REPORT

FINAL EVALUATION OF THE USAID ANTI-MALARIA PROJECT, JULY 5 - 27, 1983 BANGKOK, THAILAND

The United States Agency for International Development

Thailand

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LIST OF CONTENTS

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1. INTRODUCTION

1.1 General Introduction

Strategy

The present national anti-malaria strategy of the Royal Thai Government (RTG) is that of long-term malaria control in the forested and hilly areas of the country where malaria is endemic, and prevention of re-establishment of malaria transmission in the remaining areas, where a malaria eradication strategy is being applied.

Actual control measures depend upon the local epidemiological situation. Thailand has been appropriately stratified according to different levels of malaria receptivity in association with major variations in the terrain. The major control measures include residual house spraying (primarily with DDT), treatment of cases in malaria clinics, provision of anti-malaria drugs and health education. Other measures of control which are used as appropriate include larviciding, mass chemotherapy, space spraying, case detection and treatment and the use of larvivorous fish.

Organization

The anti-malaria program of Thailand is carried out at two major levels - national and regional - using a series of decentralized units and sectors to execute the program. The Central Headquarters, the Malaria Division, is located in the Ministry of Public Health compound in Bangkok. The Division organizational activities include administration, health education and training, vector control operations, epidemiology, applied research, entomology and laboratory services. There are five (5) Regional offices, each directed by a malariologist. The Regions are further divided into 6-7 Units. Each Unit has from 5-14 sectors, depending upon the area. (MAP 1)

Goals

The goals of the malaria control program, as set out in the current Health Development Plan (1982-1986), are as follows:

1. To reduce mortality caused by malaria to less than 8 deaths per 100,000 population.

2. To reduce morbidity caused by malaria in control areas to less than 12 cases per 1,000 population.

3. To prevent the re-introduction and transmission of malaria in eradication areas.

4. To implement a Primary Health Care approach to malaria control and to involve the local communities in personal protective measures.

Present Situation

Malaria has been a serious health problem in Thailand for many years. Although major achievements in controlling the disease have been made over the last three decades, malaria remains a disease that affects the orderly social and economic development of millions of Thai citizens located in the rural areas. The program is faced with major technical problems: drug resistant parasites, signs of increasing tolerance of vectors to the major insecticide (DDT), and behavioral changes of vector populations. Major population movements within the country compound an already complex situation.

Malaria Morbidity Summary (1978 - 1982) - Thailand

	1978	1979	1980	1981	1982
Population covered by surveillance (in millions)	41.9	42.7	44.2	44.8	46.0
Blood slides examined (in millions)	4.1	4.2	4.8	5.5	6.0
Positives recorded	329,512	302,721	395,442	473,210	420,799
Annual parasite incidence (API) per 1,000 population	7.8	7.1	8.9	10.6	9.1

Mortality Summary

Malaria remains a major cause of death and in 1981 was ranked the seventh highest cause of death in Thailand. There has been improvement in reducing mortality from malaria; the rate has dropped from 15.8 deaths per 100,000 population in 1974 to 8.6 deaths per 100,000 in 1981. This decrease reportedly is due to expansion of the peripheral health care delivery system and the establishment of the malaria clinics.

Background Reports

There are numerous reports and documents detailing the epidemiological situation in Thailand for those interested in specific details. This report does not include major descriptions of previous accomplishments, activities and problems of the remarkable anti-malaria efforts in Thailand, but primarily is focused on the final evaluation of the USAID Anti-Malaria Project. The purpose of the Project was to assist the RTG Malaria Division in meeting its goals and in accomplishing the important task of providing malaria control services to the people of Thailand.

A more complete review of the present situation in Thailand is presented in Section 2 of this report.

1.2 Summary Description of USAID Anti-Malaria Project

The USAID Anti-Malaria Project was designed to assist the Royal Thai Government (RTG) in the nationwide anti-malaria activities during the four-year period from FY 1980 through FY 1983. The project purpose specifically was aimed at developing the RTG institutional capacity for providing continuing malaria services to 9.3 million rural inhabitants living in endemic, high-risk malarious areas of Thailand; primarily by improving technical, operational and managerial capabilities of the Malaria Division in the Communicable Disease Control Department of the Health Services of Thailand.

The Project Agreement for this project was signed August 29, 1979 and the present project completion date is September 30, 1983. The USAID project provides funding assistance of $500,000 in grant funds and $4,000,000 in loan availabilities for a total of $4,500,000 in financial assistance.

This project provided assistance components to all levels of the Malaria Division - National, Regional, Zonal/Unit and Sector. The primary emphasis of the project focused on interventions made at the

first point of contact in the malaria control service delivery system to improve these services to Thailand's rural inhabitants. The project provided assistance to the RTG's Malaria Division through provision of (1) technical assistance; (2) fellowships; (3) training of malaria volunteers, malaria clinic workers, Malaria Division Sector and Zonal staff in a variety of anti-malaria skills; (4) research; (5) capital improvements in the construction of research, training and field unit buildings; (6) commodities, including sprayers, microscopes, volunteer kits, audio-visual equipment, research and training equipment, malaria clinic furniture and other such items; (7) vehicle overhauls; (8) health education materials; (9) provision of a revolving fund for motorcycle hire/purchase; and (10) RTG motorcycle procurement. The project included a mid-term evaluation and a final evaluation. The Mid-Term Evaluation was completed from 1-27 July, 1981.

1.3 Final Evaluation of the USAID Anti-Malaria Project Objective

The final evaluation of the USAID Anti-Malaria Project was held from 5 July - 27 July, 1983. The stated objective of the evaluation was to provide a final technical evaluation of the USAID project (#493-0305), in accordance with Article VI: Special Covenants. Section 6.7 of the RTG/AID Loan and Grant Agreement.

Terms of Reference

The Terms of Reference provided to the Evaluation Team were as follows:

A. Evaluate the progress of the USAID Anti-Malaria project in attaining its stated objectives over the 1979-1982 period. Present positive project factors which assisted in obtaining project targets and objectives. Describe any difficulties encountered in reaching program targets.

B. Describe the present overall status of the Thailand Malaria Program and present a summary of accomplishments up to the present time.

C. Describe the achievements of the USAID project and its impact on the overall objectives of the Thai Malaria Program over the period 1979-1982.

D. Provide specific recommendations and comments on areas of unmet needs in the Thai Malaria Program. Relate how these recommendations would assist the RTG to accomplish their objectives in malaria and vector-borne diseases over the 5th Five-Year Plan (1982-1986).

Evaluation Team Members

USAID Member

Mr. Larry Cowper
Health Science Administrator (Team Leader)

WHO Member

Dr. A.N.A. Abeyesundere
Malariologist

AFRIMS Member

Dr. Richard Andre
Entomologist

Consultant Members

1. Dr. Vimol Notananda
   Malariologist/Health Administrator

2. Dr. Sombat Chayabejara
   Malariologist/Epidemiologist

Malaria Division

1.	Regional Directors and Assistants	Coordinators
2.	Dr. Chusak Prasittisuk	Coordinator
3.	Mr. Suthas Nutsathapana	Coordinator
4.	Mr. Richard Kalina	Coordinator

USAID Thailand

Mr. Narintr Tima	Coordinator

Evaluation Methodology

After a two-day briefing at National Headquarters, the joint USAID/RTG/WHO evaluation team set up an intensive travel schedule to assess the accomplishments, problems and impact of this four-year USAID project. Discussions on various inputs from the project were held with the National Director, with the Sections of the National Headquarters, and with personnel in all five Regions of the program. The Team visited unit and sector offices, malaria clinics, malaria volunteers as well as public health officials to obtain information. It is estimated that no less than 200 interviews were made during the evaluation by the team to obtain the report information. Proformas were developed by the Team to assess each major project component to insure uniformity of the information being gathered.

At the conclusion of each travel program, the Team met to discuss findings and to exchange proforma information. The final report sections were assigned to individual team members for drafting and presentation. Typing services were made available to the team at the USAID office and at the RTG Malaria Division. The report was given to the Malaria Division on July 27, 1983, as scheduled.

Travel Schedule

The Evaluation Team, consisting of five members, was divided into two groups for the first field observations held from July 7-12. One team visited areas in Region I and Region V, including Zone/Unit reviews at Pak Chong, Chaiyaphum, Korat and Prachinburi. The second team visited Region IV and Region V areas near Songkhla, Nakhon Sri Thamarat, Surat Thani, Chumporn and Petchburi. (ANNEX 13)

The second field trip was made by the complete team to the southeast portion of the country in Region V with discussions at Sri Racha, Chantaburi and Trad. Several sectors were visited during this trip from July 14-16.

The final field trip was made from July 18 - 21 and primarily was organized to see the USAID activities of Region III, Region I, Region II and Training Center at Phraphutthabat.

Travel arrangements were made by Malaria Division personnel. Individual agencies assisted team members with specific support requests.

2. Summary of the Present Situation of the Thailand Malaria Program

2.1 Epidemiology and Surveillance

2.1.1 The Malaria Division has divided Thailand into four types of operational areas:

2.1.1.1 Full integration area: covering Bangkok Metropolitan area and the ten surrounding provinces with a population of about 18% of the country (47 million). This area may be considered non-malarious.

2.1.1.2 Partial integration area: covering most of the plain areas located in every region, with a population of about 57% of the country. Malaria incidence in this area is very low, and malaria activities are partially integrated into the general public health services.

2.1.1.3 Consolidation area: covering a small part of the country but distributed in every region, with a population of about 2%. Full surveillance is carried out by malaria personnel.

2.1.1.4 Control area: corresponds to the area bordering Burma, Laos, Kampuchea and Malaysia, plus the mountain ranges crossing Central Thailand from north to south-east, with a population representing about 23% of the country. About 66% of the population in control areas are living in areas where spraying has been withdrawn. See Annex 12 - Plan of Action, 1983

2.1.2 The reported incidence of malaria throughout Thailand has been increasing yearly from 2.2 - 3.6 cases per 1,000 population during 1966-72 to 10.6 cases per 1,000 population in 1981. The increase in malaria incidence is due primarily to population movements and malaria parasite resistance to drugs. In 1982, the malaria incidence has been reported as being reduced to 9.1 per 1,000 population. In 1983, based on the Team's field reviews on existing data, it is projected that malaria incidence may be further reduced to below 7 cases per 1,000 population. During the Team's review of the data provided by various malaria units and sectors, it was observed that there is a marked decreasing trend in malaria cases when comparing data from the first eight months of FY 1982 with FY 1983 (Figures of some Units and Sectors are shown in Annex 1, Tables 1,2,3,4 5, and 6). The main reasons for this decreasing malaria incidence are considered to be (i) early detection and prompt treatment of malaria cases by malaria clinic personnel and village voluntary collaborators whose numbers have been increased dramatically during the last three years (1980-1982) and (ii) the new regimens of anti-malarial drugs developed and used throughout the country. (MAP 2 and Annex 10).

The parasite species formula shows approximately 70% Plasmodium falciparum and 30% P.vivax, while P.malariae is quite rare and represents less than 0.1% of the cases. At present, 95% of P.falciparum cases in Thailand demonstrate some level of resistance to chloroquine. Within the last few years P. falciparum strains acquired in many parts of Thailand have demonstrated resistance to the combination of sulfadoxine and pyrimethamine. (Annex 11).

2.2 Entomology

2.2.1 General

Anopheles minimus, at present, is considered to be the most important vector in forested and cleared foothill areas with slow running streams found throughout the country. After many years of DDT residual house spraying, higher densities of A.minimus are now biting and resting outdoors as compared to indoors. Although there is some tolerance to DDT in limited areas, generally speaking, A.minimus still is susceptible to DDT.

Anopheles dirus (= A. balabacensis) is the other main vector and is prevalent in forested areas. A.maculatus has been incriminated as a vector in Southern Thailand. Susceptibility tests on both maculatus and dirus (= valabacensis) indicate tolerance to DDT in some areas.

A.sundaicus and A.aconitus are considered secondary vectors in certain areas.

2.2.2 Entomological field activities carried out since 1978 are as follows:

a) Evaluation of anti-adult measures in indicator villages in control areas.

b) Determination of vector susceptibility to insecticides in control areas.

c) Focal investigations in eradication areas.

d) Collection of data on receptivity in eradication areas.

e) Spot checks in control areas.

f) Special studies.

These activities still are carried out but lack adequate supervision by Unit Chiefs. It was observed by the Team that some entomological activities have not been carried out as scheduled. The number of successful vector susceptibility tests were considered inadequate to detect changes in insecticide tolerance. Mosquito dissections for oocysts and salivary glands should be carried out as far as possible in the incriminated primary and secondary vectors.

2.3 Spraying Operations

2.3.1 Residual house spraying with DDT, either 75% wettable powder or 25% emulsifiable concentrate, is conducted once or twice per year depending upon the epidemiological characteristics of a particular area. Fenitrothion, 40% wettable powder, has been used in villages bordering Kampuchea, Laos and Burma since 1982. In limited situations, where fogging is required, malathion or fenitrothion in oil formulations are being used.

2.3.2 The USAID Project and the Government of Japan have provided an adequate number of Hudson sprayers and spare parts as well as Thermal Foggers. There are now sufficient spray pumps in the program.

2.3.3 Household refusal of spraying continues to be a problem. The average national complete spray coverage in 1981 was 60.7% and in 1982 was 67.6% of the total target. (Annex 2, Table 1). However, complete coverage has increased gradually during the last few years by the strengthening of health education methods. In some areas of Pak Chong Unit, in Region 1, there was a marked increase of complete spray coverage following the showing of the malaria movie provided by the USAID project and the informing of the public on the malaria program. (Annex 3, Table 1 and 2). In some areas where fenitrothion is used, there has been a significant increase in the complete spray coverage. The increase in coverage may be due to fenitrothion's effect upon and reduction of other nuisance insects.

2.4 Health Education and Training

2.4.1 Public information activities conducted by the Malaria Division utilizing mass communication media include public exhibitions, radio, television and newspaper coverage. Posters, leaflets, pamphlets and plastic school book bags are distributed mostly in control areas. Sector level officials use flip charts and flannel cut-outs during health education presentations in schools in problem villages. Mobile public address systems are utilized during spraying operations. In addition, each region and some unit mobile health education teams show movies and provide health education to villagers in control areas. Malaria

officials attend meetings of other agencies, village leaders, village scouts, teachers, students, priests, etc., and give presentations on malaria to increase public awareness and understanding. Village voluntary collaborators also assist in disseminating information and encouraging participation of the community.

2.4.2 Various aspects of training are organized and implemented in the Malaria Division in the Section of Health Education and Training

2.4.3 Two-day courses of training for malaria volunteers are conducted from time to time at the sector level. At present, there are 32,760 malaria volunteers throughout the country. Most of them have attended the refresher course for one day in 1982 and 1983. The malaria clinic workers in charge of malaria clinics and treatment centers also have received both pre-service and in-service training. At present, there are 454 malaria clinic workers in the country. (Annex 10).

2.4.4 The major training facility for the Malaria Program is at Phraphutthabat. This facility has been expanded by the USAID project and now will accommodate 58 students. A wide variety of courses are offered at this facility.

2.4.5 A large amount of training is done by the Regions, Units and Sectors themselves, especially for Malaria Volunteers and similiar personnel.

The detailed progress of health education and training component of the USAID project will be discussed later in this report.

2.5 Budget and External Assistance

2.5.1 The budget authorization received from the Regular Government Budget has been increased yearly, but the budget has not risen at the same rate as the cost of living and inflation. (Annex 4, Table 1). There were numerous complaints made about the insufficient operating budget from the Unit and Sector levels during this review. For example, personnel using their own motorcycles on official business received a gasoline subsidy of 150 to 200 Baht a month, representing less than one third of the actual cost of their motorcycle operation.

2.5.2 The WHO assistance provides technical support through provision of long-term professional staff and short-term consultants. The WHO budget is approximately 250,000 US dollars annually and includes a modest amount for supplies and equipment. Additional funds also are provided by WHO for applied field research.

2.5.3 The USAID Anti-Malaria Project which started in FY 1980 is intended to continue throughout four fiscal years from FY1980-1983. The detailed project is discussed later in this report.

2.5.4 The Government of Japan provided a grant for B 70 million in 1981 and B 35 million in 1983 for an Anti-Malaria Operations Program for Kampuchean displaced persons and affected Thai people in the Kampuchean-Laos-Thailand Border areas.

2.5.5 U.S. Peace Corps Volunteers (PCV) have been working in the Thai Anti-Malaria Program since 1962. The total number of volunteers up to 1982 is 178. At present, 10 PCVs are working with the program as Assistant Unit Chiefs.

2.6 Applied Research

The Malaria Division currently is carrying out studies in the areas of parasite sensitivity and resistance to various drug regimens, immunofluorescent antibody testing, effects of different levels of insecticide pressure on vectors, and biological control of mosquito larvae. Research on malaria and its related fields also is carried out by the various institutions in the Universities, Department of Medical Sciences, and the Armed Forces Research Institute for Medical Science. In April 1983, a conference on malaria research was convened for three days.

The detailed discussion on the research component of the USAID project will be given later in this report.

3. Review of the Actions Taken on the Mid-Term Review of the USAID Project, 1981.

Following is an outline of action taken on the Mid-Term Review recommendations concerning overall program and project related activities:

3.1 Epidemiology, Surveillance and Drug Treatment

Recommendations	Action Taken
3.1.1 The collection of surveillance data at the regional level is still not up to the level it should be. Personnel should receive additional training not just in the collection and presentation of data, but also in the analysis of that data. They should be able to explain any abnormal changes in the epidemiological situation.	3.1.1 A training course on the analyzation of epidemiological data was held in December 1982.
3.1.2 Administrators at the field level should understand the benefits of surveillance data in planning, directing operations and in following up results of those operation.	3.1.2 Program agrees with recommendation and is attempting to strengthen this aspect.
3.1.3 There should be closer cooperation with the Provincial Public Health offices on exchanging surveillance data in order that a more accurate idea of the true situation in the field is made available to everyone.	3.1.3 Malaria unit personnel attend the monthly Provincial Public Health meetings where ideas and data should be shared.
3.1.4 The public health facilities must be urged to improve their PCD results by using the authority of the Provincial Public Health officer to persuade them to take more blood slides.	3.1.4 Same as 3.1.3.

3.1.5 An effort should be made to encourage village health volunteers who have been trained as malaria collaborators to produce better results.	3.1.5 Weekly visits are made to these volunteers for follow-up.
3.1.6 An effort should be made to improve the surveillance data at malaria clinics. Records should be kept registering the patient's address and source of infection. There should be a daily summary separating new cases from repeat positives; in malaria clinics where there is a high patient workload; the malaria clinic workers should be increased to the appropriate level.	3.1.6 Implemented.
3.1.7 In the cases where P. falciparum is becoming the predominant parasite species, statistices should be kept separately between the malaria clinics where immediate treatment is available and the results from voluntary collaborators and special field surveys so that a comparision of species data can be made.	3.1.7 Implemented.
3.1.8 Expand the treatment study initiated in 1980 to more centres in each Region to formulate treatment schedules on a Zonal/Provincial basis.	3.1.8 Implemented.
3.1.9 Coordination between the Malaria Division through its Regional Services and the Provincial Health Services to be further strenthened so that similar treatment schedules are adopted by the two services with the Malaria Division playing a coordinating and directing role and also providing for exchange of information.	3.1.9 Malaria Division has distributed a manual on treatment regimens, written by the school of Tropical Medicine, to all hospitals and Provincial Public Health Offices.

3.1.10 Development and implementation of intensified P. falciparum control in this south-eastern part of the country (Trad and Chanthaburi) of increased spray coverage and surveillance to interrupt, if not to reduce transmission of multiple resistant falciparum strains to the other parts of Thailand.	3.1.10 Partially implemented with the use of ESF budget in 1982.
3.2 Vector Control	
3.2.1. A target of at least 90% complete spraying should be set for each spray cycle; and no less than a 75% completion rate should be accepted in any Sector. Whatever follow-up measures are needed to achieve this 75% completion rate should be pursued in each Sector, Zone and Region.	3.2.1 Country-wide complete spray rate for 1982 is 63.9% for first cycle and 71.3% for second cycle.
3.2.2 Explore possibility of making spray personnel permanent. If this is not possible, then all temporary spray personnel should receive additional training to improve efficiency and effectiveness.	3.2.2 Possibility explored - not practical. All spray personnel receive 3 days practical field training.
3.2.3 All direct field supervision should be by permanent personnel.	3.2.3 Present Malaria Division policy.
3.2.4 New insecticides should be field-tested on a regular basis as residual house sprays in order to be prepared to change insecticides in the event insecticide resistance should develop.	3.2.4 Field trials have been conducted with fenitrothion and bendiocarb.

3.2.5 Thermal fogging and ULV spraying should be extensively tested to take full advantage of these two invaluable adult control techniques.	3.2.5 Under consideration.
3.2.6 A field manual for effective use of thermal foggers and ULV sprayers should be developed for distribution to all Regions and Zones.	3.2.6 Manual for use of thermal foggers developed and distributed. There are no ULV sprayers in the Malaria Program.
3.2.7 An intensive field training program on effective use, operation, and preventative maintenance for both thermal foggers and ULV sprayers should be conducted in all Regions.	3.2.7 Two courses of 3 days each were conducted in 1981 and 1982.
3.2.8 Both new and old larvicides should be extensively field tested throughout Thailand.	3.2.8 Limited field tests with Abate and BTI have been conducted.
3.2.9 A field manual on acceptable anti-larval measures for Thailand should be developed for distribution to all Regions and Zones.	3.2.9 Under preparation.
3.2.10 An intensive field training program on the selection and implementation of anti-larval measures should be conducted throughout Thailand.	3.2.10 Under consideration.
3.2.11 Pilot source reduction projects should be extensively planned, designed, and implemented in all Regions.	3.2.11 Under consideration.
3.2.12 A field manual on effective source reduction techniques for Thailand should be developed for distribution to all Regions and Zones.	3.2.12 Under consideration.

3.2.13 An intensive field training program on the planning, design, construction and operation of source reduction projects in Thailand should be conducted using demonstration projects in all Regions.	3.2.13 Under consideration.
3.3 Entomology	
3.3.1 A new Entomology Section protocol should be prepared as expeditiously as possible and implemented prior to 1982.	3.3.1 New entomology protocol developed and Implemented in January, 1983.
3.3.2 An annual training workshop for Regional and Zonal entomologists should be planned with major emphasis on field and lab activities and scheduled as early as possible.	3.3.2 Last training workshop for entomologists held in December, 1982.
3.3.3 A pre-workshop test should be devised and disseminated to all Regional and Zonal entomologists prior to the annual training workshop. And a post-workshop test should be devised and disseminated in the same manner.	3.3.3 Not implemented.
3.3.4 Basic research on vector and suspected vector bionomics and behavior should be planned and started on all Regions.	3.3.4 One study underway in Region 2; one study initiated in Regions 1 and 4.
3.4 Health Education and Training	
3.4.1 If candidates for U.S. academic training are not found by the end of 1981, funds should be shifted for use in other training categories.	3.4.1 Funds have been reprogrammed.

3.4.2 Training staff should review and evaluate VVMC training and revise curriculum or methods for refresher training.	3.4.2 Curriculum revised.
3.4.3 Revise VVMC training manuals to include recent changes such as drug treatment.	3.4.3 Training manual revised.
3.4.4 Village health volunteers previously trained in making blood slides should be given appropriate refresher training and provided with malaria kits.	3.4.4 Implemented.
3.4.5 For refresher training of sector chiefs, it is recommended that the malaria training staff review job functions for each position and do a task analysis for use in curriculum development. Refresher training should be job and problem oriented, not just a repeat of pre-service training. Emphasis is needed on skills in administration, health education and supervision.	3.4.5 Implemented.
3.4.6 To strengthen the teaching capability of the National Training Center at Phraphutthabat, training staff should be considered as priority candidates for training scholarships under the Project. Disciplines of administration, entomology, epidemiology and health education need strengthening to minimize reliance by the Center on "outside" lecturers.	3.4.6 Program agrees with this recommendation and is attempting to strengthen this aspect.

3.4.7 Health education activities should be evaluated and "successful" activities fed back to improve the remaining work to be done.	3.4.7 Under consideration.
3.4.8 It is recommended that seminars for village leaders be conducted in other areas to demonstrate the value of this activity in achieving good cooperation from the villagers.	3.4.8 Implemented through P.H.C. approach.
3.4.9 The project has also demonstrated that seminars between provincial health and malaria staffs resulted in better integration of services. It is recommended that at least one such seminar be held in each region.	3.4.9 implemented by Department of CDC in each Region.
3.4.10 To minimize language problems in Muslim provinces in Southern Thailand, it is recommended that all educational materials for use in Yawi areas of Region IV be pretested in the Yawi language. Region IV health education staff should assist the Zones in producing cassette tapes in Yawi for use in Malaria clinics.	3.4.10 Implemented.
3.5. Fiscal/Budget	
3.5.1 The Malaria Division should train all levels of finance personnel to understand the procedures of the Prime Minister's Office concerning fiscal administration at the provincial level for FY 1981. The regions should improve the administrative methods concerning the reimbursement of per diem and gasoline to the zones so that this procedure is more expeditious.	3.5.1 Implemented.

3.5.2 The Malaria Division should survey the needs of various zones for typewriters and calculating machines which could be procured using loan funds.	3.5.2 Implemented.
3.5.3 Allow the replacement of the Jeep engines with engines of other types which reduce the cost of repair and conserve gasoline.	3.5.3 Implemented.
3.6 Administration	
3.6.1 In the South, more of the local populace should be hired to carry out malaria operations in order to help solve the problems of language and religion.	3.6.1 Implemented wherever possible.
3.6.2 Closely follow-up and support the activities of the malaria voluntry collaborators.	3.6.2 Present policy is to follow-up volunteers at least once per week.
3.6.3 Health education should be conducted in schools and to groups of people in the villages in order to know the causes and the vectors of malaria, the symptoms, preventive measures and sources of radical treatment.	3.6.3 Implemented.
3.6.4 Standard formats should be used in the reporting system in order to facilitate the tabulation of various data and statistics (plans, targets, annual financial plan, actual achievements and actual expenditures compared with the financial plan).	3.6.4 Implemented.

3.6.5 Some zones and sectors received inadequate manpower to carry out the workload, for instance in Zone 6 Trad, Zone 7 Chantaburi, Sector 4 Bor Rai and Sector 4 Mae Sot. Manpower should be increased in these areas to be in appropriate proportion with the workload.	3.6.5 Additional personnel have been transferred to these areas.
3.6.6 The inadequate budget affects many aspects of malaria operations, such as manpower, spray coverage and shortage of per diem to perform field activities, etc. The Bureau of the Budget should be requested to consider this matter.	3.6.6 There was a 19.9% increase in the operation expenditures line item for FY 1983.
3.7 Research	
3.7.1 The Applied Research Section should be strengthened with additional qualified personnel and budget support.	3.7.1 One additional entomologist has been assigned to the section. The Civil Service Commission has approved another 3 technical positions, however only one has received budgetary approval from BOB.
3.7.2 The Malaria Division should establish closer cooperation and coordination with other institutions which have mutual interest in research in malaria and its related fields.	3.7.2 Two research conferences have been held with the participation of all institutions conducting malaria.
3.8 USAID Project	
3.8.1 The completion date for the Project should be extended from December 1982 to December 1983.	3.8.1 Project extended to September 1983.
3.8.2 The contracts for the two malaria monitors should be extended from April 1982 to April 1983.	3.8.2 One contract extended to the PACD.

3.8.3 Reprogramming of funds budgetted for U.S. academic training should be done if qualified candidates cannot be found by the end of FY 1981.	3.8.3 Implemented.
3.8.4 Funding of applied field research carried out under this project should be supported by grant funding and not loan funding.	3.8.4 Not possible without changing the Loan and Grant Agreement.
3.8.5 The research project of larvivorous fish now in progress under loan funding should be eliminated from USAID assistance.	3.8.5 Eliminated.
3.8.6 Re-programming of the expected balances in the project should be carried out as quickly as possible into suitable assistance areas. It is suggested that these funds be moved into the contingency line item to provide as much flexibility as possible in future fiscal planning to meet specific program needs.	3.8.6 Re-programmed.
3.8.7 If the extension of the project is mutually approved, there should be benchmark review in September 1982 to determine progress and to insure project funding is being directed as recommended. This review need not be as comprehensive in nature as the mid-term review but should consist of members from key RTG offices and USAID.	3.8.7 Review was held in June, 1982.

4. Progress of the USAID Anti-Malaria Project as of July 1983 in Attaining Stated Objectives Over the Life of the Project

4.1 Technical Assistance (Grant Funded)

Technical assistance was given as 2 components: component (i) made available the services of 2 long term project monitors up to the termination of the Project. When the project was extended to September 30, 1983, it was agreed to extend the services of both monitors. However one of the monitors decided not to extend. The single monitor was therefore over-taxed as he had to assume additional duties. Component (ii) made available the services of short-term consultants in the field of transportation, Health Education and Training. Under Training, professors of Chiangmai University conducted the Instructors of Trainers Course and the professors of Mahidol University conducted the Health Education Techniques Course.

The table below briefly outlines the progress to date.

Personnel	Total Planned	Actual	Comments
Project Monitors	2 for length of project	1 at present	2 contracted 15 Oct. 1979 1 terminated 14 Apr. 1982
Consultants:	12	11	
- Transportation	-	1	11 Feb. - 21 Mar. 1980
- Health Education	-	1	17 Apr. - 30 May 1980
- Training			
a) Chiangmai U.	-	4	15 - 27 May 1980
b) Mahidol U.	-	5	19 - 30 Apr. 1982

The Project Monitor is contracted for until the PACD* of 30 September 1983.

4.2 Fellowships (Grant Funded)

At the beginning of the project, funds were allocated for 7 U.S. academic M.P.H. courses, 7 In-country MSC courses, 12 U.S. observation tours and 35 3rd country observation tours. After the Mid-Term Evaluation, it was decided to reprogram funds budgeted for U.S. academic training for two more 3rd country observation tours and 1 more MSc. course (Thailand).

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* Project Activity Completion Date.

The revised program and progess to date is outlined below:

4.2.1 Type	Total Planned	Actual	Comments
U.S. Academic - MPH	2	2	1 completed at Tulane University, 1981
			1 completed at University of Hawaii, 1982
In-country Academic - M.Sc.	8	8	4 completed Apr. 1982
			4 studying at Mahidol, Kasetsart Universities
U.S. Observation tour	12	9	4 completed Oct. 1980
			5 completed Nov. 1981
3rd Country Observation tour	37	25	6 completed Dec. 1980
			6 completed Jan. 1981
			4 completed Dec. 1982
			4 completed 26 Jan. 1983
			5 started 5 Jul. 1983

4.2.2 Remainder of Project

In-country Academic - M.Sc.: Support will be continued up to the PACD for 4 fellows studying at Mahidol and Kasetsart Universities.

U.S. Observation Tour: Program for 3 participants being arranged by DTEC; tentatively scheduled for 1 August 1983.

3rd Country Observation Tour: DTEC is currently making arrangements for the remaining 12 participants tentatively to visit the following countries:

Group	Countries	Team Leader	Date
6	Malaysia/Indonesia	Mr. Suthas	1 August 1983
7	Malaysia/Indonesia	Dr. Tawat	29 August 1983
8	Philippines	Dr. Pinan	Open

Due to delays in processing the observation tours, it is unlikely the 3 remaining U.S. observation tours will be processed before PACD. The problems identified were that it was difficult to obtain adequate numbers of medical graduates for US academic MPH courses and procedural delays were encountered in processing both U.S. and 3rd country observation tours.

4.3 Training

The table below outlines briefly the training courses held in Thailand under AID assistance.

4.3.1 Progress to Date

Course	Total Planned Participants	Actual	Comments
Malaria Clinic Workshop	30	54	4-8 February 1980
Malaria Clinic Workers	310	288	41 now training
Malaria Clinic Workers Refresher Prototype	45	45	3-7 November 1980
Malaria Clinic Workers Refresher	310	247	Continuous
Financial Management	39	39	20-21 October 1980
Automotive Repair	60	60	1 April - 3 May 1980
Health Education Workshop	25	45	15-19 April 1980
Instructors of Trainers	50	92	19-23 May 1980
Trainers of Volunteers	400	522	14 Jul. - 19 Sep. 1980
Village Voluntary Collaborators	20,000	22,083	Nov. 1980 - Mar. 1982
Village Voluntary Collaborators Refresher	25,000	*	Dec. 1983 - April 1983
Malaria II	188	188	17 - 23 June 1981
Malaria I	302	186	Continuous
Health Education Techniques	55	50	19 - 30 April 1982
Audio-Visual Equipment Use and Maintenance	30	32	23 - 27 Nov. 1981
Research Workshop	35	54	28 - 29 Jul. 1981
Electrical Equipment Repair	3	3	Dec. 1980 - Sep. 1981
Operational Research Workshop	68	68	21 - 22 Oct. 1982
A/V Refresher	55	68	20 - 24 Dec. 1982

* Figures for actual number of VVC's trained not yet compiled

The Training Center at Phraphutthabat has provided a series of courses with AID inputs since 1981. The major courses were aimed at Malaria Clinic Workers (preservice and refresher), Unit and Assistant Unit Chiefs (refresher), Sector Chiefs, Trainer of Instructors (Unit Chief). A rapid review of the evaluation sheet of the courses prepared by the participants revealed that the trainees believed that they have considerably improved in their performance. All courses were presented according to approved course curricula. These training course schedules were available and were found very comprehensive. The pre-service training for new personnel and refresher courses must continue and be financially supported.

4.3.2 Remainder of Project

The last group of Malaria Clinic Workers (Group #10) completed training on 15 July 1983. Refresher training for an additional 96 Malaria Clinic Workers will be conducted for 5 days in September at the various Regions. Two Malaria I Courses, with 40 participants each, will be conducted in July and August 1983.

Since the Mid-Term Evaluation in 1981, the training program has received added impetus. The targets set originally for training programs (pre-service and refresher) of malaria clinic workers and malaria volunteers have been revised and increased.

4.4 Progress in Research

During the past five to ten years, the ecological situation in many parts of Thailand has changed drastically. Land surfaces that once were heavily forested are used now for the growing of various agricultural crops. While this transition is occurring, the rural population may be exposed to the bites of mosquitoes infected with disease organisms such as Plasmodium falciparum or P. vivax. Some of these malaria vectors e.g. Anopheles dirus (=balabacensis) may feed primarily outdoors or rest only briefly indoors and are therefore not affected by residual indoor spraying. Also, the malaria parasites being brought into these areas by migrant laborers and settlers may be resistant to standard therapeutic drugs like chloroquine or sulfadoxine/pyrimethamine. To control exophilic vectors and to cure patients infected with drug-resistant parasites, new methods and new chemicals or drugs must be evaluated in problem areas. Such trials fall into the category of applied research and should adhere to the scientific method. (See Annex 5).

At present, there are many institutions in Thailand that support research on malaria. Scientists in these institutions are doing basic research on the malaria parasite, the mosquito vector, or the biology of the parasite in its human or invertebrate host. Also scientists in Thailand are carrying out applied research projects to test the effectiveness of certain methods or materials. Some of these scientists are associated with the National Malaria Control Program.

To support investigators from the National Malaria Control Program and to provide adequate facilities for this type of research, USAID provided the necessary funds to construct a 3-story laboratory building at Malaria Division Headquarters, a 2-story research building at Pak Chong and at Chiangmai and three 2-story operational field unit buildings at Loei, Trad, and Chumporn. Guidance for projects at these locations was to come from the Applied Research Branch, Malaria Division, Ministry of Public Health, Bangkok. Funding to support the costs in each proposed project was to come from USAID or other international agencies.

Eight projects have been approved and funded by USAID as follows:

	Title	Status
4.4.1	"The Effectiveness of Radical Treatment Regimens for P. falciparum in Various Regions of Thailand" (jointly funded with WHO)	Completed
4.4.2	"Field Study of the Efficacy of Panchax spp. as a Biological Control Agent of An. maculatus in the Hilly Areas of Thepa District of Southern Thailand	Completed/ terminated
4.4.3	"A Study of the Biology of Naturally Occurring Larvivorous Fish in Thailand and the Development of a Mass Rearing Technique for the Selected Species"	Completed/ terminated
4.4.4	"A Survey for the Presence of Malaria and Antibody to P.falciparum in an Area of Partial Integration and an Area Under Control Measures"	Extended-Due for Completion in September 1983
4.4.5	"A Study of Entomological Techniques for Evaluation of the Impact of Anti-Adult Measures on Malaria Vectors in Thailand"	In Progress

4.4.6	"A Study on the Effectiveness of Radical Treatment Regimens for Falciparum Malaria in Thailand"	In Progress
4.4.7	"An Epidemiological Early Warning System for Malaria Control"	In Progress
4.4.8	"A Study to Improve Spray Coverage"	In Progress

Project 4.4.1 was completed after one year in 1981 and the findings were published in the Bulletin of the World Health Organization in 1982.

Projects 4.4.2 and 4.4.3 are listed as completed/terminated. Both projects started in 1980 and were reviewed in July 1981 (Mid-term Evaluation of the USAID Anti-Malaria Project). The evaluation team made the following statement in Section 5.8.5 (Summary of Recommendations): "The research project of larvivorous fish now in progress under loan funding should be eliminated from USAID assistance." Although USAID funding was stopped, both projects continued on with funds from the local operational budget. Project 4.4.2 was brought to completion by February 1982, and findings were published in the Journal of Communicable Disease in July 1982. Project 4.4.3 did not reach a point of conclusion when terminated in July, 1982.

Project 4.4.4 (begun August 1981) is almost finished and will reach completion before the PACD. Preliminary findings are in press in the Southeast Asian Journal of Tropical Medicine and Public Health. Publication of final results and conclusions will occur after the PACD.

Project 4.4.5 started in November 1982 and will not be completed until the end of October 1983, one month after the PACD. To obtain definitive results, the project would have to continue through July 1984.

Project 4.4.6 was begun in November 1982 and will not be finished by the PACD. At Chumporn and Trad, this project might be completed by November or December 1983, however, at Loei it has little chance of completion before mid-1984.

Project 4.4.7 was set up at three study sites by the end of 1982. An initial description of the technique appears in the WHO/MAL/83.994 report. One year of experience in using the system developed in this project will not be realized until January 1984.

Project 4.4.8 began with the first spray cycle (November 1982 to March 1983, depending upon the Region) and will end with the second spray cycle. All questionaires should have been filled out by the PACD, but statistical analysis of the data will not have been completed by this date.

Regarding non-completions of Projects 4.4.5, 4.4.6, 4.4.7 and 4.4.8, the following statement was made to the Thai Ministry of Finance:

"4. Research - All four operational studies were initiated in November 1982, in the Trat, Chumporn and Loei field units. The epidemiology and spray coverage studies should be complete by September 1983. However, in order to properly study the effectiveness of the entomological techniques, data must be collected for one full year, which necessitates continuing the study through October 1983. Because of a substantial decrease in the number of malaria cases in late 1982 and early 1983, it will not be possible to study a sufficient number of qualified patients for the evaluation of the 3 radical treatment regimens(50 patients per regimen per unit) prior to September 30, 1983."

It should be noted that other research studies, funded by agencies like WHO, are in progress at the Malaria Division (See Annex 6). Two student fellowships from this USAID Project supported M.Sc. thesis research at Mahidol University. Recent publications of research findings by Malaria Division staff are listed in Annex 7.

4.5 Capital Improvements

4.5.1 Construction to Date:

Site	Status
H.Q. Research Facility	Complete
Region II Research Facility	Complete
Region I Research Facility	Complete
New M.T.C. Phraphutthabat	Complete except for additional furnishings
Operational Field Unit, Loei	" "
Operational Field Unit, Chumporn	" "
Operational Field Unit, Trad	" "

After the Mid-Term Evaluation, there was a reprograming of loan funds to construct 3 additional zone facilities at Loei, Chumporn and Trad.

4.5.2 Improvements to Date:

Site	Status
Training Facility, Region II	Complete
M.T.C., Phraphutthabat	Complete
H.Q. Insectary	Complete
Region I Insectary	Complete

Certain essential components of the three operational field units, such as electrical installations, water tanks, security fences, etc., were omitted from the original blueprints for the unit structures. They were later approved under the contingency line item in PIL No. 42, dated November 9, 1982. Due to a delay in receiving the supplementary blueprints and cost estimates, it appears that construction cannot be completed before the present PACD. This additional work is necessary to make them fully operational. All basic constructions and improvements were completed on schedule well within the approved cost estimates.

4.6 Commodities

4.6.1 Progress to Date:

Item	Status
Sprayers, Spare Parts (3,000)	2,000 distributed, 1,000 delivered
Spray Tips (40,000)	Distributed
Microscopes, Spare Parts (360)	Distributed
Volunteer Kits (50,000)	Distributed
Volunteer Signs (20,000)	Distributed
Tape Recorders for Malaria Clinic (410)	350 distributed, 50 delivered
Audio-Visual Equipment	Distributed and/or delivered
Mobile Loudspeaker Sets (214)	200 distributed, 14 delivered
Research Equipment	Distributed
Training Equipment	Distributed
Malaria Clinic Furniture (360 sets)	300 distributed, 60 on order
Automotive Repair Equipment	Distributed
Malaria Clinic Patient Cards (100,000)	Distributed
Malaria Volunteer I.D. Cards (50,000)	Distributed
Zone Office Equipment (33 sets)	Distributed
Electronic Calculators (30)	Ordered/10 delivered
Plain Paper Copier (1)	Distributed
Interval Timer Clocks (427)	To be delivered 12 Sep. 1983

All remaining commodities should be distributed by the end of July, with the exception of the additional malaria clinic furniture which should be in place prior to the PACD. There have been increases in total numbers of certain items such as sprayers, microscopes, spare parts, volunteer kits, tape recorders, AV equipment and malaria clinic furniture. This was due to changes in actual needs and availability of remaining loan funds.

4.7 Health Education Materials

4.7.1 Progress to Date:

Item	Status
Malaria Clinic Handbook, Draft (500)	Distributed
Malaria Clinic Handbook, Final (1,200)	Distributed
Jeep Repair Manual (65)	Distributed
Handbook for the Identification of Anopheline Larvae (1,500)	Distributed
Voluntary Collaborator Handbook (25,000)	Distributed
Voluntary Collaborator Handbook Revision (18,200 in Thai, 3,500 in Yawi)	Distributed
Posters (899,600)	799,600 distributed; 100,000 on order
Pamphlets (1,080,000 in Thai, 31,000 in Yawi)	780,000 in Thai and 31,000 in Yawi distributed; 300,000 in Thai on order
Staple Guns (342)	Distributed
Cinema Slides (1,550)	Distributed
Cassette Tapes (2,985)	Distributed
Reel to Reel Tapes (10)	Distributed
Malaria Program Film (35 copies of existing film)	Distributed (Grant Funds)
New Malaria Program Film (50)	Distributed (Grant Funds)
Promotional Films (50)	Distributed (Counterpart Funds)
Flip Charts (400)	Ordered
Exhibition Sets (39)	Cancelled
Voluntary Collaborator Meritorious Achievement Certificates (20,000)	Received
Health Education Slides (1,657)	Distributed
Textbooks	Partially received; on order

4.7.2 Remainder of Project:

There is a request, currently under consideration at DTEC, for use of grant funds to purchase an additional 7 copies of the Malaria Program films (both types) and 12 Promotional Films. Due to procedural delays, it is doubtful that these films will be delivered before the PACD. It is encouraging that all other commodities have been received or will be delivered before 30 September 1983.

4.8 Vehicle Overhauls

4.8.1 Progress to Date:

Region	Planned	Approved	Completed
1	36	36	35
2	30	30	30
3	47	47	30
4	41	41	40
5	40	40	40
H.Q.	2	2	1
Total	196	196	176

4.8.2 Remainder of Project:

The remaining 20 vehicles should be overhauled by the PACD.

4.9 Revolving Fund for Motorcycle Hire/Purchase

Five hundred motorcycles were purchased under the initial procurement and are in use by sector level personnel. Monthly installment payments are being received at the Malaria Division according to the established regulations. Procurement of an additional 97 motorcycles has been completed according to procedures established in C.P. 5.8 "Motorcycle Revolving Fund". This component has been a successful program and all staff interviewed were in favor of continuing this activity.

4.10 RTG Motorcycle Procurement

Three hundred government-owned motorcycles have been purchased and are in use at the sector level for supervision of field activities. This component of the project therefore is complete.

4.11 Finance

The overall expenditure as of June 30, 1983 amounts to 80.4% of the total loan and 87.3% of the total grant. The overall utilization of both loan and grant funds has been good.

A short summary table is given below:

Fiscal Data (as of June 30, 1983)

	Budget Obligation ($)	Budget Obligation (Baht)	Total Expenditures	Projected Balance
Loan	4,000,000	88,177,968	B 70,922,997	B 6,145,642
(Est)Grant	500,000		$436,573	$ 63,427

For details of budget obligation, total expenditure to date and estimated projected expenditures by PACD, please see Annexes 8 and 9.

5. Evaluation of the Impact of the USAID Anti-Malaria Project and Suitability of the Project to the Malaria Control Strategy of Thailand

5.1 Objectives and Goals of the Malaria Program of Thailand

The long-term objectives of the program are (1) to maintain control of malaria in the forested and hilly areas of the country where malaria is endemic and (2) to prevent the re-establishment of malaria transmission in the remaining areas, where a malaria eradication strategy is being applied.

The following table presents the goals of the malaria control program as set out in the current Health Development Plan (1982-1986) and the present status of the program in meeting these goals.

Malaria Division

Goals	Present Status
1. To reduce mortality caused by malaria to less than 8 deaths per 100,000 population.	1. The mortality rate for malaria in 1981 is 8.6 (1982 not available)
2. To reduce morbidity caused by malaria in control areas to less than 12 cases per 1,000 population (API).	2. The API for control areas in 1982 is 23.0. The percent of P. falciparum of the total cases is 68.7% (1981) and 68.4% (1982).

3. To prevent the re-introduction and transmission of malaria in eradication areas.	3. The overall API for malaria eradication areas in 1982 is 5.07. The reported API using only those cases classified as indigenous is 0.1 in 1982. The percentage of P.falciparum of total cases was 69.1 (1981) and 68.7 (1982). Malaria transmission is continuing at present in some portions of these areas.
4. To implement a Primary Health Care approach to malaria control and to involve local communities in personal protective measures.	4. The malaria volunteer program of approximately 33,000 volunteers indicate that this goal is being met.

5.2 Objectives and Purposes of the USAID Malaria Control Project

The AID project (493-0305) entitled the Anti-Malaria Project has as its overall goal to improve the health status of the population of Thailand with the sub-goals of (1) maintaining long-term control of border and mountainous regions covering approximately 9.3 million people and (2) eradicating the disease in all remaining areas of the country (Pg 17, Project Paper). These goals were consistent with the stated objectives of the approved RTG Malaria and Vector Control Program 1977-1981. It was recognized at the time of preparing the Project Paper that these goals were likely not to be totally achieved. It was further viewed that during the course of this project little or no decrease could be expected in the incidence levels, but that effort and inputs made would result in a decrease in malaria morbidity and mortality over the period following the Project.

The project purposes were to develop the institutional capability for providing to rural inhabitants of Thailand's endemic malaria areas of high risk, continuing malaria control services for the foreseeable future at a level and quantity sufficient to minimize the occurrence of the disease and to provide timely and proper treatment to those who do contract the disease. The indicators of the end-of-project status include indirect indicators of institutional development as well as the operational results of such development (Pg. 19 of the Project Paper). These operational targets and accomplishments are provided in Section IV of this Report. The evaluation of the impact of the AID Project on Thailand's anti-malaria efforts is the purpose of this section.

Major assumptions for the achievement of the project's purposes included timely RTG approval of staffing and funding needs, continued health service cooperation for partial integration and acceptance by local people of the proposed interventions.

5.3 Evaluation of the Impact of the USAID Anti-Malaria Project

The Team made an in-depth study of the various project input components through a series of field visits and interviews with Malaria Division staff at all levels, village malaria volunteers, public health officials and many other concerned individuals in order to obtain insights into the project's impact. The information obtained from the Regions were correlated and summarized for the total program. A breakdown of individual regional targets and accomplishments was not done, as in the Mid-Term Review, as the original project paper did not set Regional targets.

5.3.1 General Considerations

The planned completion date of the project was revised from December 1982 to September 1983 after the Mid-Term Evaluation. This extension has proven to be a helpful administrative decision as it has allowed for additional inputs such as the three new unit offices to be completed and procurement schedules to be closed for several important project items. The impact of this extension has been very favorable on the total outcome of the project and made use of funds already programmed for this activity.

5.3.2 Technical Assistance (TA) (grant funded)

The major TA component has been the provision over the life of the project of two project monitors who have carried out administrative and liaison functions for the project. Since April 1982 the project monitor component has been reduced to one person due to the resignation of one of the monitors. The Team is of the view that this reduction did not materially affect the overall usefulness of these technical services. However, it was only because the remaining monitor continued to perform the required services in an outstanding and effective manner, at the cost of much of his personal free time. The monitor has been extremely helpful on both the Mid-Term and Final Evaluation. The Team believes that the AID project would not have achieved many of its program targets without the services of these two people. The term outstanding can not adequately describe the value of their input.

Additional TA was received from a transportation consultant (11 February - 21 March, 1980); a health education and training specialist (17 April - 30 May, 1980); and contract training services from Chiangmai University (15 - 27 May, 1980) and Mahidol University (19-30 April, 1982). In assessing the impact of these additional TA grant components, it was agreed that while the Training and Health Education components did serve the designed purposes, there were mixed assessments on the program component to overhaul vehicles rather than to use a replacement system. This item of the project inputs consistantly was mentioned in the field as being marginal in effect.

The technical assistance contracts for training to two Thailand Universities was very appropriate. As a result of this contracting arrangement, one of the University staff is now participating in other Malaria Division Courses which is very beneficial to the overall Training program. The Team felt that more use of these excellent resources should be developed by the Malaria Division in the future.

5.3.3 Fellowships and Observation Tours

Progress in regards to fellowships for post-graduate work abroad and observation tours for various categories of eligible supervisory personnel has not met with the same degree of success as the internal national training programs. In regard to nominations for U.S. Academic MPH and M.Sc. courses, the major contributory factor has been the lack of adequately skilled medical graduates interested in entering the field of public health and malaria control as a career. In addition, WHO fellowships have been utilized for 5 such post-graduate courses which has reduced the demand for such post-graduate training.

More observation tours could have been implemented if internal RTG procedural and processing delays had been reduced.

In the future, additional observation tours and short-term epidemiological and entomology courses should be planned and funds for MPH and M.Sc. courses proportionately reduced. It would be useful to plan well ahead of time the annual fellowship and observation tours, taking into account the different sources of funding. Observation tours should be carefully planned and implemented to suit the needs of the participant.

5.3.4 Training

The training capability of the National Anti-Malaria Program has improved over the life of the project and several thousand people have received training in malaria control technology and management.

Large-scale training assistance has been provided in pre-service and refresher training of Malaria Clinic Workers (288 and 292 people respectively) and malaria Village Voluntary Collaborators (over 22,000). The project's training targets have more than been met. The Team's conclusion on training was that both the trainers and the trainees were satisfied that the trainees derived benefit from the pre-service training and refresher training. The Malaria Clinic Workers felt they improved their knowledge on microscope maintenance, identification of parasites, recording and reporting and also gained knowledge on the different drug regimens, especially with reference to chloroquine-and sulfadoxine/pyrimethamine-resistant *P. falciparum* malaria.

A number of microscopists who were trained earlier in the program have not been given refresher training. It would be useful, especially in regards to treatment and new drug regimens being used for resistant P. falciparum, if this group was provided refresher training.

Malaria Clinic Workers may have an assistant and it was felt uniformly that this category should also receive training. With reference to the Malaria Volunteers, the concensus of opinion was that the refresher course should be run for 2 days instead of one. To maintain the continued interest of the volunteer, the Passive Case Detection Coordinator and other sector officials should keep the volunteer informed of measures taken as regards the positive cases detected. Supervisors should also check the quality of blood smears and whether they are numbered promptly. Refresher courses should be run at least once a year as drug regimens and malaria control strategies may change. The training in general has been well planned, reflected by the increase of passive case detection collections, generally improved quality of blood filming, greater coverage, fairly accurate treatment of positive cases and by improved case investigation.

The Sector Chief Course (Malaria 1) consistently was felt to have inadequate technical inputs. It also was felt that Passive Case Detection Coordinators should be given a 2-day refresher training.

The Automotive Course for Mechanics was regarded as being too short. This evaluation applies especially to Assistant Mechanics and driver-cum-mechanics in certain units who lacked sufficient pre-service training. The Team believes the course should be extended to 6 weeks and include training on Japanese vehicle models which are being used in the program.

It was a general view of the Team that all courses should include more "hands on" experience either in the class-room or by field visits.

There is also an urgent need to update the knowledge of the Unit Assistant Entomologists. The only training they received was given after recruitment as health workers. There is an urgent need to train them for one month before assigning them to the units as entomologists. It was also felt that refresher training should be given every year to this group for 1 week.

It was observed that although there is provision for training general public health and hospital staff, only a limited member of personnel, such as 64 Junior Health Officers and 17 Assistant Nurses, have been recorded as being provided training since 1979 at the Malaria Training Center. Every effort should be made to provide Hospital Medical Officers, Hospital microscopists, Assistant Nurses and Junior Health officers a short training course. This would increase their cooperation and improve the blood filming and case detection.

The Team is pleased to note that since the Mid-Term Evaluation, giant strides have been made in the training program and this project input has been one of the "success stories" of the present AID project. Training, however, is a continuous process. Both pre-service and in-service training must continue. If the RTG is unable to meet all requirements of training, external source assistance should be sought to continue these programs on an annual basis.

5.3.5 Research

The USAID Project provided funds for eight applied research projects that hopefully would impact on future malaria control strategies. These studies tested hypotheses in three broad categories of malaria control activities: surveillance, control, and treatment. Proof of any one of these hypotheses could result in modifications to the overall malaria program in Thailand. For example, proof of the hypothesis that standard therapeutic drugs and drug regimens used for malaria treatment are no longer effective could lead to major changes in the program.

Although the hypotheses tested were good and had direct application to malaria control in Thailand, the impact of these research projects on the accomplishment of the USAID project goals was minimal. The one exception was Project 4.4.1 (See previous section). Results from this completed study indicated a serious need to modify existing treatment policies in certain areas of the country. Project 4.4.6, when complete, may support further modifications. Once more experience is gained and under certain epidemiological situations, Projects 4.4.4 and 4.4.7 may prove to be useful surveillance tools. The future impact of Projects 4.4.2, 4.4.3, 4.4.5, and 4.4.8 cannot be assessed at this time due to lack of conclusive results.

The following reasons may account for the lack of impact: (1) the experimental design of the project was incorrect; (2) the control in the experiment was too complex or did not exist; (3) the protocols were not followed completely; (4) there was a lack of direct supervision; (5) the data were not analyzed completely; and (6) the study period was too short to allow conclusions to be reached. It should be noted, however, that useful information was and will continue to be gained from these projects. A very positive influence also was noted at all levels of the Malaria Control Program; specifically, malaria personnel looked more closely at the problems facing the program and at the causes for these problems.

5.3.6 Capital Improvements

The capital improvements provided by the project can be summarized as three research facilities, three field units and one malaria training center expansion. In addition, there were improvements approved for the Headquarters and Region I insectaries and the training facilities in Region II.

The major improvements and expansion of the Malaria Training Center, Region I, Phraphutthabat, Saraburi, has had considerable impact not only on the quality of training but the quantity. The training capacity has doubled and training schedules are now running back to back. The utilization of this facility is at 100% at present. It should be noted that other RTG agencies in the area (Rural Development, Agriculture) also have made good use of these new facilities for their courses and conferences, providing a multiplier effect from the investment. The Team visited this facility on July 21 and was impressed by the quality of the building construction (confirmed by inspection reports of the USAID engineer of O/PES). The facility now accommodates 58 students, but the program would like to increase this number to 100, but dormitory space is not sufficient. It also was considered that the 2nd lecture room should be air-conditioned. The team also felt that the design of the Parasitology Laboratory could have been improved. This addition is a major improvement in the Malaria Division's training capability. There is also some discussion that the Center may serve for specific international courses to be held in the Asian Region.

The Research facilities at National Headquarters, Pak Chong and Chiangmai are also major components of the Capital Improvement portion of the project. The Team visited all three sites and discussed with concerned officials the utilization of the buildings and impact on the program. The National Headquarters research facility which is attached to Malaria Division Building in the Health Ministry compound is about 66% utilized at the present time. There are vacant offices upstairs which are planned for utilization in the future. Important research programs and activities are in progress in the research building and it is fulfilling its intended purpose. The building at Pak Chong is being utilized almost entirely as a Unit office. While there are a number of research activities being carried out in the Pak Chong area, none of these activities utilize the building full time. However, as the building has just been available for use, it is too early to fully evaluate its use as a research facility. Relative to other buildings completed under the AID project, this building was more expensive. As a Unit Office, it has a number of defects - lack of storage space and garage facilities (being constructed by Unit). The research building at Chiangmai is being utilized partially for research but also is being used

for Regional functions. The Team was of the view that with the exception of Pak Chong, these buildings are providing a positive impact on research and providing the necessary facilities to do the operational research being carried out by the Malaria Division.

The three unit offices at Loei, Chumporn and Trad were visited by the Team (July 18, July 11, and July 16 respectively). The construction of these unit offices was recommended by the Mid-Term Evaluation (Pg. 53, item "O") to utilize available loan funding for this purpose. The RTG requested that AID authorize this change in the project on November 2, 1982 and specifically requested support for the construction of unit buildings at Trad, Chumporn and Loei. The AID approved this additional construction under the project's reprogramming schedules by letter on November 9, 1982 (PIL No. 42). This approval allowed for up to 4,740,000 Baht for this construction purpose. The authorized amount was adequate and the three buildings are now complete, except for minor modifications not affecting the basic structure. The Ministry of Health has accepted the buildings. During construction all three sites were visited by AID engineer and AID malaria project monitor (1 to 3 times) and their inspection reports are available with the Malaria Division. Two of the buildings are being presently utilized and the third building (Trad) will be occupied by the end of July. There are still difficulties, especially the Unit office at Chumporn with water supply. All the buildings lack garage and vehicle repair facilities, as well as large supply areas for insecticides. The buildings at Trad and Chumporn are in immediate need of driveway and parking improvements. While these construction components were approved by AID under the PIL - 42, the RTG did not authorize expenditures for certain items i.e. driveway and work-area improvements at Trad and Chumporn. All three buildings have established malaria clinics within the building. The impact on the program of these three unit offices is difficult to measure at this point in time, but certainly will provide a more efficient office area and allow for an improved management system. It is clear to the Team that the design of the buildings for use as Unit offices could have been improved.

Improvements in the Training facilities at Region II include additional desks and tables, ventilation and a wooden walkway. The improvement of the insectaries included water tanks, table and chairs, equipment and laboratory glass and three air conditioners for the National Headquarters and one air conditioner, desks and chairs, minor repairs of cabinets and other small constructions for the Region I insectary. All improvements are considered as being necessary and are improving the work of the Malaria Division. A review of these improvements was made by the AID engineer prior to their implementation. This report is available at the USAID Office in Bangkok and at the Malaria Division, RTG.

There was evidence that contractor payments were considerably delayed (Trad) during the project. One major delay was in getting the authorized Inspection Team together as some members were assigned in Bangkok and had to coordinate travel with other members. It appeared to the Team that local representatives from the Provincial Health Office or Provincial Governor's Office could have prevented this problem. It appeared that AID processing of the payment vouchers were done in reasonable time and did not delay the process.

5.3.7 Commodities

All commodities for the project should be in place prior to the project completion date of September 30, 1983. The commodities are all loan funded except for the grant financing of malaria films, flip charts and some entertainment films under RTG counterpart funds. The Team found all commodities provided to the project being utilized in an effective manner. It was very obvious that the success of the malaria clinics was directly related to AID-supplied microscopes (360), tape recorders (410) and furniture (360 sets). The field programs all reported use of the AID-supplied sprayers and spare parts (3,000) and spray tips (40,000). The Team observed many AID-supplied spray pumps in the field in actual use. The malaria volunteer kits (50,000) and signs (20,000) form the commodity base of this important program which is rapidly developing into a major component of the program. The mobile loudspeakers (214) were observed in many sectors and zones and they were reported as being instrumental in improving the spray coverage in many areas. The research and training equipment is in use and filling important needs in these two program areas.

Various difficulties were noted with some of the commodities provided under this project. There was a general complaint on the malfunction of the fine adjustment of AID microscopes, as well as some of the oil-immersion lenses becoming cloudy. The microscope bulb appears to burn out rapidly. The microscopes were equipped with 10X eyepieces instead of 7X eyepieces, but this difficulty can be overcome in training. There were some complaints about the sprayers provided; a plastic gasket instead of a brass one on the plunger cup.

On the positive side, there was uniform agreement on the malaria clinic furniture (360 sets) as to quality and quantity. Some locally produced furniture did crack, but the problem is minor. The Team saw the furniture being used in the clinics as planned. The Team noted that the Volunteer kits generally were regarded as satisfactory and suitable to the purpose. Some volunteers interviewed thought a bag would have been a more desirable container, but as the volunteer is intended to be stationary, the Team felt the box provided was satisfactory. Most offices reported that sufficient quantities of the volunteer kits were available for their needs.

In general, the Team concluded that effective use of the AID-supplied commodities is being done by the Malaria Division and these commodities are making an important contribution to the program.

5.3.8 Health Education Materials/Equipment

There has been a large amount of health education materials and equipment provided to the Malaria Divison under this project. In the course of the Review specific questions on the use of these AID-supplied materials and equipment were asked of malaria personnel at all levels. The Team found that the posters provided were well used and suitable for the use intended. The malaria personnel linked their increased training in health education with a better understanding of how to use the materials provided by the project.

The malaria staff interviewed said the radio/cassette tape recorders and the tapes recorded with Thai folk songs are very useful for community and youth gatherings. It was reported that these youths later gave full support to the spraying operations resulting in an increase in complete spray coverage. The participants at these meetings also disseminated information about various malaria activities to the villagers.

The malaria staff reported that showing movies in villages is often successful in attracting villagers to large community meetings. The malaria staff believed that the Malaria Program film made 2 years ago has contributed to a higher acceptance of spraying. The Unit Chief of Loei informed the Team that he was able to obtain over a 90% spray coverage in many newly constructed wooden houses in a village of Pak Chom District after using a movie presentation. In Pak Chong Unit, a study was made to compare the percent rate of complete spray between villages with movie presentations on the night before spraying and villages without movie presentations. The results show that the rate of complete spray has markedly increased in villages with movie presentations while in villages without presentations, the rate of complete spray has remained more or less the same as in previous spray rounds. (Annex 3, Table 1 and 2).

It was reported that in many villages the people go out in the early morning to work in the fields and return home in the late evening. The malaria house visitors, therefore, cannot meet them at home during the working hours. When the malaria movies are shown these people also come to watch. The movie provides a good opportunity for the house visitors to take the blood films and provide treatment to people with fever.

At present, all units and sectors have been supplied with basic audio equipment and this has proven to be very helpful in community meetings. Sector personnel have used the mobile loudspeaker sets mounted on vehicles to inform the villagers when the spray teams are to arrive in the villages and this system has resulted in more cooperation from the villagers.

In addition to the routine activities on information, education and communication performed by unit and sector personnel, the Malaria Division has also set up the first week of February to be a "Poster Week". Every unit and sector has to distribute posters and leaflets as much as possible. Other activities during this period include community meetings, showing the movie on malaria and releasing articles on the malaria program to the local radio stations and local press. These activities have created better community understanding and consequently the villagers know who the Village Voluntary Collabortors are and the location of malaria clinics which provide free treatment. The AID-supplied posters and health education materials were heavily used during this special health education effort and contributed to its success.

A number of the Sectors and Units remarked on the usefulness of the Malaria Clinic Worker and Malaria Volunteer Handbooks published under the USAID project. Most of the people interviewed thought these handbooks were well done and assisted personnel in their duties. The Team also observed that the Handbook for Identification of Anopheline Larvae was being used by the malaria personnel, but large stocks of this handbook remain undistributed. The Team was informed that these handbooks would be used in future training sessions.

5.3.9 Vehicle Overhauls

The Team gave special attention to this input element of the program as it is an assistance measure that has not been as successful in other areas where it has been used, such as India. It is a time-consuming, management intensive measure which is subject to abuse at worse and marginal improvement at best. The Team reviewed the impact of this program component with the Regional, Zone/Unit and Sector Chiefs during the field trips. In general, the Team found that its impact on the present program was marginal. Almost every senior officer interviewed suggested that engine replacement rather than engine repair would be more cost effective. A number of the vehicles which were repaired under this program were out of service (Sri Racha, Chaiyaphum, Prachinburi, and Chantaburi) and deadlined. It also was noted that some of these vehicles had been stripped of some engine parts for reported use in other Malaria Division vehicles. The lack of impact on the use of

these repaired vehicles was said to be due to the availability of new Japanese-supplied trucks and the expense of operating the repaired vehicles. In a number of places the repaired vehicles were observed serving a useful purpose in the spraying operation. This element of the project requires a complete audit to determine how cost estimates were developed and to determine end-of-project usage.

5.3.10. Revolving Fund for Motorcycle Hire/Purchase

This project component was evaluated by every office visited as a useful and helpful part of the project. The project will supply almost 600 motorcycles prior to its completion. It expected that over 1,000 motorcycles will be made available for progr m use under this revolving fund mechanism. All motorcycles are Suzuki 125 cc models and have proven reliable and extremely useful for supervision and surveillance. There has been very little abuse of the repayment schedules, as the contract was carefully designed with legal authorities prior to initiating the program. The program has not only had an impact on the operational activities, but has increased morale at the working level. This has been a well-managed, useful feature of the AID project.

5.3.11. RTG Motorcycle Procurement

There have been 300 motorcycles purchased through the loan for the Malaria Division. These motorcycles were procured, on the recommendation of the USAID transportation consultant and by approval of concerned AID/RTG offices, using reprogrammed funds from the vehicle over-haul budget. It has turned out to be a useful program correction, and the Team concluded that this input has increased program efficiency in supervision, timely delivery and despatch of slides and other supplies and in the administration of the program.

6. Specific Recommendations and Comments on Unmet Needs in the Thailand Malaria Program and Future Strategy

Taking into consideration that the Thailand Malaria Program is confronted with many unsolved problems which make the fight against malaria a difficult and complicated task, it is essential that the program should be strengthened further to meet technical and operational demands of malaria control strategy in the present situation. The Team submits the following recommendations on unmet needs based on its limited period of review.

6.1 Anti-Malaria Strategy

6.1.1 Need: To reduce the number of malaria cases in control areas to less than 12 per 1,000 population.

6.1.2 Background

In 1982, a total number of 420,799 malaria cases were reported. It can be assummed that over 90% of those cases contracted disease from the control area covering a population of 10.8 million. On this assumption, the malaria morbidity rate in the control area for 1982 should be approximately 38 per 1,000 population. In order to achieve the goal for the Malaria Control Program as set out in the current Health Development Plan (1982-1986), the annual malaria case incidence must be reduced three times that of the 1982 number. The Team believes that the recent rapid development of malaria clinics has made considerable impact on malaria control. In 1982, malaria clinics had detected and given radical treatment to 52% of all reported malaria cases in the program.

6.1.3 Recommendations

(1) Priority should be given to malaria control activities in control areas.

(2) Adequate and regular support is to be provided for application of all feasible control measures.

(3) In-depth epidemiological review of malarious areas should be done periodically by the Units and Regions, and if specific or additional measures are considered necessary, then prompt actions should be instituted.

(4) Increased technical advice and supervision should be provided to the field staff, especially at sector level.

(5) Establishment of additional malaria clinics where these services are required.

6.2 Epidemiological and Surveillance Operations

6.2.1 Need: To re-evaluate the present malaria case detection policies, procedures and mechanisms.

6.2.2 Background

It has been observed that active case detection (ACD) activities, as carried out at present, have played little part in detecting malaria cases, and the activities also were not carried out uniformly.

It is considered that there is an urgent need to establish well-defined epidemiological criteria for carrying out special surveys. Special surveys should be a prelude to immediate remedial measures in areas where there are reports of epidemics or in border areas where there is difficulty in carrying out routine surveillance. In certain instances, the Team found that special surveys were carried out as a supplement to active case detection. This type of survey increases the laboratory workload and is not particularly productive in detecting positive cases.

The Team believes that the current classification system of the source of infection does not present a true epidemiological picture of an area. For example, the differentiation of imported cases should be more broad based (i.e. whether the case originates from the control or eradication area).

The Team supports the present policy of the Malaria Division on the recruitment of Malaria Volunteer Collaborators, but it is advisable that more Village Health Volunteers of the Ministry of Public Health also should be trained and utilized to assist in the orderly integration of the program into the Primary Health Care system.

6.2.3 Recommendations

(1) The Team suggests that each Region should review all of its current case detection activities and make adjustments as deemed necessary. The Team further suggests that ACD activities in control areas should be reconsidered technically and operationally. If ACD is withdrawn in some of the control areas, the personnel employed in this activity can be utilized in other productive work (e.g. supervising spraying operations, coordinating and motivating Malaria Voluntary Collaborators, etc.).

(2) The Team recommends that special surveys be implemented under strict epidemiological criteria. Precise instructions should be issued uniformly so that the recorded Annual Blood Examination Rate (ABER) excludes the blood film collections by special and mass surveys.

(3) The Team recommends that the current classification system be revised. In addition, the Team suggests that all cases originating in a sector be considered as indigenous cases for that area.

(4) The policy of using Village Health Volunteers as malaria volunteers should be continued and expanded.

6.3 Spray Operations

6.3.1 Needs:

(a) To improve and strengthen the quality and quantity of spray operations.

(b) To ensure that all spray operations are implemented in a safe and environmentally sound manner.

6.3.2 Recommendations

(1) Spraying should only be withdrawn in control areas based on well-defined epidemiological criteria, such as the absence of indigenous cases and a marked lowering of malaria incidence. Increased efforts should be made to improve spray coverage in areas where spraying has been retained. The Team suggests that improvement in spray coverage can be accomplished by intensive health education, along with constant and effective supervision of spraying activities.

(2) It is necessary that all operators of fogging machines be trained in the proper caliberation of the machines and in correct application of thermal fog with a minimum of wastage and a maximum of environmental protection.

(3) It is recommended that the following minimum precautions be taken in applying organo-phosphate (O.P.) insecticides:

(a) Rigorous training and retraining of spray personnel in the correct use of fenitrothion and other O.P. compounds with special emphasis on transportation, safe handling, storage and application. Intense field supervision to insure compliance to safety standards for the protection of the community as well as malaria workers. As there is a rapid turnover of seasonal spraymen, continuous training and in-service training on safety measures should be provided to squad chiefs and spray personnel before each spray round.

(b) In spray operation areas where fenitrothion or other O.P. insecticides are used, all spray personnel are to be tested for normal cholinesterase levels prior to any exposure (handling, storage and application). Periodic re-testing should be carried out on all spray personnel to monitor cholinesterase levels.

(c) Provision of adequate protective clothing and equipment to spray personnel is required.

(d) Increased environmental and health safeguard practices are to be applied in areas using DDT formulations.

6.4 Operational Entomology

6.4.1 Need: To increase the significance of entomological operations.

6.4.2 Recommendations

(1) Dissect primary vectors for sporozoites.

(2) Determine vector breeding areas in problem areas.

(3) Re-evaluate susceptibility testing program.

(4) Initiate more intensive field supervision.

6.5 Training

6.5.1 Need: To provide the necessary level of training to meet the present and future needs of the Malaria Program.

6.5.2 Recommendations

(1) As AID assistance in pre-service and refresher training courses for Unit Chiefs, Sector Chiefs, Malaria Clinic Workers, auto-mechanics, and Malaria Voluntary Collaborators has proven invaluable, the Team recommends that this training be continued and that adequate funds be provided for this program.

(2) As entomology is playing a more and more important role in epidemiological stratification and malaria control strategy, and as newer techniques are constantly being developed in the field, the Regional Entomological Assistant and the Chief of the Investigation Team at the Unit level should be trained for 1 month before being assigned to supervise entomological activities. This initial training should be followed-up annually with a week's refresher course.

(3) To improve passive case detection and to motivate health personnel to assist in anti-malaria efforts, it is recommended that public health personnel, hospital and para-medical staff be provided short, well-prepared, intensive training courses at the Malaria Training Center or at the Regional training facilities.

(4) The Team recommends that fellowship funds be restricted to the number of available graduates, and any additional funds should be utilized for short-term courses in epidemiology and entomology, observation tours, etc.

(5) To maximise the benefits accruing from an observation tour, it is recommended that the interests and expertise of selected participants should be submitted in advance to the host country, in order that an appropriate program can be arranged.

(6) It is recommended that in the processing of fellowship and observation tours that every effort should be made to complete procedural requirements in a timely fashion.

6.6 Health Education

6.6.1 Need: To increase community consciousness and participation in the Malaria Control Program.

6.6.2 Recommendations:

(1) It is recommended that the supply of posters and pamphlets be continued. It is suggested that in the future consideration be given to the productionof more durable posters.

(2) Health education activities at the malaria clinics be strengthened through active participation of clinic staff.

(3) As the movie film on malaria produced with AID assistance was well received by malaria personnel and communities, the Team recommends that more publicity and more intensive coverage be given to this film within the country. It is further suggested that the program may wish to consider the production of additional films on malaria.

(4) School teachers should be motivated to assist in the administration of drug treatment and in providing health education on malaria to their students and the community.

6.7 Commodities

6.7.1 Need: To insure an adequate level of commodities to carry out the activities of the approved program.

6.7.2 Background

There will continue to be a major need for the procurement of commodities for operational use in the Thailand Malaria Program. Such items as insecticides, vehicles, sprayers, spareparts, laboratory equipment and drugs are basic to program needs. For example, the Team was informed that the present program requires 800 metric tons (MT) of DDT, 75% wettable powder, to carry out the approved program, but RTG budget allocations do not cover this requirement. In addition, the malaria program would like to carry out a replacement program of 60 four-wheel vehicles and 100 motorcyles per year in their fleet.

6.7.3 Recommendations

(1) Careful planning should be undertaken to determine commodity needs and to develop a supply system which insures timely delivery.

(2) Any commodity which is ordered should have clear, precise specifications in order to avoid obtaining poor quality materials.

(3) Increased funds should be allocated for the additional requirements of insecticides, vehicles and motorcycles.

6.8. Capital Improvement

6.8.1 Need: To provide adaquate working facilities for the Malaria Field Units.

6.8.2 Background

The need for permanent unit offices is appropriate as malaria control will remain a long-term effort. The Team feels that a provision for construction of suitable Malaria Unit offices would improve operational and managerial skills. At present, 12 more Malaria Units need adequate and permanent accommodations.

6.8.3 Recommendation

(1) Prepare justification and cost estimates for the required buildings.

6.9 Transportation

6.9.1 Needs: To provide efficient and economical transportation for field workers.

6.9.2 Background

The malaria program by its very nature requires a mobile work force to implement activities, supervise, transport men and materials and to evaluate its efforts.

6.9.3 Recommendations

(1) to continue the revolving fund for motorcycles.

(2) to prepare and carry out a vehicle replacement program.

(3) to require that vehicle control and maintenance procedures are in place and enforced.

6.10. Laboratory Services

6.10.1 Need: To improve the quality of the stained blood slide.

6.10.2 Background

The Team observed that the technique of taking blood slides by certain volunteers and malaria clinic workers and the staining procedures used by some malaria clinics did not meet approved standards. Although considerable time has been spent both in pre-service and refresher training on these aspects, constant and close supervision by the immediate supervisors is necessary to improve the quality of the thick smear and to minimize faulty staining. Efforts must be made to collect the blood films taken by the volunteer and PCD posts with a minimum of delay, so that the blood films will not become fixed.

6.10.3 Recommendation

(1) Improve supervision of the microscopist by Unit and Sector Officers.

(2) Stress the importance of obtaining a good blood slide at the time of training.

(3) Stain blood slides in accord with the set procedures of the Malaria Division.

(4) Timely collection of blood films from malaria voluntary collaborators.

6.11 Technical Assistance

6.11.1 Need: To provide additional technical and/or managerial assistance to solve specific problems facing the Malaria Program.

6.11.2 Background

The Team felt that there were program areas where further technical assistance might be useful - data management and system development including computer use, vector control including the improvement of operations, applied research; training; and coordination with the public health services. It was noted that the Health Education Technique Course contracted to Mahidol University was most beneficial. Technical assistance also was provided from other in-country sources. It would be, however, a decision of the RTG whether these services are available from in-country sources.

6.11.3 Recommendation

(1) Technical assistance should be sought in the fields of data management, vector control, training and applied research.

6.12 Research

6.12.1 Need: To solve scientifically the technical and operational problems facing the Malaria Program.

6.12.2 Background

Thailand, for many reasons, remains one of the best places in the world to study human malaria. There are high-quality scientists at the universities and government institutes throughout the country. Laboratories are well-equipped and staffed, providing resources for the latest technological approaches (e.g. use of monoclonal antibodies or recombinant DNA). Hospital staffs are cooperative and helpful during studies on malaria patients. Access to endemic malarious areas is facilitated by a good road network, and rural people are ameniable to entomological and epidemiological investigations of their villages.

Despite the large effort expended in solving problems in malaria, the disease still flourishes. The areas of drug-resistant malaria, vector identification, vector behaviour, surveillance and control contain many applied research problems. These are the areas that should be given research emphasis by the National Malaria Program in Thailand.

The Team feels that there are many questions to be answered by malaria personnel in relation to current control problems. Some questions of immediate concern are:

(1) Is the combination drug sulfadoxine/pyrimethamine still effective in the South?

(2) Is Anopheles maculatus the primary vector of human malaria in the South?

(3) Are larvivorous fish effective vector control agents?

(4) Is Anopheles minimus still controlled by indoor residual spraying?

(5) What percent of spray coverage provides significant vector control in a village situation?

(6) In what epidemiological situations is insecticide fogging an effective control measure?

(7) What degree of larviciding will provide effective vector control in the dry season?

(8) Will community - wide use of bednets reduce indigenous malaria transmission in a village situation?

(9) What changes in malaria transmission occur following deforestation of land for agricultural use?

6.12.3 Recommendations

(1) Although some of the USAID - supported research projects did make an impact on the overall program, the Team recommends that these ideas not be dropped. However, the Team recommends that experimental designs be modified so that hypotheses can be scientifically proven or refuted. Modifications should include definitive controls and planned data analyses. Experiments should be supervised directly by the responsible investigators, not by the local field staff.

(2) Provision of a course annually on experimental methodology at one of the universities or at the National Research Council;

(3) Provision of continuing education courses in association with scientific meetings;

(4) Establishment of a formal panel of Thai scientists to establish research priorities in malaria and to prevent duplication of effort;

(5) Increased collaboration with investigators from the universities or other governmental institutes on projects specifically designed to answer malaria control problems;

(6) Addition of a statistician (M.Sc.) to the Malaria Division;

(7) Addition of more research - oriented supervisory staff members (M.Sc. or Ph.D.);

(8) To reduce the diversion of essential field staff from operational duties through the use of public health workers and teachers, who have been given training in malaria.

(9) A national malaria research meeting should be held annually.

6.13 Finance

6.13.1 Need: To obtain the necessary financial support to carry out the planned approved program.

6.13.2 Recommendation

(1) That the Malaria Program be adequately financed in order that the approved Plan of Operation can be implemented.

7. ACKNOWLEDGEMENTS

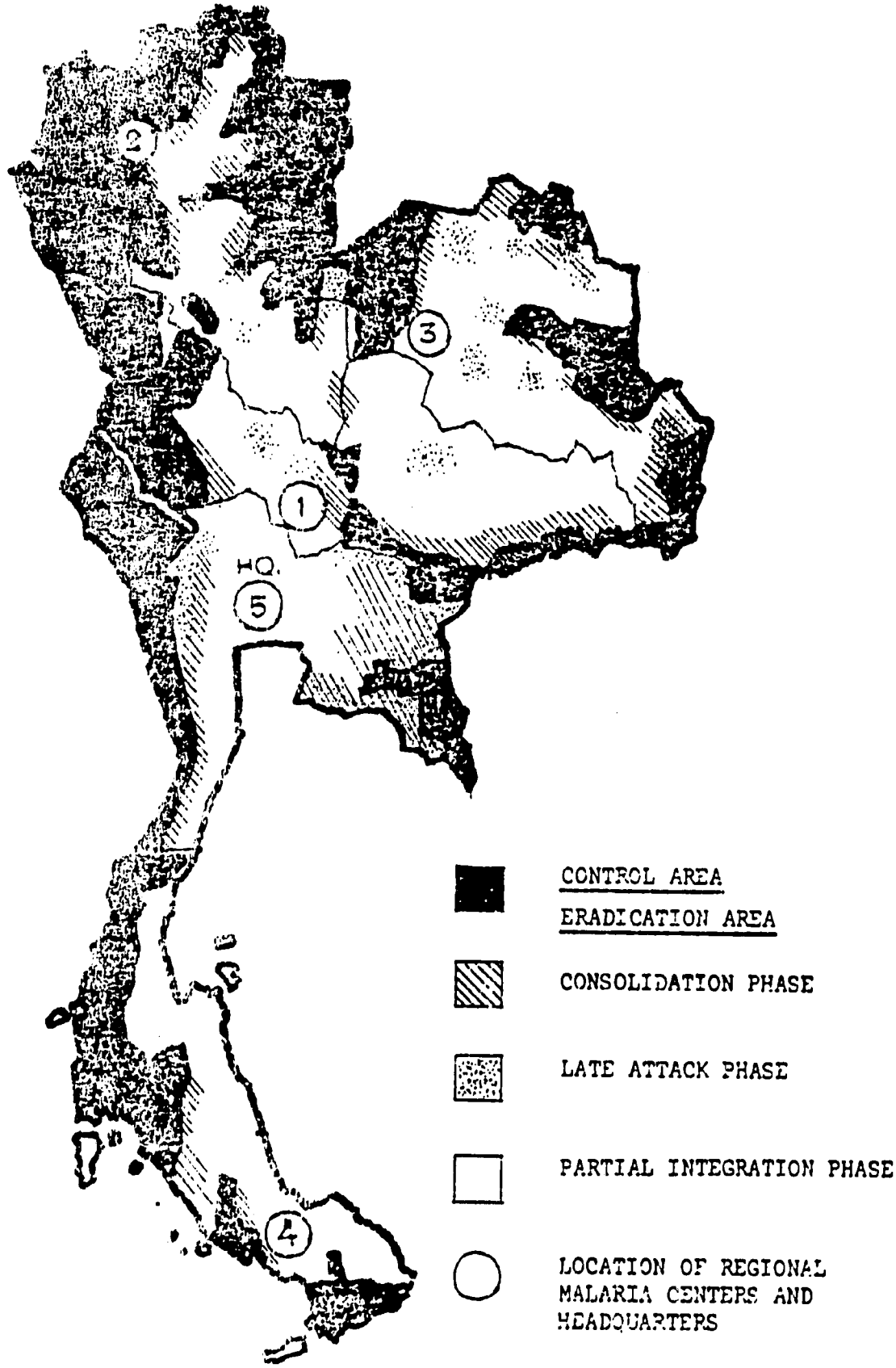
The Team wishes to express its sincere appreciation to the Director of the Malaria Division and his staff at all levels for providing general information and a comprehensive picture of the present malaria situation. In addition, the Team wishes to express its special thanks to the USAID Project Officers (Health) and the USAID Project Monitor who accompanied the Team on field trips and provided very valuable assistance in obtaining an accurate picture of the AID project activities.

The Team wishes to acknowledge its special thanks and appreciation to the Directors and Assistant Directors of Regions I, II, III, IV, V, and their staff stationed at the Units and Sectors for their willing assistance and the outstanding hospitality afforded the Team members.

All members of the Team would like to express their graditude for the support and help afforded by the Director General of the Department of Communicable Disease Control, his two deputies, Director of USAID Bangkok, his staff, and the World Health Organization Program Coordinator and Senior Malariologist to Thailand.

MAP 1

THAILAND
AREAS OF MALARIA PROGRAM REGIONS
AND ACTIVITY AREAS



MAP 2

THAILAND
MAP INDICATING NUMBER OF MALARIA CLINIC BY MALARIA UNITS

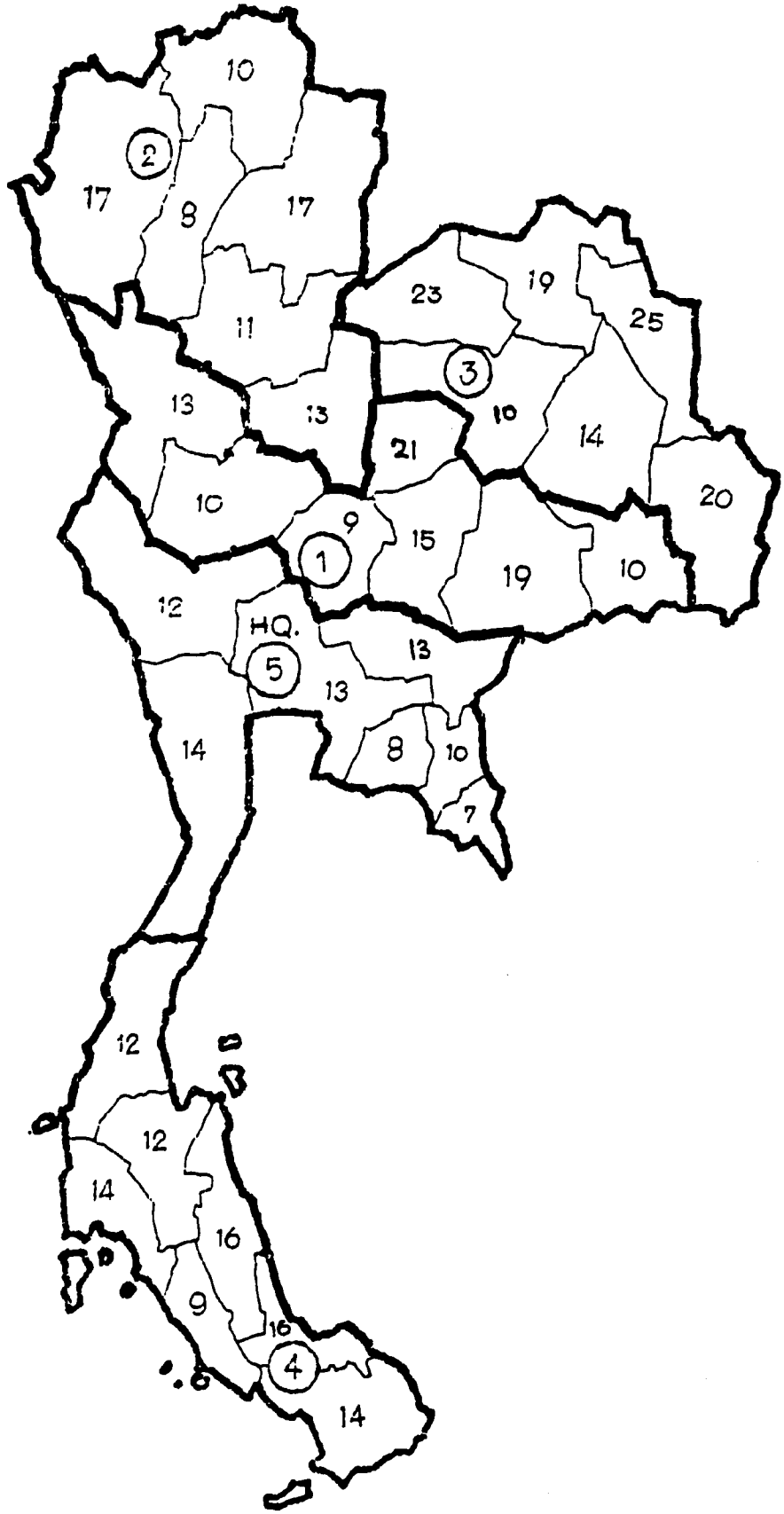


Table 1

Result of Blood Films Examined in Unit 1, Sriracha
in the First Eight Months of FY* 1982 and FY 1983

	FY 1982 Up to May	FY 1983 Up to May
Bl. films exam.	53,572	54,268
Positives	7,616	6,030
SPR	14.2	11.1

Table 2

Result of Blood Films Examined in Unit 7, Chantaburi
in the First Nine Months of FY 1982 and FY 1983

	FY 1982 Up to June	FY 1983 Up to June
Bl. films exam.	187,866	164,208
Positives	28,706	15,401
SPR	14.1	9.38

Table 3

Result of Blood Films Examined in Unit 4, Chaiyaphum in the First Eight Months of FY 1982 and FY 1983

	FY 1982 Up to May	FY 1983 Up to May
Bl. films exam.	113,011	86,538
Positives	7,521	3,532
SPR	6.6	4.08

Table 4

Result of Blood Films Examined in Sector 4, Ban Khai, Rayong in the First Eight Months of FY 1982 and FY 1983

	FY 1982 Up to May	FY 1983 Up to May
Bl. films exam.	6,753	5,771
Positives	1,193	510
SPR	17.6	8.8

Table 5

Result of Blood Films Examined in Sector 6, Bamnetnarong, Chaiyaphum in the First Eight Months of FY 1982 and FY 1983

	FY 1982 Up to May	FY 1983 Up to May
Bl. films exam.	12,779	10,639
Positives	1,324	641
SPR	10.3	6.0

Table 6

Result of Blood Films Examined in Sector 1, Arunyaprathet, Prachinburi in the First Nine Months of FY 1982 and FY 1983

	FY 1982 Up to June	FY 1983 Up to June
Bl. films exam.	19,707	21,783
Positives	635	453
SPR	3.2	2.08

*FY = October to September

ANNEX 2

Table 1

Results of Spraying Operations in 1981 and 1982

	1981		1982	
	Cycle 1	Cycle 2	Cycle 1	Cycle 2
Total houses	764,161	395,585	792,118	472,468
*% Complete Spray	59.9	61.7	64.0	71.3
% Incomplete Spray	31.3	31.9	28.8	21.4
% Unspray	8.8	6.4	7.2	7.3
Total Farmhuts Sprayed	351,448	279,660	373,564	276,802
Population in Sprayed Houses	3,416,117	1,813,504	3,544,340	2,110,518

*% Rounded.

Table 1

Complete Spray Coverage in Villages of Pak Chong
Before and After Movie Showing

Village No.	Canton	% of Complete Spray Coverage	
		1982 No Movie Showing	1983 After Movie Showing
9	Khanong Phra	71.8	86.9
10	"	81.7	85.4
11	Wang Kata	65.0	72.2
10	"	63.4	72.0
10	Nong Sarai	63.6	76.2
4	Lam Sompung	61.6	80.6
6	"	62.2	87.5
8	"	76.1	90.5
10	Hin Dad	64.9	82.1
16	"	73.2	89.0
10	Wang Nam Cheo	88.2	81.9
13	"	84.9	87.4
17	"	63.1	87.2

Table 2

Complete Spray Coverage in Villages of Pak Chong
With No Movie Showing

Village No.	Canton	% of Complete Spray Coverage	
		1982	1983
		No Movie Showing	No Movie Showing
11	Khanong Phra	77.9	71.9
5	Wang Kata	73.3	67.8
3	Lam Sompung	72.3	71.7
11	Hin Dad	67.0	63.2
15	Wang Nam Cheo	82.3	85.6

ANNEX 4

Table 1

Budget Expenditures from RTG 1978-1983

Categories	1978	1979	1980	1981	1982	1983
	(Millions of Baht)					
Salaries	15.50	16.57	16.70	21.45	27.72	33.79
Permanent wages	47.35	49.56	55.69	70.35	73.03	86.12
Temporary wages	17.24	17.24	18.23	21.86	22.36	25.99
Remunerations	1.15	1.42	1.49	2.54	3.47	3.58
Operating Expenses	10.88	15.51	14.89	15.14	17.65	21.17
Utility Expenses	-	-	0.85	0.93	1.12	1.60
Supply and Materials	56.12	59.46	60.57	53.42	68.44	69.94
Equipment	2.55	4.18	4.76	2.45	3.02	2.61
Land and Construction	3.4	3.39	0.12	0.50	1.13	1.32
Other	0.16	0.54	-	-	-	-
Total	154.43	167.38	173.30	188.67	217.95	246.12

ANNEX 5

STEPS IN RESEARCH

1. A clear identification and statement of the problem to be investigated.

2. A tentative formulation and statement of the major objectives.

3. Analysis of the reasons and justification for undertaking the work on this topic.

4. A thorough review of the published literature supplemented by any other sources of information available, to determine what is now known on this and directly related subjects and specifically the points at which information is lacking and further research needed.

5. A re-statement of the objectives in light of the above.

6. Formulation of tentative hypotheses as to the direction in which the solutions may be found or the basic principles which might seem to be applicable.

7. In light of the above, design of specific experiments which will give clear evidence as to the extent to which these hypotheses may apply.

8. Experimentation, with ruthless adherence to objectivity in making and recording observations.

9. Analysis of the data and its interpretation.

10. Publication of data and conclusions.

Malaria Division Applied Research Projects
(Not funded by USAID Project)

	Title	Principal Investigator	Time	Funded By	Status
1.	Regional collaborative studies on drug-resistant malaria.	Mrs. Laksami Suebsang	1977 - 1983	WHO/SEARO	In progress
2.	Studies to determine the effectiveness of the presumptive treatment regimen at present in use.	Dr. Somthas Malikul	1978 - 1983	TDR	Completed
3.	A small scale trial of Bendiocarb (FICAM) against An.balabacensis and An. minimus.	Dr. Chusak Prasittisuk	1980 - 1981	Chesterford Park Research Station, England.	Completed
4.	Field research on the development of the microculture test kits for assessing the sensitivity of P. falciparum to chloroquine and mefloquine in Thailand.	Mrs. Laksami Suebsang	1980 - 1983	TDR	In progress
5.	A study of the effect of different levels of coverage of intradomiciliary spraying on the An. minimus in a foothill malaria control area of Thailand.	Mr. Suthas Nutsathapana	1981 - 1983	TDR	In progress
6.	Colonization of Anopheles minimus (Theobald) and its insecticide resistance status.	Miss Nilobol Vanicha	1981 - 1982	USAID Fellowship	Completed
7.	The role of Anopheles maculatus (Theobald, 1901) in malaria transmission in Thailand	Mr. Dakorn Limratana	1981 - 1982	WHO Fellowship	Completed

	Title	Principal Investigator	Time	Funded By	Status
8.	Clinical trails with mefloquine	Dr. Surin Pinichpongse	1982 - 1983	Roche Foundation	Completed
9.	Clinical trials with mefloquine: double blind randomized comparative trial with mefloquine versus mefloquine and sulfadoxine/ pyrimethamine in outpatients suffering from symetomatic falciparum malaria	Dr. Surin Pinichpongse	1982 - 1983	TDR	In progress
10.	A small scale trials of Bacillus thuringiensis var. israelensis against An. minumus in slow-running streams.	Dr. Chusak Prasittisuk	1982 - 1983	SANDOZ LTD. Switzerland	Complete
11.	Preliminary studies on the control of Anopheles minimus (Theobald, 1901) larvae in natural running streams by drip application of Temephos (OMS-786).	Mr. Suchart Phatipongse	1982 - 1983	WHO	Completed
12.	Development of seroepidemiology capability in the anti-malaria program using immunofluorescent antibody test.	Dr. Surang Tanpradist	1982 - 1984	TDR	In progress
13.	Study of the effectiveness of radical treatment of P. falciparum by four different brands of sulfadoxine/pyrmethamine	Dr. Krongthong Thimasarn	1982	Malaria Division	Completed
14.	Studies on the use of some medicinal plants as a mosquito-repellent	Miss Nilobol Vanicha	1982	Malaria Division	Completed

	Title	Principal Investigator	Time	Funded By	Status
15.	In vitro study on the antimalarial action of plants upon Plasmodium falciparum	Mr. Chawalit Tassanaswang	1982 - 1983	USAID Fellowship	Completed
16.	Large-scale field trail of mefloquine to combat multi-drug resistant falciparum malaria in Thailand (TMP)	Dr. Surin Pinichpongse	1983 - 1985	TDR	In progress
17.	Studies on the bionomics of An. maculatus and its role in malaria transmission	Dr. Suchart Upatham & Dr. Chusak Prasittisuk	1983 - 1984	BOSTID, NAS Washington D.C.	In progress
18.	Comparison of two in vitro techniques for culture of Pasmodium falciparum in the production of antigen for immunologic evaluation of malaria endemicity by a national malaria service.	Dr. Udom Chitprarop	1983 - 1985	USAID Grant	In progress

RECENT PUBLICATIONS OF THE MALARIA DIVISION
1977 - 1983

Cullen, J.R.,Chitprarop, U., Doberstyn, E.B. and Sombatwattanangkul, K. 1983. An epidemiological early warning system for malaria control in Northern Thailand. WHO/MAL/83. 994

Ismail, I.A.M.,Pinichpongse, S. and Boonrasri, P. 1978. Response of Anopheles minimus to DDT residual spraying in a cleared forested foothill area in central Thailand. cta Tropica 35:69-82

Ismail, I.A.H and Pinichpongse, S. 1980. Monitoring susceptibility of malaria vectors and suspected vectors to pesticides in Thailand. WHO/MAL/80. 923

Ismail, I.A.H., Pinichpongse, S., Chitprarop, U, Prasittisuk, C. and Schepens, J. 1982. Trials with CDC and Monks Wood Light-Traps for sampling malaria vectors in Thailand. WHO/VBC/82. 864

Limratana, D. 1982. The role of Anopheles maculatus (Theobald, 1901) in malaria transmission in Thailand. M.Sc. Thesis, Mahidol University.

Phatipongse, S. 1983. Preliminary studies on the control of Anopheles minimus (Theobald, 1901) larvae in natural running streams by drip application of Temophos (OMS - 786). M.Sc. Thesis, Mahidol University

Pinichpongse, S., Doberstyn, E.B., Cullen, J.R., Yisunsri, L., Thongsombun, Y. and Thimasarn, K. 1982. An evaluation of five regimens for the outpatient therapy of falciparum malaria in Thailand 1980-1981. Bull. WHO, 60:907-912.

Prasittisuk, C. and Busvine, J.R. 1977. DDT - resistant mosquito strains with cross-resistance to Pyrethroids. Pestic. Sci., 8:527-533

Prasittisuk, C. and Curtis, C.F., 1982. Further study of DDT resistance in Anopheles gambiae Giles (Diptera:Culicidae) and a cage test of elimination of resistance from a population by male release. Bull. ent. Res. 72:335-344.

Prasittisuk, C. and Curtis, C.F. 1982. Absence of effects of insecticides on susceptibility of Anophelines to Plasmodium yoelii nigeriensis. Southeast Asian J. Trop.Med.Pub.Hlth. 13:127-132

Vanicha, N. 1982. Colonization of Anopheles minimus (Theobald) and its insecticide resistance status. M.Sc. Thesis, Mahidol University

Yisunsri, L. 1980. *In vitro* microtechnique for determining the drug susceptibility of cultured parasites of *Plasmodium falciparum*. Trans. Roy. Soc. of trop. Med. and Hyg. 74:809-816

ANNEX 8

FINAL EVALUATION OF USAID ANTI-MALARIA PROJECT

SUMMARY OF GRANT FUND STATUS

(As of June 30, 1983)

Line Item	Budget Obligation (U.S. Dollars)	Estimated Expenditures to PACD	Estimated Balance on September 30, 1983
1. Technical Assistance	$200,187.-	$151,872.-	$48,315.-
2. Training	198,457.-	197,432.-	1,025.-
3. H.E. Materials	52,035.-	52,035.-	-
4. Evaluation	40,000.-	26,410.-	13,590.-
5. Contingency	9,321.-	8,824.-	497.-
Total	$500,000.-	$436,573.-	$63,427.-

ANNEX 9

FINAL EVALUATION OF USAID ANTI-MALARIA PROJECT

Summary of Loan Fund Component of Project (as of June 30, 1983)

Line Item	Budget Obligation (US $))	Budget * Obligation (Baht)	Total Expenditures to Date	Total Projected Expenditures	Projected Balance
1. Training	$579,000.-	B 12,754,721.-	B 7,086,200.59	B 12,754,721.-	B -
2. Research	100,000.-	2,235,140.-	546,211.51	865,736.-	1,369,404.-
3. Capital Improvements	1,093,643.10	24,463,831.-	20,118,753.50	21,118,753.50	3,110,658.50
4. Commodities	1,196,222.-	25,888,417.-	21,154,572.88	24,838,300.38	1,050,116.62
5. Vehicle Overhauls	152,103.-	3,402,794.-	3,234,612.-	3,402,794.-	-
6. Health Education	205,000.-	4,407,602.-	4,372,647.-	4,407,602.-	-
7. Revolving Fund	435,116.34	10,012,000.-	10,012,000.-	10,012,000.-	-
8. Motorcycles	212,156.30	4,398,000.-	4,398,000.-	4,398,000.-	-
9. Contingency	26,759.26	615,463.-	-	-	615,463.-
Total	$4,000,000	B 88,177,968.-	B 70,922,997.48	B 82,032,325.88	B 6,145,642.12

* Budget obligation in Baht estimated at 20:1 exchange rate until July 16, 1981 and thereafter at 23:1

ANNEX 10

Location of Malaria Clinics by Region

Region	Regional or Unit Office	Sector Office	Other Public Health Facilities	Community Donated Facilities	Total
1. Phraputthabat	7	45	33	12	97
2. Chiangmai	6	49	21	-	76
3. Khon Kaen	5	47	38	21	111
4. Songkhla	6	58	27	2	93
5. Bangkok	8	49	9	11	77
Total	32	248	128	46	454

DRUG REGIMENS IN USE IN MALARIA PROGRAM IN THAILAND

A. PRESUMPTIVE TREATMENT

(1) Single dose

S 1000 mg
P 50 mg
+ prim. 30 mg

or (2)

Dose 1	Dose 2
CHL 300 mg	CHL 300 mg
prim 15 mg	prim 15 mg

B. RADICAL TREATMENT

P. FALCIPARUM (PF)

(1) In areas where Pf. is still sensitive to S/P

Day 1	Day 2	Day 3	Day 4	Day 5
S 1000 mg, P 50 mg + prim 15 mg	prim 15 mg	prim 15 mg	prim 15 mg	prim 15 mg

(2) In areas where Pf. is less sensitive to S/P

Day 1	Day 2	Day 3	Day 4	Day 5
S 1500 mg, P 75 mg + prim 15 mg	prim 15 mg	prim 15 mg	prim 15 mg	prim 15 mg

(3) In areas where Pf. is resistant to S/P, especially infections from Chantaburi and Trad Provinces.

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Q 600 mg x3	Q 600 mg x 3	Q 600 mg x 3	-	-	-	
T 250 mg x4	T 250 mg x 4	T 250 mg x 4	T 250 mg x 4	T 250 mg x 4	T 250 mg x 4	T 250 mg x 4
prim 15 mg	prim 15 mg	prim 15 mg.	prim 15 mg	prim 15 mg		

For children, age lower than 9 years, use only quinine and primaquine

P. VIVAX and P. MALARIAE

Day 1			Day 2	Day 3	Day 4 - 14
Dose 1	Dose 2	Dose 3			
CHL 300 mg	CHL 300 mg	CHL 300 mg prim 15 mg	CHL 300 mg prim 15 mg	CHL 300 mg prim 15 mg	prim 15 mg

NOTE: S/P - Sulfadoxine/Pyrimethamine
CHL - Chloroquine
Prim - Primaquine
Q - Quinine
T - Tetracycline

ANNEX 12

Plan of Action 1983

Malaria Control and Eradication Program

in Thailand

Region	Provinces/ Districts/ Subdistricts	Cantons/ Municipalities Land Settlement	Villages	Population (1 July 1982)	Control Area				Eradication Area			
					Villages	Population Unsprayed	Sprayed 1 Cycle	Sprayed 2 Cycles	Villages	Population Co	PI	FI
I	12/110/16	1,212+23M	12,908	9,816,401	1,679+(80)	876,069	247,661	323,115	11,149+(80)	190,204	8,179,352	-
II	13/112/11	984+18M	8,690	7,501,697	3,993+2M+(280)	2,351,796	552,109	302,032	4,412+16M+(5)	584,513	3,711,247	-
III	11/133/26	1,297+15M	15,195+1L	10,027,992	3,801+1M+1L+(356)	1,964,657	151,693	495,771	10,577+14M+(461)	-	7,415,871	-
IV	14/107/16	938+25M+10L+1H+1C	6,498	5,592,152	2,529+6M+4L+1H+1C(599+15M+4L)	1,244,878	497,501	579,952	3,370+4M+2L	199,100	3,070,721	-
V	22/168/8	1,601+45M	12,399	13,986,083	1,226+(306)	686,492	105,581	432,331	10,822+(45)	227,572	4,028,582	8,505,525
Whole Country	72/638/77	6,032+126M+10L+1H+1C	55,690+1H	46,924,325	13,228+9M+5L+1H+1C (1621+15M+4L)	7,123,892	1,554,545	2,133,201	40,330+34M+2L+(591)	1,201,389	26,405,773	8,505,525

H = Municipality
L = Land Settlement
H = Hamlet
C = Center

Co = Consolidation Phase
PI = Partial Integration Phase
FI = Full Integration Phase

FINAL REVIEW OF THE ANTI-MALARIA PROJECT IN THAILAND

Summary Report of Sites Visited By Team Members (2 Teams) During the Review

	Site	Date Visited
Region I	Malaria Unit 7, Pak Chong	
	Sectors 1 and 2, Pak Chong	(July 7)
	Sector 7, Pakthongchai	(July 10)
	Malaria Unit 4, Chaiyaphum	
	Sector 6, Nongbuaraway and	
	Sector 4, Bumnetnarong	(July 8)
	Malaria Unit 5, Nakhon Ratchasima	
	Sector 1, Khonburi	(July 9)
	Malaria Unit 2, Nakhon Sawan	
	Sector 8, Uthai Thani	(July 20)
	Region Center I and Malaria	
	Training Center, Phraputthabat	(July 21)
Region II	Malaria Unit 4, Phitsanulok	
	Sector 1, Nakhon Thai	
	Sector 4, Sapraiwan	(July 19)
	Region Center II, Chiangmai	(July 20)
Region III	Region Center III, Khon Kaen	
	Malaria Unit 6, Loei	
	Sector 1, Dan Sai	(July 18)
	Sector 7, Pak Chom	(July 19)
Region IV	Region Center IV, Songkhla	
	Malaria Unit 2, Songkhla	
	Sector 1, Taphong	(July 7)
	Malaria Unit 4, Nakhon Sri Thammarat	
	Sector 8, Chauat	
	Sector 10, Patalung	(July 8)
	Sector 7, Chwang	(July 9)
	Malaria Unit 5, Surat Thani	
	Sector 1, Khiansa	(July 9)
	Sector 5, Chaiya	(July 10)
	Malaria Unit 6, Chumporn	
	Sector 4, Langsuan	(July 10)
	Sector 2, Thasae	(July 11)

	Site	Date Visited
Region V	Malaria Unit 2, Prachinburi	
	Sector 7, Wattananakhon	
	Sector 1, Aranyaprathet	(July 10)
	Sector 2, Srakaew	(July 11)
	Malaria Unit 4, Phetburi	
	Sector 2, Chombung	(July 12)
	Region Center V, Bangkok	(July 13)
	Malaria Unit 1, Sri Racha	(July 14)
	Sector 1, Ban Khai (Unit 5, Rayong)	
	Sector 4, Klaeng (Unit 5, Rayong)	(July 14)
	Malaria Unit 7, Chantaburi	
	Sector 7, Pongnamron	
	Sector 4, Muang	(July 15)
	Malaria Unit 6, Trad	
	Sector 3, Khaosaming	(July 16)