made for training of users and applicators. _____

- The provisions made for monitoring the use and effectiveness of the pesticide. _____

- Will the use of the pesticide impact on an endangered or threshold species? _____

Annex F

Protocol to Determine Residual Action of Insecticides and Reinfestation of Houses by Triatomines (developed by CCH-Chagas Project)

Protocolo para determinar el poder residual de insecticidas y la reinfestación de las casas por triatominos.

Proyecto CCH-Chagas

Objetivo.- Determinar la eficacia del depósito de insecticida en una pared en función del tiempo frente a *T. infestans*.

Método 1.- Pruebas biológicas de pared en la localidad seleccionada.

2.- Pruebas biológicas en laboratorio en substrato de adobe de Tarija, Chuquisaca y Aramasi.

1.- Pruebas biológicas de pared

- Localidad seleccionada: una o varias contigual que sumen 120 casas cerca de Cochabamba c/porcentaje de aproximadamente 80% de infestación.
- Rociamiento de la localidad:

  - 20 casas c/agua (control)
  - 20 casas con BENDIOCARB con gr/m2
    ~~1 frasco p/1 bomba (conseguir de Arata).~~
  - 20 casas con DELTAMETHRIN con gr/m2
  - 20 casas con SUMITHION con gr/m2
  - 20 casas con ICON con gr/m2
  - 20 casas con TEMPO con gr/m2

- Frecuencia de pruebas:

- La primera prueba será a 1 mes después del rociamiento.
- Las siguientes pruebas serán hechas cada mes hasta que la mortalidad sea inferior al 70%
- Selección de las casas para cada insecticida: en la(s) localidad(es) numeradas previamente del 1 al 20: aplicar BENDIOCARB en las 20 primeras, DELTAMETHRIN en las del 21 al 40: SUMITHION en la del 41 al 60: ICON en la del 61 al 80; TEMPO en las del 81 al 100: agua en las del 101 al 120.

- Pasos de cada prueba:

- Serán aplicadas 20 N5 de T. infestans alimentadas 5 días antes, en la pared rociada en 2 cajas de PETRI.
- Se dejaran aplicadas 6 horas consecutivas.
- Al final de la exposición se recogeran todos los triatominos en un vasito con papel plegado y cubierto con grasa y liquido, debidamente etiquetado (Nº casa, insecticida y fecha) y guardados en la caja con temperatura y humedad constantes en el laboratorio.
- Las observaciones de mortalidad de los triatominos seran realizadas a las 24 hrs. 48 hrs. y 72 hrs.: al finalizar la observación registrar en el formulario los datos correspondientes.

- Preparación del polvo para rociar:

BENDIOCARB

Agregar de al %
a lts. de agua en el interior de la bomba HUDSON
y rociar con la misma metodologia y velocidad que se realiza habitualmente.

DELTAMETHRIN

Agregar de al %
a lts. de agua en el interior de la bomba HUDSON

SUMITHION

Agregar de al %
a lts. de agua en el interior de la bomba HUDSON

ICON

Agregar de al %
a lts. de agua en el interior de la bomba HUDSON

TEMPO

Agregar de al %
a lts. de agua en el interior de la bomba HUDSON

Vigilancia de la reinfestación por métodos comparativos

Será realizado con una frecuencia mensual utilizando simultaneamente 3 métodos diferentes:

a) Hora/Hombre/Casa: búsqueda activa igual a la empleada en la línea de base.

b) Sensor Maria: aplicar 5 sensores para casa a las paredes contiguas a las camas, dejarlas durante 1 semana para luego revisarlas la unidad será promedio de triatominos capturados para trampa por semana.

c) Cinta adhesiva: aplicar los 5 metros por vivienda cintas en las paredes contiguas a las camas a/metro por encima de estar, dejarlas 1 semana y luego revisarlos la unidad de medida será promedio de triatominos capturados por metro por casa por semana.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120

Casas a rociar con BENDIOCARB
Casas a rociar con DELTAMETHRINA
Casas a rociar con SUMITHION
Casas a rociar con ICON
Casas a rociar con TEMPO
Casas a rociar con agua (control)
Hora/Hombre/Casa
Sensor María
Cinta adhesiva
Pruebas biológicas de pared

2.- <u>Pruebas biológicas en laboratorio</u>

- Substrato: Adobes originarios de Tarija, Chuquisaca y Aramasi (3 por insecticida; 15 por localidad) colocados en un ambiente con temperatura y humedad:

- Rociamiento: Rociar a dos adobes por localidad (sin revoque y con revoque c/ materiales locales) y con cada insecticida a la dosis utilizada por las instituciones que actualmente emplean: gr/m2
de Deltamethrin, gr/m2
de Sumithion, gr/m2
de Cypermethrin, gr/m2
de Tempo, gr/m2
de Icon, gr/m2
gr/m2

- Aplicación de los triatominos: 20 ninfas de 5º estadio por cada adobe en copias de Petri, seran aplicadas en la superficie con insecticidas. Los triatominos oriundos de las localidades serán utilizadas para los adobes correspondientes.

- Tiempo de exposición: 6 horas

- Observación post-aplicación: Los triatominos recuperados en vasos con papel plegado, cubiertos con tul y liguilla, seran observados a las 24, 48, y 72 horas después de la aplicación.

- Registro de los datos: Un formulario especifico será utilizado para cada adobe.

- Frecuencia:

- La primera prueba será aplicada a 2 semanas después del rociamiento (1 mes)

- Las siguientes cada 2 semanas hasta que la mortalidad de los triatominos sea inferior a 80-70% (los siguientes dependerá de la disponibilidad de vinchucas)

- Los siguientes cada hasta que la mortalidad de los triatominos sea inferior a %

5. PRESUPUESTO

	Mayo 15 Junio 2do. trimestre	Julio, Agosto Septiembre 3er.trimestre	Octubre, noviembre Diciembre 4to. trimestre	TOTAL E
5.1. Equipo y material (segun lista)				
- Linea de base - Laboratorio	19,465.-			19,465.-
- Colonias de triatominos	11,510.-			11,510.-
- Pruebas de susceptibilidad-resistencia		7,970.-		7,970.-
- Ensayos biológicos de pared			2,886.-	2,886.-
- Vigilancia entomológica comparativa			18,440.-	18,440.-
- Ciclo silvestre		3,220.-		3,220.-
- Equipo de campo	3,030.-			3,030.-
SUBTOTAL 5.1.	34,005.-	11,190.-	21,326.-	66,521.-
5.2. Pago de estipendios:				
- Colonias triatominos, procesamiento triatominos, linea de base y pruebas de susceptibilidad/resistencia				
- 4 personas:Bs.300/mes x 8 meses	2,400.-	3,600.-	3,600.-	9,600.-
- 4 personas:Aguinaldo			960.-	960.-
SUBTOTAL 5.2.	2,400.-	3,600.-	4,560.-	10,560.
5.3. Viáticos:				
5.3.1. Vigilancia entomológica por metodos comparativos y pruebas biológicas				
- 2 personas:Bs.35 x 20 dias/mes x 2 meses			2,800.-	2,800.
5.3.2. Detección de reinfestación "hora/h/casa" en Aramasi				
- 4 personas: Bs.35 x 20 dias/mes x 1 mes			2,800.-	2,800.-
5.3.3. Ciclo silvestre				
2 personas: Bs.35 x 15 dias/mes x 3 meses		2,100.-	1,050.-	3,150.-
SUBTOTAL 5.3.		2,100.-	6,650.-	8,750.
5.4. Mantenimiento y reparacion de Laboratorio	2,000.-			2,000.
SUBTOTAL 5.4.	2,000.-			2,000.
TOTAL GENERAL	38,405.-	16,890.-	32,536.-	87,831

	Unidad	Cantidad
- Cilindros graduados 10mm.	pza.	2
25mm.	pza.	2
- Pipetas descartables 0.5 ml	paq.	100
1 ml	paq.	200
5 ml	paq.	120
10 ml	paq.	100
- Guantes de goma	paq.	10
- Embudo vidrio pequeño	u.	4
- Papel filtro	paq.100	5
- Pisetas 250 ml.plástico	u.	6
- Vasos precipitación 10 ml	u.	5
28 ml	u.	5
50 ml	u.	5
- Kits de susceptibilidad WHO (papeles impregrados)	paq.	10
- Balanza analitica	u.	1
- Formularios		
- Refrigerador pequeño	u.	1

3. Ensayos biológicos de pared

	Unidad	Cantidad
- Discos de petri vidrio grandes	1	50
- Cinta adhesiva 3 cm. de ancho	rollo	10
- Vasos de yogurt	u.	100
- Papel kraft	plgo.	20
- Tul	m.	10
- Liguillas	paq.200	2
- Termómetro de max.y min.	pza.	4
- Higrómetro	pza.	4
- Pinzas anatómicas punta normal	pza.	4
- Kits de ensayos biológicos	paq.130	4
- Formularios		
- Material de escritorio		

4. Vigilancia entomológica comparativa de reinfestación

	Unidad	Cantidad
- Tramoa Nuñez-Gómez	u.	600
- Sensor Maria	u.	600
- Cintas adhesivas	rollo	50

5. Colonia de triatominos

	Unidad	Cantidad
- Estantes de metal x 6 bandejas	pza.	4
- Frascos de plástico grandes boca ancha	doc.	5
- Papel kraft	plgo.	100
- Papel sábana	plgo.	200
- Tul ilusión	u.	20
- Liguillas	pq.200	3
- Alimentador de madera(dibujo)	pza.	2
- Gallinas	u.	25

Annex G

Protocol to Determine Level of Susceptibility of *T. infestans* from Tarija, Chuquisaca and Valle Alto to Insecticides

Protocolo para determinar el grado de sensibilidad de T. infestans de Tarija, Chuquisaca y Valle Alto a los insecticidas.

1.- Objetivo: - Establecer los niveles de susceptibilidad normal de T. infestans de Tarija, Aramasi y Chuquisaca.

- Realizar pruebas rutinarias de los niveles de susceptibilidad a intervalos de.....

2.- Material y equipo:

2.1 Cada prueba realizar con: 100 (opción I y II) ó 40 (opción III) T. infestans de 5º Estadio (de cada uno de los Departamentos) alimentados 5 días antes.

2.2 Para cada insecticida, disponer en una gradilla:

Opción I: 10 tubos (de 15 cm de longitud y 24 cm de diámetro interno): 2 controles y 2 por cada una de las 4 concentraciones.

Opción II: 10 tubos: 2 controles y 2 por cada uno de los 4 tiempos de exposición (1 sola concentración de papeles impregnados)

Opción III: 4 tubos: 2 controles y 2 con papeles impregnados.

2.3 Papeles impregnados con insecticidas con concentraciones diferentes (ideal opción I) (la cantidad ver en la hoja de registro de cada opción)

2.4 Caja de madera con instalación de temperatura 25 a 30 C, HR > 25% más o menos constantes.

3.- Método:

3.1 De acuerdo a la disponibilidad de papeles impregnados con los insecticidas y de la cantidad de Triatominos de cada lugar utilizar una de las 3 tablas de concentración y tiempos de exposición siguientes:

Tabla 1.- Para la prueba con cuatro concentraciones diferentes (opción I)
Las concentraciones de los papeles por cada insecticida y el tiempo de exposición de acuerdo a la siguiente tabla:

PRODUCTO	CONCENTRACIONES	TIEMPO DE EXPOSICION HRS
PERMETHRIN	; ; y	
DELTAMETHRIN	; ; y	
FENITROTHION	; . y	24
MALATHION	; ; y	24
BENDIOCARB	. ; y	

Tabla 2.- Para la prueba con tiempos de exposición crecientes-papeles y triatominos diferentes (opción II)

Los tiempos de exposición por insecticida de acuerdo a la siguiente talba:

PRODUCTO	CONCENTRACION %	TIEMPOS DE EXPOSICION HRS			
PERMETHRIN	0,25				
DELTAMETHRIN	0,025				
FENITROTHION	1.0	6	12	24	48
MALATHION	5.0	6	12	24	48
BENDIOCARB	0,1				

Tabla 3.- Tiempos de exposición creciente-con los mismos papeles y triatominos (opcion III)

Los tiempos para la lectura durante la exposición por cada insecticida será segun la siguiente tabla.

PRODUCTO	CONCENTRACION %	TIEMPOS DE LECTURA DURANTE LA EXPOSICION HRS					
PERMETHRIN	0,25						
DELTAMETHRIN	0.025						
FENITROTHION	1.0	3	6	12	24	48	72
MALATHION	5.0	3	6	12	24	48	72
BENDIOCARB	0.1						

Anexo

1. Lista de Equipo y Material:

1. Linea de base-Laboratorio:

	Unidad	Cantidad
- Microscopio binocular	pza.	1
- Estereomicroscopio	pza.	1
- Pinzas 15 cm. punta angular delgada	pza.	4
- Porta-objetos	paq.50	10
- Cubre-objetos 18x18 ó 22x22	paq.100	20
- Ventana covertora (4 vidrios 20x15cm.+poxipol)	pza.	2
- Giemsa	g.	50
- Azul de metileno	g.	25
- Acido acético glacial	ml.	500
- Alcohol metilico (fco.800 ml)	pza.	10
- Eter (800 ml/100 ml)	fco.	1
- Recip.(pirex) vidrio liso	pza.	12
- Bandeja hierro enlozado blanco 20 x 15 cm x 2 alto	pza.	2
- Varilla de vidrio 0,5 cm Ø	m.	1
- Lápiz diamante	pza.	2
- Tijeras 11 cm. punta fina recta	pza.	2
- Pinzas finas 11 cm. punta angular	pza.	12
- Algodón	lb.	1
- Aceite de inmersion	fco.x10cc.	4
- Papel de limpieza de lentes		10
- Etiquetas autoadhesivas p/láminas	paq.	4
- Vasos de precipitación (Vidrio pirex) 50 ml.	paq.	6
100 ml.	paq.	6
200 ml.	paq.	6
- Na OH lentillas	fco.x200g.	1
- Detergente	lt.	2
- Guantes goma	par	20

2. Pruebas de susceptibilidad-resistencia

	Unidad	Cantidad
- Tubos de ensayo 25 mm.Ø x 200 mm.	pza.	100
- Gradillas p/tubos	pza.	4
- Gasa	m.	5
- Liguillas	paq.200	3
- Cilindros graduados 100mm.	pza.	4
200mm.	pza.	4
500mm.	pza.	4

5. PRESUPUESTO

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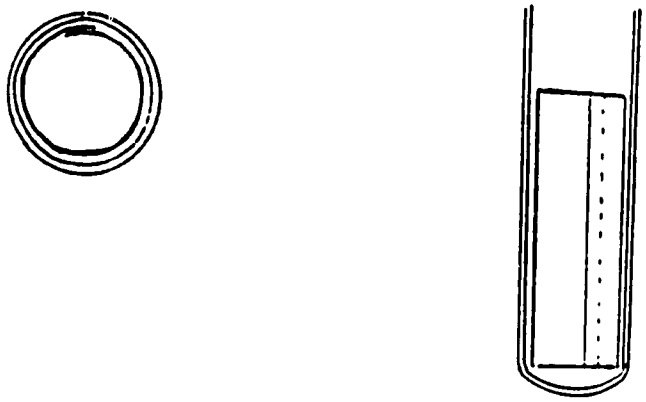
SUBTOTAL 5.4.	2,000.-			2,000.
TOTAL GENERAL	38,405.-	16,890.-	32,536.-	87,831

3.2 Los papeles impregnados disponibles cortarlos por la mitad; luego introducir un papel en el tubo correspondiente de manera que la superficie impregnada quede en el interior.



3.3 En cada tubo introducir 10 ninfas; taparlo con gasa y liguilla.

3.4 Colocar todo el equipo en la caja de temperatura y humedad constante durante el tiempo indicado.

3.5 Al final; por el tiempo de exposición examinar los triatominos y registrar la mortalidad en las hojas de control según las opciones; contando como muertos los que se encuentran sin ningún movimiento más aquellos con ligeros movimientos pero incapaces de sujetarse en el papel impregnado. Eliminar los papeles usados, destruir los triatominos y lavar los tubos adecuadamente.

3.6 Recuperar los muertos en el frasco de vidrio y registrar su mortalidad a las 6, 12 y 24 horas (opciones I y II).

3.7 Con triatominos originarios de un mismo lugar es necesario repetir 4 veces la prueba para obtener datos adecuados y necesarios para construir la Linea de Base de susceptibilidad. Los resultados serán consignados en los formularios correspondientes y de allí traspasarlos al papel milimetrado-semilogaritmico.

3.8 Construir la curva de Linea de Base para cada insecticida en papel semilogaritmico.

3.9 Si la mortalidad en los tubos control excedieran al 20% es necesario repetir toda la prueba.

	Unidad	Cantidad
- Cilindros graduados 10mm.	pza.	2
25mm.	pza.	2
- Pipetas descartables 0.5 ml	paq.	100
1 ml	paq.	200
5 ml	paq.	120
10 ml	paq.	100
- Guantes de goma	paq.	10
- Embudo vidrio pequeño	u.	4
- Papel filtro	paq.100	5
- Pisetas 250 ml.plástico	u.	6
- Vasos precipitación 10 ml	u.	5
28 ml	u.	5
50 ml	u.	5
- Kits de susceptibilidad WHO (papeles impregnados)	paq.	10
- Balanza analítica	u.	1
- Formularios		
- Refrigerador pequeño	u.	1

3. Ensayos biológicos de pared

	Unidad	Cantidad
- Discos de petri vidrio grandes	1	50
- Cinta adhesiva 3 cm. de ancho	rollo	10
- Vasos de yogurt	u.	100
- Papel Kraft	plgo.	20
- Tul	m.	10
- Liguillas	paq.200	2
- Termómetro de max.y min.	pza.	4
- Higrómetro	pza.	4
- Pinzas anatómicas punta normal	pza.	4
- Kits de ensayos biológicos	paq.130	4
- Formularios		
- Material de escritorio		

4. Vigilancia entomológica comparativa de reinfestación

	Unidad	Cantidad
- Trampa Nuñez-Gómez	u.	600
- Sensor Maria	u.	600
- Cintas adhesivas	rollo	50

5. Colonia de triatominos

	Unidad	Cantidad
- Estantes de metal x 6 bandejas	pza.	4
- Frascos de plástico grandes boca ancha	doc.	5
- Papel Kraft	plgo.	100
- Papel sábana	plgo.	200
- Tul ilusión	u.	20
- Liguillas	pq.200	3
- Alimentador de madera(dibujo)	pza.	2
- Gallinas	u.	25

Annex H

Collection Forms for Registering Data Resulting from Insecticide Susceptibility Trials

HOJA DE REGISTRO PRUEBA DE SUSCEPTIBILIDAD-TRIATOM

Opción I Prueba con 4 concentraciones

INSECTICIDA: _____

Nº de pruebas: _____

1.-

	1	2	3	4		5
A	10	10	10	10		10
B	10	10	10	10		10

CONC:						Control

2.- Tiempo de exposición:_____ Hora de inicio:_____ Fecha:_____

3.- Al cabo de 24 horas, recuperar los vivos en frasco de vidrio y registrar su mortalidad a las 12, 24, 72 hrs.

4.- Registro de mortalidad:

Tubos: 1

Concentración		
Nº caidos todavía no muertos		
MUERTOS	Fin exposición	
	12 hrs. después	
	24 hrs. después exposición	
	48 hrs. después exposición	

Tubos: 2

Concentración		
Nº caidos todavía no muertos		
MUERTOS	Fin exposición	
	12 hrs. después	
	24 hrs. después exposición	
	48 hrs. después exposición	

Tubos: 3

Concentración		
Nº caidos todavía no muertos		
MUERTOS	Fin exposición	
	12 hrs. después	
	24 hrs. después exposición	
	48 hrs. después exposición	

Tubos: 4

Concentracion		
Nº caidos todavia no muertos		
MUERTOS	Fin exposición	
	12 hrs. después	
	24 hrs. despues exposición	
	48 hrs. despues exposición	

Tubos: 5

CONTROL		
Nº caidos todavia no muertos		
MUERTOS	Fin exposición	
	12 hrs. después	
	24 hrs. después exposición	
	48 hrs. después exposición	

Nota: 1.- Al finalizar el tiempo de exposición (24 horas) recuperar los triatominos vivos en un frasco de vidrio por separado y registrar su mortalidad a las 12, 24, 48 y 72 horas.

2.- Repetir la prueba 4 veces consecutivas.

3.- En caso de haber más del 20% de mortalidad en los controles repetir toda la prueba.

Cálculo de material:

Papeles: 2 papeles x 4 veces x 3 locs.= 24 (12x2) de c/concentración y por c/insect.

2 papeles x 4 veces x 3 locs.= 24 (12x2) de control por c/insect.

Triatominos: 100 vinchucas x 4 veces x 3 locs.= 1200 por c/insect. (400 x c/loc. y x c/insect.)

T O T A L = 6.000 Triatominos

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HOJA DE REGISTRO-PRUEBA DE SUSCEPTIBILIDAD-TRIATOMINOS

Opcion II: PRUEBA, TIEMPOS DE EXPOSICION CRECIENTES-PAPELES Y TRIATOMINOS DIFERENTES

INSECTICIDA: _____

CONCENTRACION: _____

1.-

	1	2	3	4		5
A	10	10	10	10		10
B	10	10	10	10		10

Tiempos de exp.:	6 h	12 h	24 h	48 h		Control

2.- Fecha de inicio de la prueba:

Horas: de inicio:_____; Reg. Prelim. (3 h):_____; 1ª Reg. (6 h):_____

2ª Reg. (12 h):_____; 3ª Reg. (24 h)_____; 4ª Reg. (48 h):_____

3.- Registro de mortalidad:

Tubos: 1

Nº Caidos todavia no muertos		
MUERTOS	Fin exposición	
	12 hrs. después exp.	
	24 hrs. después exp.	
	48 hrs. después exp.	

Tubos: 2

Nº Caidos todavia no muertos		
MUERTOS	Fin exposición	
	12 hrs. después exp.	
	24 hrs. después exp.	
	48 hrs. después exp.	

Tubos: 3

Nº Caidos todavia no muertos		
MUERTOS	Fin exposición	
	12 hrs. después exp.	
	24 hrs. después exp.	
	48 hrs. después exp.	

Tubos: 4

Nº Caidos todavia no muertos		
M U E R T O S	Fin exposición	
	12 hrs. después exp.	
	24 hrs. después exp.	
	48 hrs. después exp.	

Tubos: 5

Nº Caidos todavia no muertos		
M U E R T O S	Fin exposición	
	12 hrs. después exp.	
	24 hrs. después exp.	
	48 hrs. después exp.	

Nota: 1.- Al finalizar el tiempo de exposición retirar los triatominos de los tubos correspondientes (A+B) y observar la mortalidad a las 12, 24 y 72 horas después.

2.- Repetir la prueba 4 veces consecutivas.

3.- En caso de haber más del 20% de mortalidad en los controles repetir toda la prueba.

Cálculo de material:

Papeles: 10 papeles x 4 veces x 3 locs.= 120 (60x2) de la conc. existente y por c/insect.
2 papeles x 4 veces x 3 locs.= 24 (12x2) de control por c/insect.

Triatominos: 100 vinch. x 4 veces x 3 locs.= 1200 por c/insect. (400x c/loc. y x c/insect.)

T O T A L = 6.000 Triatominos

HOJA DE REGISTRO - PRUEBA DE SUSCEPTIBILIDAD - TRIATOMINOS

Opción III.- PRUEBA. TIEMPOS DE EXPOSICION CRECIENTES - MISMOS PAPELES Y TRIATOMINOS

INSECTICIDA: _____

CONCENTRACION: _____

1.-

	1		2
A	10		10
B	10		10
			Control

2.- Fecha de inicio de la prueba: _____

Horas: de inicio: _____ 1ª Reg. (3 h): _____ 2ª Reg. (6 h): _____

3ª Reg. (12 h): _____ 4ª Reg. (24 h): _____ 5ª Reg. (48 h): _____

6ª Reg. (72 h): _____

3.- Registro de mortalidad

Tubos: 1

Horas de exposicion	Estado	Nº de Triatominos
12	Caidos c/ mov.	
	Muertos	
24	Caidos c/ mov.	
	Muertos	
36	Caidos c/ mov.	
	Muertos	
48	Caidos c/ mov.	
	Muertos	
72	Caidos c/ mov.	
	Muertos	
96	Caidos c/ mov.	
	Muertos	

Tubos: 2

Horas de exposicion	Estado	Nº de Triatominos
12	Caidos c/ mov.	
	Muertos	
24	Caidos c/ mov.	
	Muertos	
36	Caidos c/ mov.	
	Muertos	
48	Caidos c/ mov.	
	Muertos	
72	Caidos c/ mov.	
	Muertos	
96	Caidos c/ mov.	
	Muertos	

Cálculo de material:

Papeles: 2 papeles x 4 veces x 3 locs.= 24 (12x2) papeles de la cono. exist. y por c/insect.

2.- papeles x 4 veces x 3 locs.= 24 (12x2) de control por c/insect.

Triatominos: 40 vinch. x 4 veces x 3 locs.= 480 por cada insect.

(160 x c/ loc.-x c/ insecticida)

T O T A L = 2.400 Triatominos

Annex I

LAC Telex to USAID/La Paz on Approval of EA

USAID / ECUADOR
mail: c/o American Embassy, Quito, Ecuador
U.S. Mail Address: USAID/Quito, APO Miami, FL 34039
FAX NUMBER: (593-2) 561-228 OFFICE TELEPHONE: (593-2) 521-100

FAX COVER SHEET

to FAX #: (703) 243-0013 routine urgent X

PLEASE DELIVER TO: Dr. Andy Arata
Vector Biology and Control Project
Medical Service Corp. Int.
1901 North Ft. Myer Dr., Suite 400, Arlington, VA

FROM: Howard L. Clark, AID Regional Environmental Advisor (REA/SA)
USAID/Quito, AMRO/REA phone: (593-2) 551-643 or 521-100
mail: casilla 538, Quito / or USAID/Quito, Washington, DC 20523-3420

NUMBER OF PAGES INCLUDING THIS COVER SHEET: 1 DATE 26 Sept. 1991

MESSAGE: ♦ ♦

♦ Review of the draft Environmental Assessment for the Chagas' Disease Control Component of the Community and Child Health Project (Bolivia 511-0594). (Sorry not to get it back to you ASAP, as stated in the 12 September FAX, but I did not go to Perú as planned, was ill and not able to review the EA.)

As expected, this is the best EA I have seen in AID; everything has been considered rationally, with substantial consideration of impacts on non-human biota.

I would like to add the following monitoring component: After one year of Project activities, determine pesticide residues in drinking water and in soils around houses where the various pesticides have been used. If there are detectable residues, make appropriate changes in application procedures to reduce possible residues and impacts, with subsequent periodic monitoring of residues and impacts on downstream biota and an in-depth study of threatened and endangered biota. If there are no detectable residues, no further data are needed, unless application procedures or pesticides are changed or if project plans to expand to other life zones/ecosystems with different climate, soils, etc.

For USAID/La Paz, note that PROCIPLA has been working in the Cochabamba region with the Valles Altos/Chapare Project for several years; their experience and contacts should be valuable in pesticide education. Ditto, Carlos Aliaga, Ecologist with VA Project. Also, there is(was?) a well-equipped pesticide residues lab in La Paz, partially funded by AID, connected with the Plant Introduction branch of MACA. There ARE rare and endangered species in the region -- see Biodiversity Management study for Valles Altos component PP and EA amendment of Chapare Project, Conservation Data Center/La Paz, 1987-88, which is relevant to this Chagas' project area and should be updated -- I see no need to consider impacts on rare and endangered species unless significant pesticide residues are being moved into the food chain, and I do not expect such to happen (agreeing with all of Dr. Arata's conclusions in the EA), and this cannot be determined until after applications have been in place and residues determined after ± one year.

cc: Ch. Llewellyn, J. Hester ♦

bochagas.fax

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AID/LAC/DR/E:ACHIRI:AC:CHAGAS
10/29/91 647-5680
AID/LAC/DR/E:JWILSON

LAC/DR/RD:WNILSESTUEN(INFO) LAC/DR/SA:LLUCKE(INFO)
LAC/SAM:SEPSTEIN(INFO)

RECEIVED 11/12/91

PRIORITY LA PAZ, QUITO

AIDAC LA PAZ FOR C. LLEWELLYN, QUITO FOR H. CLARK

E.O. 12356: N/A

TAGS:

SUBJECT: APPROVAL OF ENVIRONMENTAL ASSESSMENT FOR CHAGAS' DISEASE CONTROL PROGRAM, COMMUNITY AND CHILD HEALTH PROJECT (511-0594)

REF: LLEWELLYN/HESTER MEMO OF 10/1/91

1. LAC DEPUTY CHIEF ENVIRONMENTAL OFFICER, JOHN WILSON, HAS REVIEWED AND HEREBY APPROVES SUBJECT ENVIRONMENTAL ASSESSMENT (EA), PREPARED BY ANDREW ARATA AND DATED 8/1/91.

2. APPROVAL IS CONTINGENT UPON ADOPTION OF THE MITIGATIVE ACTIONS RECOMMENDED IN SUBJECT EA IN PROJECT IMPLEMENTATION. RECOMMENDED ACTIONS INCLUDE: (A) PESTICIDE MANAGEMENT TRAINING AND PROJECT PROVISION OF PROTECTIVE EQUIPMENT AND EXPLICIT SAFE PESTICIDE USE INSTRUCTIONS FOR APPLICATORS; (B) INCORPORATION OF PESTICIDE SAFETY INFORMATION INTO THE EDUCATIONAL MATERIALS BEING DEVELOPED BY PROJECT FOR HOUSEHOLD OCCUPANTS; (C) CLOSE SUPERVISION AND MONITORING OF PESTICIDE SPRAY PERSONNEL AND OPERATIONS; (D) FREQUENT MONITORING OF CHOLINESTERASE LEVELS FOR APPLICATORS IF ORGANOSPHATE INSECTICIDES ARE SELECTED FOR OPERATIONAL USE; AND (E) TESTING FOR PESTICIDE CONTAMINATION OF SOIL AND WATER IN AND NEAR HOUSES LOCATED IN REPRESENTATIVE PROJECT SITES AT THE END OF THE FIRST YEAR OF PROJECT ACTIVITIES, AND IMMEDIATE IMPLEMENTATION OF CORRECTIVE ACTIONS AND A PERIODIC MONITORING PROGRAM IF EXCESSIVE RESIDUES ARE FOUND.

3. ONLY THOSE INSECTICIDES LISTED IN TABLE 1 OF THE EA ARE APPROVED FOR USE UNDER PROJECT. FURTHERMORE, THE PROJECT SHALL NOT USE THE PESTICIDE, DELTAMETHRIN, IN FIELD OPERATIONS UNTIL THE EPA HAS COMPLETED ITS REVIEW AND REGISTRATION OF THIS PESTICIDE (DELTAMETHRIN MAY BE REGISTERED BY EPA SOMETIME IN 1992).

4. MISSION IS COMMENDED FOR DEVELOPING A COMPREHENSIVE, INFORMATIVE, AND HIGHLY READABLE EA. 44

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