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USAID ANTI-MALARIA PROJECT

MID-TERM EVALUATION

JULY 1-27, 1981

O/HPN

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TABLE OF CONTENTS

| | <u>Page</u> |
|---|-------------|
| 1. Introduction | 3 |
| 1.1 Reason for Review | 3 |
| 1.2 Team Members | 3 |
| 1.3 Terms of Reference | 5 |
| 1.4 Field Visit Description | 5 |
| 2. Present Status of Malaria | 7 |
| 2.1 Background, Epidemiology, Surveillance | 7 |
| 2.2 Spraying | 9 |
| 2.3 Entomology | 13 |
| 2.4 Health Education and Training | 19 |
| 2.5 Fiscal/Budget | 31 |
| 2.6 Administration | 36 |
| 2.7 Research | 37 |

| | <u>Page</u> |
|---|-------------|
| 3. Evaluation of the Impact of the USAID Anti-Malaria Project on Thailand's Control Activities..... | 42 |
| 3.1 Objectives and Goals of the Malaria Programme of Thailand | 42 |
| 3.2 Objectives and Purposes of the USAID Malaria Control Project..... | 42 |
| 3.2.1 Present Progress and Accomplishments | 43 |
| 3.2.2 Problems Impeding Progress..... | 47 |
| 3.2.3 Future Planning and Activities of the USAID Anti-Malaria Project..... | 49 |
| 4. Alternative Methodologies..... | 54 |
| 4.1 Biological, Chemical, Physical, and Mechanical..... | 54 |
| 4.2 Drug Treatment | 59 |
| 5. Recommendations..... | 63 |
| 6. Acknowledgements..... | 72 |
| 7. Annexes..... | 73 |

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1. Introduction

1.1 Reason for the Review

The Thailand Project Paper for the three-year Anti-Malaria Project #493-0305 called for mid-term and final, end-of-project, evaluations. The first major evaluation, using external expertise, was planned for December, 1980. A subsequent USAID-RTG internal evaluation was scheduled to be held in 1981.

The program evaluation reported here combines the external and the internal evaluations into a single review, and comes at about the midpoint of the project, which started in August, 1979 and is to be completed in December, 1982. Both external and internal members of the evaluation team are noted in the next section.

Timing of this evaluation has special significance in view of the increasing rate of resurgence of malaria cases in Thailand. Reported malaria cases, which have been increasing steadily since 1970, showed a 31 percent rise in 1980 over 1979 - 397,491 cases reported in 1980 compared with 303,173 reported in 1979. Also of concern, the more serious falciparum strain of malaria increased 11 percent, to 69 percent of all reported cases, in that one year period.

The evaluation team has been asked to look at the many complex factors influencing the resurgence of malaria in Thailand, particularly those issues addressed by the USAID-Anti-Malaria Project. It is hoped that findings and recommendations of the Team will have immediate short-term application in the conduct of the USAID Anti-Malaria Project and also contribute toward the long-term objectives of the National Programme.

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1.3 Terms of Reference

1.3.1 Evaluate progress towards attainment of the objectives of the project;

1.3.2 Identify and evaluate problem areas or constraints which may inhibit such attainment;

1.3.3 Assess how such information may be used to help overcome such problems;

1.3.4 Review the present status of malaria and make recommendations for project and program improvement.

1.4 Field Visit Description

Field visits arranged for the Evaluation Team included trips to selected highly malarious areas in provinces and zones which, together, account for more than 50 percent of all malaria cases reported in Thailand. These cluster provinces are located mainly along the borders of Thailand with Malaysia, Burma and Kampuchea. They constitute the zone of operations which will probably remain in the control phase of the program for many years.

Four field trips followed a general briefing of program operations in Bangkok by the Malaria Division on July 1. The itinerary was as follows:

1.4.1 Field Trip #1

| | | |
|--------|--|---|
| July 2 | Region IV, Songkhla Zone 1, Yala | Briefing Briefing |
| July 3 | Zone 1, Yala and Narathiwat | Visit Malaria Clinics, Volunteers, Sector Offices |
| | Zone 2, Songkhla (includes Pattani) | " " |
| | Haad Yai | Overnight |
| July 4 | Zone 3, Phang-nga (includes Phuket) | Briefing, visit Malaria Clinics, Volunteers, Sector Offices |
| July 5 | Zone 3, Phang-nga | Observe Field Activities |
| July 6 | Phuket-Bangkok | Return to Bangkok |

1.4.2 Field Trip #2

| | | |
|---------|--|---|
| July 8 | Region V, Zone 5, Rayong and part of Chonburi and Trat | Briefing, Visit Sector Offices, Malaria Clinics, Volunteers |
| July 9 | Zone 6, Trat Chantaburi | " " |
| July 10 | Zone 7, Chantaburi | " " |
| July 11 | Chantaburi-Bangkok | Return to Bangkok |

1.4.2 Field Trip #3

| | | |
|---------|----------------------------|--|
| July 13 | Region I, Phraphuttabat | Briefing, Visit Training Center, Observe Research |
| | Zone 7, Pak Chong | Briefing |
| July 14 | Zone 7, Pak Chong | Observe Malaria Clinics, Volunteers, Sector Offices |
| | | Return to Bangkok |

1.4.2 Field Trip #4

| | | |
|---------|--|--|
| July 19 | Region I, Zone 1 Tak and Kamphangphet | Travel to Tak |
| July 20 | Zone 1, Tak Mae Sot | Briefing Visit Sector Office, Malaria Clinic |
| July 21 | Mae Sot | Visit Sector Offices, Volunteers, Observe Field Activities |
| July 22 | Mae Sot-Bangkok | Return to Bangkok |

(See Annex 6, Places Visited and Persons Seen)

2. Present Status of Malaria

2.1 Background, Epidemiology and Surveillance

The number of malaria cases in Thailand has been increasing yearly for the past ten years, starting in 1972. Malaria Division reports show that 53% of the malaria cases detected in 1980 were concentrated in 11 provinces which are primarily forested, mountainous and border areas. Migrating populations are particularly into and across the border for gem mining. In the Southern provinces there are problems in areas

with terrorists which obstruct the full performance of malaria workers.

The USAID Anti-Malaria Project was initiated in August, 1979, the same year that the Malaria Division divided the operational areas of the country into two areas as follows:

1. Control area covering forested, mountainous, border and sensitive areas with a population of 9,301,666, plus 31,628 in late attack phase (Annex 1 Table 2).

2. Eradication Area covering most of the plains areas with a population of 33,368,766 and further divided into 2 phases:

- 2.1.1 Consolidation phase with surveillance, case detection and source reduction activities.

- 2.1.2 Partial integration phase with surveillance and case detection with eventual integration into the general public health service.

When the evaluation team conducted field visits and examined various records it was found that this division into control and eradication areas had effects on the operational aspects of the programme. For example, the targets of spraying operations in some control areas were reduced to half after 1979. In most control areas there were no case detections conducted. Because of some initial confusion in this new phasing the number of slides examined as well as positive slides detected in 1979 in Malaria Regions 1 and 5 were lower than those in 1978.

However in 1980 the targets for spraying were increased and there was an increase in the number of voluntary collaborators taking blood slides. Even though it appears that after the beginning of the USAID Anti-Malaria Project the number of positive malaria cases increased, actually much of this can be attributed to the initial confusion as mentioned above. Targets have been improved at both the regional and zone levels in 1980 and 1981.

Blood examination figures for 1980 were still lower than 1979 in Region I indicating that surveillance results have not been increasing. It was found that in some sectors house visitors have stopped ACD in order to visit and collect blood slides from village voluntary collaborators and the number of blood slides collected is less than if the house visitor conducted monthly ACD house visiting. PCD results from other

health facilities are very low. The district hospital in Mae Sot had good PCD results but some other district hospitals visited are in fact taking blood slides and giving treatment but are not reporting the figures to the malaria units concerned.

The malaria clinics have many patients coming in for blood examinations and treatment. However, in some areas the clinic facilities and personnel are not sufficient to cope with the patient workload thereby causing surveillance data, such as source of infection information, to be incomplete.

It was found that entomological workers conducting current epidemiological investigations follow a plan devised from data from the previous year. Because of the rapidly changing malaria situation from year to year it would be more appropriate to conduct epidemiological investigations based on current data.

P.falciparum malaria cases have been rapidly increasing in proportion of P.vivax cases since 1979. A doctor at Mae Sot District Hospital gave an interesting explanation to this phenomenon. She felt that since patients with P.falciparum malaria have more severe symptoms than those with P.vivax, they tend to be predominate in hospital and malaria clinic statistics, while patients with P.vivax may tend to purchase drugs for self-medication.

From the various malaria zones visited, it could be seen from the available figures that when comparing the first five months of 1981 with 1980, there is a decreasing trend in malaria cases only in Zone 1, Yala. It will be interesting to see if this trend continues through the transmission season (July - December).

2.2 Spraying

Presently the spraying program is based almost entirely on residual house spraying with DDT either as a 75% wettable powder or as a 25% emulsifiable concentrate. There is very little thermal fogging being carried out at present. And there is even less ULV spraying being carried out. And there is no regular larvicidal spraying being carried out at the present time, there is only very limited use of Abate as a larvicide in "test" situations. So essentially all the spraying being carried out in the Malaria Control Program in Thailand is DDT residual house spraying. This review of the spraying operation will be divided into the following areas: equipment, personnel, coverage, insecticide, effectiveness, and special problems.

2.2.1 Equipment. The 3 gallon Hudson X-pert sprayer is being used exclusively throughout Thailand. The number of sprayers appear to be adequate. And there appears to be an adequate supply of spare parts and a satisfactory sprayer maintenance program. The USAID project has provided within the last 12 months 2,000 new Hudson Sprayers which has solved for the immediate future any potential spray equipment shortage.

2.2.2 Personnel. Temporary personnel are hired twice each year to accomplish the spraying. The first cycle of spraying occurs for an approximate 6-8 week period in March and April whereas the second cycle lasts approximately 6 weeks and is conducted in July-August. However in certain areas visited, e.g., Phuket, spraying only lasted 6 days in the first cycle and 7 days in the second cycle. The spray cycles vary greatly depending on target and spray personnel available. Based on the spray targets now being set for each Region and each Zone there appears to be enough spray personnel. All Regional; Zone and Sector Chiefs questioned about the adequacy of spray personnel said they had an ample number. It was learned though there is almost a complete turnover of spray personnel each spray cycle. Thus there is no accumulation of experience and hence better spray performance. Therefore, it is suggested that the possibility be explored of making the spray personnel permanent as a means of building experience and hence obtaining better spray coverage and a higher quality of work. In order to compensate for increased salaries possibly the spray cycles could be lengthened and fewer spray personnel hired. And these permanent personnel could then be assigned other control tasks, such as, larval surveillance, larviciding, source reduction, herbiciding, adulticiding, etc. In any event, every effort should be made to get the highest quality of spray personnel possible and to train and motivate them to do the best job possible under the constraints of budget and governmental policy. A good example of getting better spray coverage from permanent personnel was seen in Tak (Zone 1, Region 1) where a "Special Spraying" was carried out by permanent personnel in areas of high malaria transmission where the regular temporary employees had experienced a high incomplete rate and refusals and/or locked houses were high. With these permanent employees, a 97.70% complete spraying rate was obtained in 1979, 94.62% in 1980 and 84.48% in 1981 (1st cycle). Also another Sector in Zone 1, Region 1, had a 80% completion rate in 2nd cycle by using the Sector Chief to supervise the regular temporary spraymen. Both these instances clearly show that with better motivated and trained experienced personnel, it is possible to obtain more than 80% complete spraying.

2.2.3 Coverage. Spray coverage varies in Regions 4 and 5, where complete coverage may be lower than 40%, to Region 1, where complete spray coverage is approximately 60%. The reasons given for such poor complete spraying are many and they will be discussed below under "Special Problems". However, none of these reasons alone or altogether are a satisfactory excuse for not achieving a much higher percentage of complete coverage. In fact, where less than 60% complete coverage is obtained, it is highly probable that this degree of spray coverage will not interrupt malaria transmission. Therefore, it is doing little, if any good, and in fact, may be considered a waste of time and money. Possibly the educational project of USAID will materially assist in the effort of obtaining better spray coverage by bringing about a demand for spraying by the people themselves.

The subject of targeting the spraying operations should be discussed here. Setting the target for spraying is an administrative decision made by the Regional Chiefs in consultation with the Malaria Division staff. However, it appears to be highly variable in different Regions, Zones and Sectors. In some areas like Region 1, Zone 7, Sector 5, which is listed as entirely a control area only about 40% of the total houses were targeted for spraying. With 60% coverage in the first cycle only about 25% of all the houses in the Sector were actually sprayed. In view of the fact that there were 937 detected cases of indigenous malaria in the Sector, many of which were in areas not sprayed, the target would seem to be much too low. So much thought and effort should go into targeting the spraying, which may be the determining factor as to whether or not malaria transmission occurs or not. Also targeting can have a significant influence on completeness of coverage. If all of the difficult areas are left out of the target, 100% coverage can be easily obtained.

2.2.4 Insecticides. Presently DDT is the insecticide being used in the residual house spraying. There are two formulations being used: 75% Wettable Powder and 25% Emulsifiable Concentrate. The 75% W.P. has two distinct advantages: it is approximately 1/3 less costly than the 25% E.C. and has longer residual activity. So wherever and whenever possible the 75% W.P. is the formulation of choice. There were adequate supplies of DDT on hand in all areas visited by the Assessment Team. When and where the Swing Fog Thermal Foggers are in operation, malathion 57% E.C. is the insecticide being used. And in the Fontan ULV spraying at Kamput Refugee Camp, malathion 91% concentrate is being used. Fenithrothion is planned for use in 80 border Sectors in 1982 both as a 40% W.P.; and as an oil formulation (for fogging).

2.2.5 Effectiveness. The true effectiveness of any disease control program is measured in terms of the morbidity and mortality prevented. Inasmuch as the malaria cases (morbidity) have been steadily rising for the last 10 years and leaped dramatically in 1980 this would indicate some breakdown in control program effectiveness. The very fact of the 31% increase in malaria morbidity in 1980 over 1979 indicates the need for careful reevaluation and redirection of control effort. Whereas it is true that DDT spraying has been decreasing and inflation is increasing faster than the malaria control budget is increasing, it is not certain that the increase in malaria morbidity is negatively correlated. It is felt that the educational efforts of USAID can pay tremendous dividends in the future in stemming the precipitous rise in malaria morbidity.

2.2.6 Special Problems. At every Regional, Zonal and Sector office visited a list of special problems was presented to the Assessment Team. These various problems are listed and discussed here.

1. Inadequate budget. This is a recurring problem in inflationary times but it must be dealt with in a realistic manner. An effective and efficient malaria control program must be continued. Regional, Zonal and Sector Chiefs must conduct the most effective control program possible in preventing malaria with the shrinking budgets they have.

2. Inadequate vehicles and inoperable vehicles. This is a very real problem that can effect the delivery of all malaria control services. This situation is being partially rectified by the USAID program of vehicle rehabilitation and delivery of motorcycles.

3. Insecurity in border areas. This is a problem that is insoluble by malaria control personnel. It can only be solved by political, military, or law enforcement means. This problem will result in more malaria than would otherwise be the case in these particular areas.

4. Migration of laborers and illegal gem miners. This is another problem that does not lend itself to easy solution. However it must be dealt with through appropriate malaria control and drug therapy measures. Secondary transmission should be prevented in such populations.

5. Rubber tappers working at night. This also is a very real problem in many southern areas of Regions 4 and 5. The best approach probably lies in convincing the

plantation operators and tappers themselves that the rubber tappers maintain better health and welfare if tapping were done in daylight hours. If this cannot be done, then they should be instructed in ways to prevent anopheline biting such as repellents and clothing. Also various thermal fogging and ULV spray techniques might be employed to some benefit in certain situations.

2.3 Entomology

2.3.1 Eight anopheline species have been incriminated as principal, secondary and suspected vectors of malaria in Thailand.

2.3.1.1 Principal vectors

An. balabacensis
An. minimus
An. maculatus (in southern Thailand)

2.3.1.2 Secondary vectors

An. sundaicus
An. aconitus

2.3.1.3 Suspected vectors

An. philippinensis
An. campestris
An. culicifacies

2.3.2 An. balabacensis has shown some tolerance to DDT in some areas. An. minimus has changed its habit from endophilic and endophagic to exophilic and exophagic; it has also shown some tolerance to DDT in some areas. An. maculatus and An. sundaicus have also indicated tolerance to DDT in some tests. An. aconitus is not confirmed to be a vector of malaria in Thailand since the first reports of Gould et. al. in 1967, and it is still susceptible to DDT. Among the suspected vectors, An. culicifacies is the only species that is resistant to DDT in Northeast Thailand.

2.3.3 During the past two decades An. balabacensis was considered the most important vector of malaria in Thailand. However now An. minimus has assumed much more importance-especially in the forested foothill areas where the forest is cleared such as the Pakchong District, Nakorn Rajsima Province, and Muaklek. Saraburi Province.

2.3.4 All of the principal vectors are exophilic and exophagic. The houses or the dwelling quarters of the people in the highly malarious areas are often scattered and incompletely sprayed with insecticide. Incomplete spraying can be defined as not spraying the entire house, not having adequate coverage, or the housing unit not having four walls and a roof, thus greatly reducing the effectiveness of insecticide coverage. These factors make house spraying ineffective and the density of the malaria vectors remain at the same level which results in the continuous transmission.

2.3.5 The Entomology Section of the malaria Division has carried out three main activities as follows:

2.3.5.1 Evaluation in Control Areas.

2.3.5.2 Foci Investigations.

2.3.5.3 Applied Entomological Research

(For details of the activities -- see Annex 2).

2.3.6 A strong entomology component is indispensable in any effective malaria control program. A sound entomology program is what defines the vector problem, steers the control efforts, and evaluates control effectiveness. Where there is a strong entomology program in force that is sound in approach and practice one finds effective malaria control. It cannot be emphasized enough how vital a strong and sound entomology program is to effective malaria control.

The Entomology Section protocol that was developed in 1978-79 by the Malaria Division, Department of Communicable Diseases Control, Ministry of Public Health, RTG, represented a vast improvement over previous entomological support. However it is considered neither broad enough or deep enough to accurately plan, direct, and evaluate the malaria control program. Moreover many parts of the present protocol are not being followed which results in significant information gaps.

The present entomology control program will be evaluated in the following areas: personnel training, number of personnel, equipment and facilities, transport vehicles, and adequacy of present entomology plan.

2.3.6.1 Personnel Training. The present entomology training procedures at both the Regional and Zonal level should be restructured and strengthened. First the annual

Regional training workshops should emphasize the practical and field aspects of entomology with as much "hands on" field and laboratory work as possible. Lectures on strategy and principles should be minimized. Also to guide and evaluate training effectiveness and efficiency, a pre-workshop test should be devised and given to all participants both at the Regional and Zonal level. The results of this pre-test would provide guidance in conducting the training workshop. Then upon the completion of each training workshop a post-test should be given covering basically the same areas as the pre-test. By comparing these tests, it will be possible to evaluate the effectiveness of training as well as indicate future training needs. There would be no passing or failing grade, the tests would be used as evaluators of training subject content and methods.

Apparently there has been no training courses conducted in 1981 to date.

2.3.6.2 Number of Personnel. Presently there are 7 Regional Entomology Teams (2 teams in Regions II and III, and 1 team in each of the other 3 Regions). Although this Assessment Team did not visit Region II and III, there are indications that the malaria control programs are more successful in these Regions - possibly as a direct result of the higher level of entomological work. Also in the 3 Regions visited, all indicated that they needed additional entomological staffing. Frequently entomological tasks, such as, "Foci Investigations" and "Checks in Control Areas", are neglected due to the inadequacy of personnel. There are 33 Zone Teams - one team for each of the 33 Zones.

It is apparent that there should be several additional entomology teams created at the Regional level. A good case could be made for 2 more teams in each of Regions I, IV and V. This would mean 3 teams in each of these Regions.

Also the Entomology Section of the Malaria Division Headquarters should be bolstered in the number of personnel if necessary so that each Region is visited at least monthly throughout the entire year.

2.3.6.3 Equipment and Facilities. It is axiomatic that the quality of entomological data obtained is dependent upon satisfactory and sufficient equipment and facilities. At several Zone offices there were complaints about microscopes. This problem is being rectified with new scopes that are planned for delivery within the next year. Also it was apparent that the space for entomology work was cramped or non-existent at many Zone offices.

2.3.6.4 Transport Vehicles. At virtually every Regional and Zone Office visited there were complaints about too few operating vehicles. Possibly in some cases the small amount of entomological data was due to unavailability of an operating vehicle. This problem is being rectified by the planned delivery within the next year of additional new vehicles and the USAID rehabilitation program.

2.3.6.5 Adequacy of Present Entomology Plan. The present entomology plan is based on the "Entomology Section" prepared in 1978-79. Taking the listed Entomological Field Activities in order, each will be discussed below:

Monitoring of Vector Susceptibility to Insecticides in the Control Areas. Presently 100 villages are scheduled for such monitoring annually. Ideally all vectors and suspected vectors in each village should be tested at least once annually. With an average of 3 vectors and suspected vectors in each village this would mean a minimum of 300 tests for each insecticide per year. However in 1980 only 86 such tests were made. And there was only one test with An. balabacensis in the entire Kingdom of Thailand. This is inadequate. Actually if 4 insecticides (DDT, malathion, dieldrin, fenitrothion) were tested per species in each village a total of 1,200 tests should have been conducted. Obviously this goal is not possible to accomplish with present entomological capabilities. It may be more realistic to reduce the number of villages to 25 and make the 4 insecticide tests per vector (and suspected vector) which would result in 300 tests. This number of tests should be adequate in detecting changes in insecticide tolerance. Under no circumstances should insectary-reared mosquitoes be used to obtain insecticide susceptibility data.

Evaluation of Anti-Adult Measures in Indicator Areas. There are 20 indicator areas across the Kingdom. Entomological surveys are supposed to be carried out 3 to 4 times a year in each indicator area. The man-biting collections, as presently being carried out, provides only data on where feeding is taking place; it does not provide any data on resting behaviour. Spray sheet collections and/or window trapping should be carried out to determine endophily or exophily. And probably the same amount of data on phagy could be obtained in 2 nights of man-biting collections.

Presently CDC light traps are not being used as recommended in the protocol. Since this technique has not been yet field-tested for efficacy, we recommend that the procedure be eliminated from the entomological protocol until research verifies its effectiveness.

Dissections should be performed on all vectors and suspected vectors collected for parous rate and sporozoites. Also stomach should be examined for oocytes. It is apparent from our field visits that many females are not being checked for sporozoites. It was said, "we never find any anyway, so it is a waste of time." As many female anopheline specimens as possible should be checked for sporozoites.

Collect Data on Receptivity of Consolidation and Partially Integrated Areas. In 1980 only 158 such studies were made. This entomological activity should be expanded to at least 250 such studies per year. Further it is recommended that man-biting collections be changed. Instead of collecting from 6 p.m. to midnight on 2 consecutive nights, collections should be made from 1800-2400 the first night and from 2400-0600 the second night. This would enable the sampling of late biting species like An. balabacensis and An. campestris. Larvae collections should be made and breeding sources carefully mapped. All larvae should be identified an/or reared to an identifiable stage. All vector and suspected vector breeding sites should be referenced for either source reduction (permanent control) or larviciding. Please refer to Section IV. Alternative Methodology.

Spot Checks in Control Areas. In 1980, 395 spot checks were made in control areas where no previous entomological data had been collected. This entomological activity should be expanded to at least 500 such studies per year. Further it is recommended that man-biting collections be changed. Instead of collecting from 6 p.m. to midnight on 3 consecutive nights, collections should be made from 1800-2400 the first night and from 2400 to 0600 the second night.

CDC light traps are not currently being used, so this should be dropped from protocol until research proves the value of this technique.

Anopheline larvae collections should be made and locations of breeding sources carefully mapped. All larvae should be identified and/or reared to an identifiable stage. All vector and suspected vector breeding sites should be referenced for either source reduction (permanent control) or larviciding. Refer to Section IV. Alternative Methodology.

Special Studies. This activity should be greatly expanded with emphasis on obtaining basic data on biology and bionomics, location of breeding sites, location of resting sites, peak flight times, and flight ranges. As opposed to research projects these studies should be performed on a continuing year round basis.

Foci Investigations in Consolidation and Partially Integrated Areas. This activity was performed only 67 times in 1980. This number is considered very inadequate. Ideally every indigenous case of malaria in the areas not being sprayed should be promptly investigated. Practically this will not be possible because of manpower and time limitations during the height of the transmission seasons. Notwithstanding, the prompt investigation of all indigenous cases should be the goal. And under no circumstances should less than 25% of the cases be investigated. And foci investigation should be given higher priority in the overall entomological protocol.

The man-biting collections should be altered, as recommended above, collections should be made from 1800-2400 the first night and 2400-0600 the next night. Again the purpose is to sample late-biting species which are being missed under current procedure.

Dissections of anopheline adult females should be carried out for sporozoites, parity and oocytes. A diligent search for the anopheline larvae breeding sites should also be made. And when larval of vectors or suspected vectors are found, the breeding site(s) should be promptly referenced for appropriate source reduction (permanent control) or anti-larval measures.

Also all breeding sites should be accurately mapped and indexed for future reference.

Applied Entomological Field Research. It is our strong recommendation that applied entomological research be greatly expanded. Fertile areas for future research are: vector biology and bionomics, flight range, dispersal habits, host range of adult females, development of sensitive collection techniques, and testing various control methods (source reduction, larviciding and adulticiding (other than residual spraying). Much more man-hours and money should be allocated for research on the vector. The entomology is just as important as the parasitology. However it is getting very little attention and no emphasis at the present time. This should be changed in order for the malaria program to be ultimately successful. The malaria control program must evolve with the vector bionomics, socioeconomics of the people, changing geography, and new developments in control technology (including new spray equipment, insecticides, techniques and strategies). And the only cost-efficient and cost-effective way that allow for this co-evolution of the control program and the vector is through a strong and rigorous entomology component that is an equal partner with parasitology.

2.4 Health Education and Training

2.4.1 Objectives

Health Education and Training activities supported under the USAID Anti-Malaria Project contribute directly toward achievement of the overall anti-malaria program goals. The project purpose is to develop the institutional capability for providing services, particularly to rural inhabitants of Thailand's endemic areas of high risk, with special emphasis on assisting the Malaria Division toward improvements in health education, training, case detection and treatment. The quality of each program component directly affects the others.

a. Training

The Project provides assistance for the preservice training of 20,000 village volunteer malaria collaborators (VVMC's) and 250 malaria clinic workers. Refresher training is provided for 200 regional and service zone level personnel and 738 sector level personnel.

To improve the quality of training, the Project has assisted in the 3-tier training of trainers. This project activity, designed to prepare high level, middle level and sector level personnel to train VVMC's, also has long-term benefits for the training of malaria workers beyond the project completion period. The objective has been to develop a capable corps of trainers at division, regional and zone levels.

Training capacity at the National Malaria Training Center at Praphuttabat will be doubled, from 30 to 60 trainees, with the construction of a second building with Project financing.

b. Health Education

The objective for health education in the malaria program has been to prepare all malaria workers to carry out appropriate educational/motivational activities, with special emphasis on achieving greater community understanding and participation. Health education and public relations methods have been built into the curriculum for the training of all categories of workers.

Health education materials and audio-visual equipment for both public education and training have been procured with Project financing. These materials and equipment provide the tools essential for the achievement of health education and training objectives.

2.4.2 Evaluation of Progress Toward Attainment of Objectives

a. Training

The training activities under the Project have been progressing according to schedule. Of the 20,000 VVMC's targeted for training, more than 15,000 have been trained. VVMC training has been completed in Regions I, II, and III. In Region IV, half of the targeted VVMC's have been trained and the rest will be trained and deployed by the end of August 1981. Region V will complete training and deployment by the end of September 1981. (See Annex 3 for VVMC training by Region).

The training of VVMC's was preceded by the training of instructors in Chiang Mai for one week in May, 1980. That group included Division, Regional and Zone personnel. Those instructors held training courses in each region for a total of 552 zone and sector personnel, who, in turn, conducted the two-day training sessions of VVMC's at the sector level. Zone and sector level trainers also helped squad chiefs in the training of spraymen and house visitors.

Because most of the VVMC training has only recently been completed, and some is still in progress, evaluation of the impact of this activity has been limited. However, in several areas visited by the Team, early indications are that the quality of training has been much improved over former volunteer training.

The question arose as to why the village malaria collaborator, as an unsalaried volunteer, could be expected to perform well. The response is that the VVMC gains respect in his/her village and increasing recognition from the government. After training the VVMC is given a sign for his/her post identifying the person as a malaria collaborator. After one year of continuous service he/she is awarded a meritorious achievement certificate from the Malaria Division. After three years of continuous service the MOPH awards him/her with a pin and on completion of five years of good service he/she receives a pin granted by the King.

As a Buddhist the volunteer also regards his service as merit making.

Volunteers who do not perform satisfactorily are replaced. Most sector offices visited by the Team were seen to have an up-to-date performance record for every volunteer.

In Zone 7 of Region I, Pak Chong, people live in smaller-than-village clusters. Thus, the Zone trained volunteers at a rate of 2 or 3 per village. They will not be expected to turn in many slides, but will be strategically placed to find cases as they occur in the control area.

There were mixed reports regarding cooperation between the health services and the malaria program. In one sector, the sector chief was not obtaining information on malaria cases from the district hospital located just across the highway within sight. Yet the hospital, when visited by the Team, reported that more than 70 percent of its patients were admitted with fever and more than 50 percent had positive slides.

In other areas the interchange of information and joint activity was reported as excellent. In many sectors more than 50% of the VVMC's serve as village health volunteers as well.

Academic and technical training activities within Thailand under the USAID Anti-Malaria Project are listed in Annex 3, Table 2, indicating targets planned and numbers trained as of May 31, 1981.

Fellowships for U.S. and Third Country training are listed in Annex 3, Table 3. Only two of the seven fellowships planned for master degree training in the U.S. have been filled due to difficulty in finding qualified candidates. Recruitment is still in progress, but it is unlikely that the remaining five places can be filled by EOP. This will require either an extension of the training period, or a change from academic training to in-country training or third-country observation.

Four candidates of the 7 targeted in the project began study in March, 1980 toward master degrees at Mahidol University. One group of four senior malaria officials has completed an observation tour in the U.S., with the second group preparing to leave in 1981. A third group is scheduled for 1982.

Third country observation tours have been completed for two groups of six middle-level malaria officers. Additional groups totalling 23 personnel are scheduled to go by EOP.

b. Health Education

In all areas visited by the Team, the

zone and sector personnel were engaged in a variety of Information, Education and Communications (IE&C) activities they regarded as important in achieving program objectives. In each zone, one staff person has been designated to have responsibility for health education, as recommended at the Division's health education workshop in May, 1980. In most instances an Assistant Zone Chief has combined responsibility for the Section on Vector Control and Health Education. In several zones, a sector chief or other zone-level staff person with special interest in health education has been given full-time responsibility for IE&C activities.

At the time of this evaluation the designated health education staff had not been trained in health education methodology. This was expressed as a special problem and need in every area visited. To meet the need, a Project supported course in health education techniques has been planned for 55 division, regional and zone personnel in collaboration with Mahidol University in 1982. For sector-level personnel, health education methods will be included in refresher training courses planned for 1982.

The approach followed in all zones and sectors to gain better community understanding and participation includes: 1) emphasis on developing good working relations with village headmen and other leaders, 2) small group and large community meetings to reach all villagers, 3) visits to schools to meet with teachers and talk to classes, 4) distribution and/or display of posters and leaflets, 5) use of cassette tapes with local messages in malaria clinics, 6) slides for projection in all movie houses and 7) radio and press releases informing the public about the malaria programs, measures of prevention and where to go for treatment.

Health Education Materials

Table 4 in Annex 3 lists education materials developed and reproduced under the USAID Anti-Malaria Project. A production plan has been developed for each item, as recommended last year in discussions with the USAID consultant in health education and training. This has resulted in materials of higher quality, designed with specific messages for specific audiences. Art work and layout has been done by the Malaria Division artist.

The team observed the new posters, leaflets and other display materials in every sector office, malaria clinic and collaborator post visited, even though distribution was initiated less than two months ago. The posters were also visible in shops seen in villages along the way.

The initial printing of posters was done in the Thai language only. Since only Yawi language is used in some rural villages in Thai-Muslim provinces in Region IV, Southern Thailand, the Thai language materials are inappropriate. Some pamphlets have already been printed in Yawi. To complete the production, a proportionate quantity of the 150,000 posters and 300,000 pamphlets will be printed in Yawi. Translations for these and other educational materials are being done by the USAID Interpreter/Assistant Project Officer. Table 5, Annex 3, shows the distribution plan for the four new malaria posters.

Health Education Equipment (Loan Funded)

Basic audio-visual equipment for health education and training use has just begun to arrive. Only radio/cassette tape recorders had been distributed to sector offices and malaria clinics, along with tapes recorded with malaria messages and Thai folk songs, some of which are about malaria. Additional blank tapes were sent so that zone or sector staff could record appropriate local dialects.

The team observed the tape recorders in use. In Yala the zone health educator had prepared a tape in Yawi for use in malaria clinics, where an estimated 95 percent of the patients are Muslim. Table 6, Annex 3, lists health education equipment and status as of July 15, 1981. Equipment procured for the National Malaria Training Center is listed in Table 7.

2.4.3 Problem Areas/Constraints

a. Training

1) Although problems in training remain, the training capability of the National Anti-Malaria Program has improved markedly in the past year, due in large part to the Project supported training of trainers program. The main weakness in the initial training of instructors was the lack of practice and feedback from practice sessions. This problem has been partially overcome through repeated practical experience at the zone and sector levels in the actual training of VVMC's, spraymen and house visitors. U.S. Peace Corps Volunteers assigned to zone offices in Pak Chong and Chantaburi have assisted in the training of VVMC's. They have been impressed with the improved capability of the trainers as they gained teaching experience.

2) Regional section chiefs and zone chiefs, who carry the main responsibility for training, still need more skill training in teaching methodology. The same is true for Sector Chiefs and Assistant Sector Chiefs, who are responsible for training VVMC's and for follow-up supervision. This need has been considered, and appropriate health education and training units will be included in refresher courses scheduled for 1982.

3) Training materials are improving, especially with the revision of the VVMC manual to be consistent with lesson content and teaching sequence. There remains the need in some areas to be more innovative in the production of simple training aids locally.

4) The Malaria Training Center reports that outside experts from Bangkok often are unable to provide lectures at scheduled hours due to unanticipated conflict with other duties. MTC staff have found it difficult to arrange "last minute" substitutes. Also, Malaria personnel of Region I, particularly section and zone chiefs, are expected to participate in the training, but work pressures often make this extremely difficult, especially during spray cycles. As a result, they have little time to prepare lesson plans or teaching materials, which reduces the effectiveness and continuity of the training process.

The MTC has only one full-time staff person out of four positions needed; the other three are vacant due to lack of budget authorization for those positions.

5) The training of VVMC's was delayed in some zones, particularly in Region IV, because malaria kits were not complete, lacking Hagedorn needles and/or slides. Some zones trained and deployed VVMC's without the complete kit. Some were using other types of needles. For example, in Zone 3, Region IV, Pang-Nga Province, follow-up of collaborator activity found that only 88 of 200 trained had sent in blood slides. Lack of needles was reported as a major reason for the deficiency.

b. Health Education

1) Malaria patients given the first pills for radical treatment at a clinic, with instructions to complete the seven day regimen at home, are relieved of their symptoms after two or three days and stop taking their pills.

2) Night tapping of trees on rubber plantations exposes laborers to vector mosquitoes.

3) In remote farming areas and in the forests the people sleep in open-walled huts or out-of-doors, only a few use mosquito nets.

4) It is a custom of Thai Muslim not to want spray teams to enter their houses. Complete coverage is as low as 13 percent. This is especially true when the man of the house is not present. Also, in general the people do not like to move all household effects to the center of the room, including the removal of pictures or other articles from the walls.

5) In control areas where spraying has been in progress 15-20 years, and especially in newer, better constructed houses, the people have become tired of having their houses subjected to "messy" DDT. They refuse partially because of the disruption, but also because of the smell and what they consider a hazard to the very young and very old and to domestic animals. Acceptance is much higher when emulsion is used, although people still complain of the odor.

6) Border security is a major problem, although through good public relations by zone and sector malaria workers, the spray teams and other malaria workers are permitted to work. Even so, seven malaria workers have lost their lives in the insecure areas in Region IV.

7) The high cost of gasoline and shortage of funds budgeted for malaria personnel using jeeps and motorcycles directly affects health education services necessary to stimulate community participation and follow-up of the VVMC's. Workers get discouraged if they lack equipment or gasoline. In many areas the sector personnel and coordinators who pick up slides, who also provide the education/training backup support, are buying gasoline out-of-pocket. They need Baht 500 per month, but receive at most Baht 100 from the government. In Sector 6, Region V, Trat Province, budget constraints have reduced the gasoline subsidy for personnel using private motorcycles to Baht 76/month.

Health Education staff at the Zone level lack access to transportation to carry audio-visual equipment and exhibit materials.

8) Most audio-visual equipment provided by donors during the 1960's under the malaria eradication project was found to be in disrepair or in poor condition. In Region IV the mobile IE&C equipment had been inoperable for the past three years. Entertainment films, used

to attract villagers to large community meetings, were no longer available. (One zone chief in Region I noted that the use of entertainment films in his experience is not essential. His personnel get excellent participation by leading in the singing of folk songs and use of socio-drama created spontaneously by the villagers themselves.)

9) Language is a problem in the predominately Muslim South, which speaks Malay (Yawi). The health educator in Zone 1 of Region IV said 95 percent of clinic patients are Muslims and do not use Thai. Yala Province is 80 percent Muslim, most of whom live in villages, not in the larger towns. When malaria workers go to the villages it is impossible to use the Thai language; they must use the local Yawi. Thus, Thai speaking malaria workers must take Muslim escorts, for both language translation and for security reasons.

The Zone has only one sector chief and three assistants who can speak the Yawi language. Because of difficulty in meeting minimum civil service requirements, it has been difficult to recruit qualified Muslim candidates for training.

Language used in educational materials in the South is also a problem. Posters and leaflets, if in Thai, reportedly are not effective. (The USAID interpreter, a Muslim born in Southern Thailand, has translated materials for the Southern region. Those are now being produced, but were not seen by the Team in the field visits.)

10) Migration of people in and out of high malaria transmission areas creates serious problems for health education in regard to case detection and treatment. Thais travel from many provinces to Southeast Thailand and into Kampuchea for gem mining, into the forests in various parts of Thailand to log trees, to clear areas for agriculture, or to find seasonal work on rubber plantations or other rural areas with endemic malaria.

It is illegal for Thais to cross into Kampuchea, thus they avoid check points on returning, where screening for fever could be carried out. The same problem exists in the forests where much of the logging is done illegally.

Many fever patients attending malaria clinics in border provinces of Trat and Chantaburi had learned of the clinics' location by word of mouth from other Thais in the gem mining areas. It was also pointed out that

although they seek treatment, they still do not understand how malaria is transmitted and do little to protect themselves. Old myths and superstitions about the source of fevers persist. After treatment, patients return to the mining areas to expose themselves to reinfection. In observations made at Zone and Sectors in Tak and Mae Sot, malaria patients appeared to be confusing transmission of malaria thru water. Supervisors should review simple facts about malaria to make sure they are understood clearly and correctly.

2.4.4 Recommendations for Project Improvement

The Evaluation Team was impressed with the scope and quality of health education and training activities observed during field visits. The momentum gained in the implementation of these activities under the USAID Anti-Malaria Project is commendable and should be maintained. Numerous successful experiences in the training of VVMC's and in gaining better cooperation from villagers were reported by zone and sector personnel in their briefings for the Team. These "success stories" should be further identified, documented and shared with other malaria workers throughout the country, at meetings, and in newsletters or other printed reports.

Similarly, problems experienced in the implementation of health education and training activities need to be carefully evaluated and alternative ways of solving them explored. What has worked well in some areas may prove valuable in solving problems elsewhere.

a. Project Improvement Through Training

1) Now that the initial round of VVMC training has been completed, emphasis should be placed on early and continuous follow-up support by sector malaria staff, to assure successful VVMC job performance.

Volunteer collaborators deployed without a complete malaria kit should be supplied with the missing items as soon as possible. To minimize this problem in the future, the Malaria Division should expedite procurement by "walking" the purchase documents through the various processing points.

To strengthen community participation, the training of malaria collaborators should include more emphasis on techniques of health education and motivation of the public.

2) Cross Training of Village Health Volunteers

To maximize the efforts of village volunteers in malaria consolidation and partial integration phases, existing village health volunteers trained under the Primary Health Care Program should be selected and trained to serve as VVMC's. This is already being done in some areas. The MOPH should consider changes in criteria for selection of VHV's to allow existing malaria collaborators to qualify as VHV's. At the same time, criteria for future selection of malaria volunteers should be standardized and circulated in writing to all regions and zones for guidance in recruitment.

3) As part of the training process, any changes in program procedures should be incorporated without delay in the teaching content for new groups and updated as part of on-the-job training and supervision for workers already in place. For example, it appeared to the Team that there is confusion in some areas about the prescribed presumptive and radical treatment procedures. As the treatment may vary depending on local conditions, these variations should be clarified and followed uniformly in each area.

4) Malaria Training Center

The three vacant positions presently not budgeted for the MTC training staff should receive priority attention by the MOPH and the Civil Service Commission. Effectiveness and efficiency of the MTC will be seriously constrained unless a core staff is functioning by the time the new training facility is added in 1982.

A qualified staff with expertise in the several program components, including entomology, epidemiology, health education, training and administration, would greatly reduce the present undue reliance on outside lecturers and service personnel. These experts and malaria staff with practical experiences to share would still be important in the conduct of training, but could be used more selectively.

To minimize the disruption when outside lecturers cannot meet schedules, the MTC staff should build a library of recorded tapes on each subject. These tapes could be recorded during regular lectures or at the convenience of the outside lecturers.

Audio-visual and printed materials for self-instruction purposes could be developed from the

technical lecturers to reinforce the classroom presentations. This would benefit trainees who have limited background, who have difficulty in following technical lectures and usually cannot take accurate notes.

5) For use in training as well as in program operations, precise and detailed job descriptions should be prepared for every position. A job analysis identifying training needs should be carried out in advance of every refresher course. Segments not in need of being repeated could be eliminated from the curriculum.

b. Project Improvement Through Health Education

1) As noted in the training section above, integration of the Malaria and Primary Health Care Programs in the selection and training of village volunteers would avoid duplication and improve community services. Practical ways to work effectively with villagers should be emphasized in the training and follow-up support of village volunteers.

All service personnel at zone and sector levels should have training in health education methods, especially sector and squad chiefs, house visitors and malaria coordinators.

2) The USAID Anti-Malaria Project provides for seminars at the provincial level to bring health and malaria staff together to discuss problems, strategies and services. Where seminars have already been held, marked improvement in program coordination has been reported. Regular conferences of this nature should become routine for MOPH staff and malaria personnel at all levels of operation.

3) Another innovation in some zones visited by the Team was the initiation of seminars for village leaders. These have served as a "breakthrough" in gaining better understanding of the malaria program by leaders who exercise considerable influence in their villages.

Seminars for village leaders deserve support under the USAID Anti-Malaria Project to demonstrate the effectiveness of this approach. Leaders selected to participate in the seminars should include not only the village headman, but other natural leaders, such as teachers, merchants, monks, or trusted members in the village sought out by their neighbors for help and advice.

4) Language barriers between Thai speaking malaria workers and Muslim villagers who speak only Yawi in Southern Thailand should be minimized to the extent possible by greater placement of Muslim malaria workers at the sector level. Any vacancies recurring in permanent civil service positions should be filled by workers who can speak Yawi, and preferably by Muslims who would be more acceptable to the Muslim villagers.

Similarly, posters, pamphlets, cassette taped messages and other educational materials should be produced in the Yawi language. This need has been recognized and second printings of the new posters and pamphlets will include sufficient quantities in Yawi for distribution in Region IV.

5) Solutions to the problems reported in borders areas and among migrating populations will continue to plague the malaria program. It is suggested that billboards, be posted at points along known routes taken by migrating populations, especially for those crossing the Kampuchean border illegally for gem mining and in other highly malarious areas. The notices would alert them to the danger of contracting malaria, suggest individual preventive measures and inform them of malaria clinic locations.

Health education about malaria in the villages of origin of migrating gem miners, loggers or farm laborers should be intensified. Also, when patients come to clinics out of malarious areas careful attention should be given to explaining how the fever was contracted and what to do to prevent reinfection. Patients often know where to get treatment when they have a fever, but do not understand how malaria is transmitted.

6) The problem of spray refusals is so severe in many control areas to virtually negate the effect of the spraying that crews are allowed to do. In many Muslim villages in Southern Thailand the percentage of completely sprayed houses was below 30 percent. Similar low percentages were reported in the other regions visited.

The team heard several success stories where the percentage of houses sprayed was raised by 20 to 80 percent, largely due to exceptional public relations skills and hard work of zone and sector personnel. It is strongly recommended that special problem areas be targeted for this kind of intensive work. Refresher and inservice training should focus on ways to improve public relations skills.

7) As a planning technique, zones might consider special malaria campaign days for selected villages in high transmission areas. A concentrated effort could be made sector by sector in advance of the spray cycle or other off-season periods to promote better understanding of why anti-malaria measures are necessary. This approach should be combined with leadership training and supplement the regular working relationships malaria workers have with village collaborators.

2.5 Fiscal/Budget

2.5.1 The provisions of the USAID Anti-Malaria Project Loan and Grant Agreement between the Kingdom of Thailand and the United States of America, signed on August 29, 1979, specified that the expenditures during the period of Fiscal Year 1980 to Fiscal Year 1982, would be as follows:

1. Loan (including inflation and contingency line items) - US \$4,000,000.
2. Grant - US \$500,000.
3. RTG Counterpart Funds - US \$217,750.
4. RTG Regular Budget - US \$28,000,000.

These expenditures can be further classified as follows:

| Line Item | Budget Expenditure (US\$) | | | | Total US\$ |
|-------------------------------------|---------------------------|------------------|-----------------|-----------------|-----------------------------------|
| | FY 1980 US\$ | FY 1981 US\$ | FY 1982 US\$ | FY 1983 US\$ | |
| 1. Loan | | | | | |
| 1.1 Training | 312,955 | 98,934 | 159,984 | | 571,973 |
| 1.2 Capital Improvement | 394,000 | 240,000 | - | | 634,000 |
| 1.3 Commodities | 821,000 | 57,500 | 12,500 | | 891,000 |
| 1.4 Vehicle Overhauls | 50,000 | 150,000 | 200,000 | | 400,000 |
| 1.5 Health Education | 135,000 | 30,000 | 40,000 | | 205,000 |
| 1.6 Research | 30,000 | 40,000 | 30,000 | | 100,000 |
| 1.7 Motorcycles | 500,000 | - | - | | 500,000 |
| Inflation (9%) | 130,000 | 100,000 | 120,000 | | 350,000 |
| Contingency (9%) | 238,045 | 65,566 | 44,516 | | 348,127 |
| Total (Loan) | 2,611,000 | 782,000 | 607,000 | | 4,000,000 |
| 2. Grant | | | | | |
| 2.1 Technical Assistance | 103,000 | 120,000 | 64,000 | 25,000 | 312,500 |
| 2.2 Training | 69,750 | 106,750 | 11,000 | - | 187,500 |
| Total (Grant) | 172,750 | 226,750 | 75,000 | 25,000 | 500,000 |
| Total Loan and Grant | 2,783,750 | 1,008,750 | 682,000 | 25,000 | 4,500,000 |
| 3. RTG Counterpart | | | | | |
| 3.1 Technical Assistance | 15,000 | 65,000 | 61,000 | 9,000 | 150,000 |
| 3.2 Training | 30,000 | 29,500 | 8,250 | | 67,750 |
| Total (RTG Counterpart) | 45,000 | 84,500 | 69,250 | 9,000 | 217,750 |
| 4. Government Regular Budget | - | - | - | - | 28,000,000 (approximately) |
| Overall Total Project Cost | | | | | 32,717,750 (approximately) |

2.5.2 From the Anti-Malaria Project budget expenditure data analysis and from the study of data in the field from July 2, 1981 through July 22, 1981, the problems and impediments concerning the budget can be summarized as follows:

1. The Expenditure of the RTG Regular Budget

From Fiscal Year 1978 to 1980 the Malaria Division received increased appropriations in its budget every year as shown in the following table.

| Activity | Financial Plan vs. Actual Expenditures in ₪ Thousands | | | Remarks |
|---|---|-----------|-----------|---|
| | FY 1978 | FY 1979 | FY 1980* | |
| 1. Mosquito Control Insecticide Spraying | 49,180.2 | 54,288.8 | 56,320.0 | <p>* In FY 1980 the RTG deducted 10% from the following line items:</p> <ul style="list-style-type: none"> - remunerations - miscellaneous - supplies <p>It was approved to refund this 10% at the end of the fiscal year which was too late for the Malaria Division to utilize the funds. As a result ₪5,940,000 was remaining at the end of FY 1980</p> |
| | 47,687.1 | 51,359.2 | 47,168.0 | |
| 2. Entomological Studies | 5,532.7 | 6,279.9 | 6,305.7 | |
| | 5,571.5 | 6,261.9 | 5,246.1 | |
| 3. Malaria Survey | 5,080.9 | 5,805.2 | 5,881.4 | |
| | 5,059.3 | 5,933.7 | 5,386.9 | |
| 4. Case Detection and Treatment | 66,822.9 | 75,682.5 | 78,491.4 | |
| | 66,749.2 | 73,217.2 | 73,000.2 | |
| 5. Blood Examination | 10,693.9 | 11,881.8 | 12,303.2 | |
| | 10,665.1 | 11,854.7 | 11,237.7 | |
| 6. Health Education | 6,599.8 | 7,431.8 | 7,552.6 | |
| | 6,536.9 | 7,245.2 | 6,456.5 | |
| 7. Supervision and Training | 5,771.1 | 6,472.9 | 6,448.8 | |
| | 5,684.8 | 6,397.5 | 5,373.8 | |
| Total | 151,081.5 | 167,842.9 | 173,303.1 | |
| | 147,953.9 | 162,269.4 | 154,282.2 | |

The data in the table indicate that the operational budget of the Malaria Control Programme has increased every year and in FY 1981 received a budget of 188,674,800 Baht. In FY 1980 fiscal data analysis it was found that the actual expenditure was lower than the financial plan because:

a. The government deducted 10% of remuneration, miscellaneous expenses and supplies line items. Even though the Bureau of the Budget had approved to refund the budget of the line items mentioned above at the end of the fiscal year, it was too late to spend the refunded budget.

b. The Malaria Division, the implementing agency, set aside 5,940,000 Baht as accrued amount for reimbursement.

c. There was a shortage of temporary wage employees in certain localities and the rate of turnover for these employees was high.

However, when comparing the results of each activity with the targets set for FY 1980, it was found that the results of the spraying operations were slightly below the target. As for the results of case detection and treatment, they were very much below the target. The results of other activities were very close to the targets or above the targets.

From the data analysis in the field it was found that the results of the major activities were below the targets due to various causes as follows:

a. The results of spraying operations in some areas were below the target such as in Region 4, Songkhla, out of 181,668 houses targeted, only 154,621 houses or 85.11% of the houses were sprayed (partially sprayed houses included). In Zone 7, Chantaburi in Region 5, Bangkok, the target was 44,470 houses but only 29,007 houses or 65.23% were sprayed.

b. The results of case detection and treatment were far below the target (only 43.22%), i.e., out of the target of 5,530,000 persons for examination only 3,140,000 cases were examined. This was due to the fact that the results of blood smear taking by the village voluntary collaborators in some area were below the targets.

2. The Expenditure of Loan Funds

The loan funds have been utilized in

training activities, the improvement and construction of buildings, and in the procurement of supplies and equipment such as volunteer kits, microscopes, audio-visual equipment and automotive repair tools.

At the end of FY 1980, it was found that the actual expenditures were below the target set in the financial plan, i.e. the total financial plan was 5,668,000 Baht (revised) but the actual expenditures were 2,262,000 Baht. The results of operations were mostly below the targets, such as:

a. Training. The operational expenditures for training were far below the target because the training of the Village Voluntary Malaria Collaborators (VVMC) was about 50% below the target. This was due to the delay in procuring needles and slides which are necessary in order for the volunteers to operate effectively.

b. Capital Improvements. The target for this activity was to improve 6 places, but the project was only able to improve 3 places.

c. Vehicle Overhauls. 50 vehicles were targeted for overhaul but only 10 vehicles were completely overhauled and repaired.

3. The Expenditure of Grant and Counterpart Funds

The financial plan of the Anti-Malaria Project was established to use 3,000,000 Baht (revised) but the actual expenditure was about 2,300,000 Baht. The expenditures were mainly for technical assistance, procurement of health education materials and training fellowships. From the data in the field, it was found that the academic training was below target due to the lack of qualified personnel to accept the fellowships.

In Fiscal Year 1981, the Malaria Division has improved and revised the financial plan to be more practical. The activities which were below the targets in FY 1980, such as blood smear taking and capital improvements were improved in FY 1981. In the use of grant and counterpart funds, the operational and financial plans for training fellowships were revised and improved and results were achieved closer to the target.

2.5.3 Problems and Constraints of the Project
Concerning the Budget

1. The personnel in the provinces are lacking in the proper understanding of the methods of procurement and hiring, especially the non-expendable properties line item, which should be implemented in accordance with the procedures of Prime Minister's Office concerning the budget administration at the provincial level.

2. The process of reimbursement of per diem and cost of supplies from central agencies in miscellaneous expenses and the supplies line items was very slow. For example, Zone 6 Trat in Region 5 had to wait for 2 months to be reimbursed for the cost of gasoline.

3. The budget for per diem and gasoline for sector and zone personnel was rather small and not in proportion with the actual work they performed, especially in control areas where close supervision and follow-up of spraying operations and other activities is needed at all times, specifically in Trat, Chantaburi, Rayong and Tak provinces and in the sensitive areas of the South.

4. The expenses for repair and maintenance and gasoline for vehicles at various regions were rather high because most of the vehicles have been used for a long period of time. Most of them have been used for over 10 years, such as the Jeeps and Chevrolet trucks. These vehicles consume much gasoline but have very low efficiency. For example a Jeep runs 5 kilometers per litre of gasoline. Each region has 120-140 four-wheel vehicles and according to the Anti-Malaria Project, 40 vehicles in each region are to be overhauled. The overhaul of each vehicle must get approval from USAID/Thailand. The remaining vehicles in each region are to be repaired or overhauled by using the regular RTG budget.

5. Most of the zone and sector offices have no budget for procuring typewriters. From field data it was found that each zone had a very old typewriter which could not be fully utilized as it has to be repaired very often.

6. Another problem found was that zone offices in the South are short of spraymen and spray squad chiefs. At present the zones use temporary wage employees. The turnover is high because these workers are hired on a temporary basis for 2-3 months to cover the spraying seasons and the wages offered them are low. Therefore, the workers are not motivated to perform good work.

2.6 Administration

2.6.1 The Malaria Division, Department of Communicable Diseases Control, Ministry of Public Health is administratively divided into 7 sections as follows:

1. General Administration Section.
2. Vector Control Section.
3. Training and Public Information Section.
4. Laboratory Services Section.
5. Epidemiology Section.
6. Entomology Section.
7. Applied Research Section.

The country is operationally divided into 5 regions as follows:

Region I Serving 12 provinces with an estimated population of 9,554,280 with headquarters located in Phra Phutthabat, Saraburi. This region has 7 zones and 61 sectors.

Region II Serving 13 provinces with an estimated population of 7,514,265 with headquarters located in Chiang Mai. This region has 6 zones and 62 sectors.

Region III Serving 11 provinces with an estimated population of 10,062,844 with headquarters located in Khon Kaen. This region has 6 zones and 63 sectors.

Region IV Serving 14 provinces with an estimated population of 5,823,211 with headquarters located in Songkhla. This region has 7 zones and 61 sectors.

Region V Serving 22 provinces with an estimated population of 14,006,138 with headquarters located at the Ministry of Public Health, Bangkok. This region has 7 zones and 55 sectors.

Altogether, the five regions have 33 zones and 302 sectors, covering 72 provinces with a population of 42,701,740 people.

2.6.2 Problems and Constraints in the Administration of Operations

1. There is a shortage of appropriate transportation in operations due to the poor condition of the old vehicles coupled with the high cost of gasoline. This has created a problem in the implementation of operations and supervision.

2. Some areas of the country are insecure, infested with robbers, communist terrorists and separatists, especially in the South. It is not safe for malaria personnel to perform their duties in these areas.

3. Migration is going on within the country and across the borders. Internal migration is caused by people seeking land for cultivation and occupations such as ore mining, gem mining and rubber tappers. The international migration is caused by the refugees from neighboring countries and by people from Thailand crossing the border into Kampuchea for gem mining. These areas tend to have high malaria transmission and it is quite difficult to control and follow up the patients.

4. Populations in sprayed areas complain about the smell and dirty appearance of DDT, the rusting of their corrugated roofs and the death of domestic animals after DDT spraying.

5. There is a language problem in some areas such as in the 3 southern provinces of Yala, Pattani and Narathiwat and in areas where there are hilltribes. This impedes the full effectiveness of operations in these areas by malaria personnel.

6. There is an inadequate number of microscopists, especially in Region 4, Songkhla, where there has been a continual backlog of blood slide examinations. This causes delays in giving radical treatment and provides an opportunity for increased malaria transmission.

7. In Region 4, Songkhla, the turnover rate of the temporary wage employees is high because DDT spraying is a difficult job but the wages are low when compared to the income derived from other local basic occupations.

2.7 Research

2.7.1 In the past with the assistance of WHO as well as USAID, applied research had been carried out from time

to time in order to solve operational problems whenever they occurred. Various institutions in the Universities, Department of Medical Sciences, and the Armed Forces Research Institute for Medical Science also participated and supported research in malaria and its related fields. In October 1979 the Applied Research Section was established in the Malaria Division, Bangkok. The section is responsible for the total applied research activities covering all fields of the anti-malaria programme.

2.7.2 At present, due to the shortage of well trained personnel and limited funds, few applied research activities are currently being carried out by the malaria program itself. The active research is as follows:

a. In vitro macro test studies to determine the distribution and extent of chloroquine resistant strains of P.falciparum. These studies, started in 1977, were supported by the national regular budget and WHO. Studies have been completed in 20 provinces located in every region of the country and reports will be submitted shortly.

The results of the studies show that the chloroquine resistant strains are distributed in all 20 provinces and the percentage of resistance ranges from 20 to 100 with the average of 85% resistance. (See Annex 5).

b. In vitro macro test studies to determine the base line data of the sensitivity of P.falciparum to mefloquine. Funded by WHO and planned to study in 10 provinces in various parts of the country in 1981. Now the studies are in progress.

c. Studies on the development of the standard micro culture test kit for the assessment of the sensitivity of P.falciparum to anti-malarial drugs. This project is supported by TDR and started in 1980. The studies have been impaired due to the delay in sending supplies from Geneva.

d. Studies to determine the effectiveness of the presumptive treatment regimen at present in use. Funded by TDR starting in 1979 and expected to be finished in 1981. The preliminary results show that the regimen is still 100% effective for P.vivax but very much less effective for P.falciparum. In the same studies the project has also tried the other new regimens of presumptive treatment such as amodiaquine plus pyrinethamine with the hope to use them as alternates.

e. Studies to determine the effectiveness of the radical treatment regimens for P.falciparum in various regions. Funded by WHO and USAID starting in 1980 and finished in 1981. The report will be submitted shortly. The results shown in the following tables reveal that 1) Amodiaquine alone can produce a cure rate of only 43%, 2) all three regimens which included quinine were highly effective (no statistically significant difference exists between the three groups) and 3) the cure rates for Fansidar are equally low in three of the five areas, namely Chantaburi in the southeast close to Kampuchean border, Kalasin in the northeast, and Mae Sot in the north close to Burmese border. In the South and the North central, Fansidar was found to be effective.

Results of studies to determine the effectiveness of radical treatment regimens for P.falciparum:

| Location | Radical Cure Rate % | | | | |
|-----------------------------|---------------------|----|-----|-----|----|
| | I | II | III | IV | V |
| Mae Sot | 42 | 84 | 93 | 94 | 31 |
| Phitsanuloke and Petchaboon | 90 | 91 | 89 | 100 | 70 |
| Kalasin | 39 | 96 | 100 | 96 | 38 |
| Sadao | 82 | 94 | 100 | 83 | 15 |
| Chantaburi | 32 | 86 | 95 | 95 | 45 |
| Total | 57 | 90 | 90 | 93 | 43 |

Regimens

- I. Fansidar 3 tao
- II. Quinine 7 days Therapy
- III. Quinine plus fansidar
- IV. 7 days Quinine plus 7 days Tretacyclin
- V. Full dose Amodiaquine

When the team was visiting Malaria Zone 1 Yala, Region 4 in the South the Zone Chief had stated that during September 1980 and May 1981 (9 months) there were 5,198 P.falciparum cases attending the Zone Malaria Clinic Yala. 1,410 cases out of the total cases had been repeated blood film examinations within 6, 7, 8, 9 and 10 days after the Fansidar radical treatment and found only 193 cases still positive for P.falciparum. It is therefore apparent that Fansidar can produce a cure rate of 86.31% which confirms the above data that in the South Fansidar is still effective for P.falciparum.

f. Field study of the efficacy of Panchax spp. as a biological control agent of An maculatus in the hilly areas of Thepa District, Southern Thailand. Funded by USAID and started in October 1980. The team had been informed that in the first five months the sites of the study were selected and all necessary base line data had been collected. During the last four months before the Team visited, the fish had been released into the natural larval habitats 2-3 times. Unfortunately during that period there were heavy rains and the fish then were flushed away. The results therefore have not yet been available. The Team would suggest to discontinue the project.

g. A study of the biology of natural occurring larvivorous fish in Thailand and the development of a mass rearing technique for the selected species, funded by USAID and started in 1980. The project was carried out at the Malaria Centre Region I, Phra Phutthabat. At present there is one specy - Rasbora lateristriata sumatrana, in the rearing ponds. The Panchax spp. could not survive well in the rearing ponds and all died while the Rasbora are well developed.

h. Trial of Bendiocarb against malaria vectors. This project was supported by Chesterford Park Research Station, Fison Ltd., England. It was carried out in Malaria Zone 1 Tak, Region 1 in the north in 1980 and has been finished. The report will be submitted shortly. It is concluded that Bendiocarb is effective against malaria vectors, but its residual effect lasts only 2 months. Its cost seems to be higher than malathion.

2.7.3 The Malaria Division has proposed several new projects to be carried out in 1981-1982 and two of them have already been approved and submitted for funding. The two projects are:-

a. A small scale trial of mono-molecular organic surface film (ISA 20E) against An minimus in slow running water.

b. A study of the effects of different levels of DDT selection pressure on An minimus in foot-hill malaria control areas of Thailand.

2.7.4 In September 1979 the Independent Assessment team on malaria and vector control program had suggested in their report several topics for research and also additional remedial measures to be considered. Many of them are worthwhile and have not yet been followed so far. The Team would like to stress the same suggestions and recommendations. During the course of the evaluation the Team had observed the problems of entomological activities and spraying operations and would like to suggest the following topics of research for consideration:

a. Studies to develop sensitive collection method for An. balabacensis.

The team would suggest possible oviposition trap made of coconut shells or small clay pots placed in shaded forest habitants.

b. Test CDC light trap with CO₂ to determine the ratio of effectiveness to human bait.

c. Field study of the efficiency of Malaise trap against vectors such as An. balabacensis.

d. Studies on blood meals of vectors by precipitating testing.

e. Further study on basic bionomics of vectors-peak flight times, resting sites (daytime/night), flight range.

f. Field tests with ULV sprays.

g. Further trials with slow-release larvicides such as Dursban 10 CR.

h. Further field tests of source reduction (permanent control) techniques such as sluicing and flushing, herbiciding stream banks, channelization of stream beds.

3. Evaluation of the Impact of the USAID Anti-Malaria Project on Thailand Malaria Control Activities

3.1 Objectives and Goals of the Malaria Programme of Thailand

The Malaria Division of the Department of Communicable Diseases Control of the Ministry of Public Health has the primary responsibilities of malaria control in Thailand. Anti-Malaria activities have been carried out for many years through a series of Plans of Operations.

The long term objectives of the programme are to maintain long term control of malaria in the forested and hilly areas of the country where malaria is endemic and to prevent the re-establishment of endemic malaria in the remaining areas with malaria eradication as an ultimate goal.

The short term objectives of Thailand's malaria activities are (1) to reduce the annual parasite incidence (API) by 30% over the five year period 1977-1981 and (2) to reduce the annual mortality due to malaria by approximately 50% over the five year period 1977-1981.

3.2 Objectives and Purposes of the USAID Malaria Control Project

The AID Project (#493-0305) titled "Thailand Anti-Malaria Project" has as its overall goal to improve the health status of the population of Thailand with the sub-goals of (1) maintain long term malaria control of the border and mountainous regions covering approximately 8.7* million people and (2) eradicating the disease in the remaining areas. The achievement of these goals and sub-goals can be considered accomplished if (1) there is measurable significant reduction in general morbidity and mortality; (2) malaria mortality is reduced by 50% of its 1977 level to approximately 5 deaths per 100,000 population and (3) malaria is eradicated in eradication designated areas and there are no major malaria outbreaks in control areas. These targets are in accord with the RTG approved Plan of Operations for Malaria Control.

USAID assistance is aimed at all levels of the program from the National Headquarters to the Region, Zonal and Sector offices/activities. The primary emphasis of the project is directed at interventions which are focused on the first point of contact in the malaria control service delivery system.

* Now estimated at 9.3 million population.

It is evident that at this time there is little likelihood of the project achieving these goals during the life of the present project with the reported malaria cases increasing from 303,173 in 1979 to 397,491 cases in 1980; the percent of P. falciparum increasing from 58.16 percent to 68.50 percent in these same two years and a malaria death rate given as 8.2 cases per 100,000 in 1979. There are a number of valid reasons why the project will not achieve the overall goal targets provided in the Project Paper. The goal targets are considered overly ambitious given the AID inputs and limited time frame in an economic environment where high inflation and increasing program costs are occurring as well as uncontrolled population movements within and with neighboring countries. In the initial design stage for this project considerable assistance support was planned for operational costs (insecticide) but the approved present project did not contain this element and the life of project was shortened to three years. However, the goals and general purposes of the present project were not modified at the time when the redesigned project was approved.

The achievement of the Project's goal targets are considered a long term development function and cannot be completed within given project period. However, the project has made considerable improvement in the conditions of Thailand's anti-malaria activities to achieve these targets in the future by providing training for malaria collaborators and other malaria workers; facilities, supplies and support for training and research; vehicle repair and provision of motorcycles for operations improvement; and material production in the health education field.

The project's purpose was to develop the institutional capability for providing to the rural inhabitants of Thailand's endemic malaria areas of high risk malaria control services for the foreseeable future at a level and quality sufficient to minimize occurrence of the disease and to provide timely and proper treatment to those who do contract the disease.

The project is designed to assist in the development and support of malaria clinics, community volunteers, expanded public information activities, technical training, training facilities and equipment, research facilities and equipment, vehicle maintenance and improvement of field operational capability.

3.2.1 Present Progress and Accomplishments of the AID Malaria Control Project

The present Project Agreement was signed August 29, 1979 and was planned to reach its completion by

December, 1982. The team made a region by region study of the important components of the project in relationship to the planned objectives and the present status of accomplishments as of June 30, 1981 or roughly the mid-point in the life of the AID project. Detailed tables for this study were prepared by Region for the major project activities and can be found in the Annex 4 portion of this report.

In summary, the following general evaluation statements can be made for project accomplishments and progress up to June, 1981:

Technical Assistance (TA)

The TA component of the project has primarily been provided by two project monitors who have carried out administrative liaison activities for the project as well as conducting on-going evaluations of AID-assistance inputs into the field activities. The two monitors have to date spent approximately 15% on training or training related activities, 30% on supply, construction or procurement efforts, 50% on administrative matters and 5% on field monitoring. The inputs of time for health education material development, revolving fund activities in regards to motorcycles and preparing for the mid-term evaluation are included in the administrative percent. The work inputs and accomplishments of the two AID monitors are considered outstanding in the development, operational and evaluation aspects of the project.

Additional technical assistance in the form of a transport consultant, a health education and training specialist and contract training personnel have been provided and work was accomplished as planned. It may well be that additional consultant services will be required (vector control, training) during the remaining period of the Project.

Procurement

AID documentation for foreign-source commodities have been completed and contracting or re-negotiation is underway. There was considerable difficulty in some procurement items such as volunteer kits as several re-bids had to be made which delayed the arrival of the required supplies. Part of the problem in procurement was the differences between the requirements of the RTG and USAID in the submission of bids for a given item and in the English to Thai translation of the specifications. It has been projected that the remaining project commodities such as tools and research equipment will be in-country by the end of 1981.

Malaria Clinics and Treatment Centers

The opening of new malaria clinics and treatment centers is contingent upon the training of suitable staff to maintain and operate these centers. 150 malaria clinics have been targeted by the end of the year of 1981 and it is expected that this goal will be reached. The remaining 100 clinics of the 250 planned are scheduled to be operational by the end of CY 1982. There have been some regional variations of progress and this information is provided in the Annex. The clinics visited during this review were active and it appears that a good deal of useful information and treatment services will come from these clinics.

Village Volunteer Malaria Collaborators

(VVMC)

Village Volunteer Malaria Collaborators training has been completed in Region I, Region II and Region III. In Region IV, half of the VVMC's have been trained and the remaining half will be trained and deployed by September, 1981. Region V will complete training and deployment by the end of September, 1981 according to information given to the Team. Specific details on training of VVMC's are found in the training portion of this report and the Annex. The training objectives for VVMC's are expected to be met by the end of the project period. The Team visited a number of VVMC's during the course of the field work (see contact list in Annex) and were impressed with the development of this program and the excellent spirit of service exhibited by the VVMC's. The medical kits, signs and other items for the VVMC's were available in posts visited by the Team. It appeared from supervision records that the VVMC were being visited regularly by malaria staff.

Research

The joint funded WHO/USAID research effort on drug treatment regimens has now been completed. The results of this study are being incorporated into the operational guidelines for the malaria programme. This research activity has proven to be most helpful to malaria activities in Thailand and made a significant contribution to malaria knowledge of the area.

The study of biological control measures using larvivorous fish is in progress, and the results are not yet available. The team visited work areas where the fish trials/rearing are in progress, but the preliminary data provided does not indicate that satisfactory progress has been

made with these trials and it is very questionable that AID-support should be continued for this research activity.

Motorcycles

At the advice of the USAID transport consultant and with the approval of concerned RTG/AID offices, funds were reprogrammed from the project's vehicle overhaul account for the purchase of 300 motorcycles for use in field operational supervision. These 300 motorcycles have been distributed to the five malaria control regions. Another 500 motorcycles financed through a revolving account fund are expected to be operational in the field by January, 1982 as contracting is now in progress. Several motorcycles obtained through the AID project were observed by the Team being used on field supervision during this review.

Training

There was considerable support for training under the AID Anti-Malaria Control Project. The details of the completed, on-going and scheduled training under the project is given in Part 2 of this report. This assistance input is considered to be a key element in the project's usefulness to the RTG and will be a major contributing factor in assisting the RTG to meet its stated programme objectives for malaria control. There appears to be difficulties in the availability of qualified participants for U.S. training for Master's level study in public health.

Vehicle Overhauls

Thirty-six vehicles have been overhauled and are in use in Regions I, II, III and V. Eighty-three additional vehicles are presently being overhauled or are scheduled for overhaul and should be completed during this fiscal year. The remaining 81 vehicles are scheduled for completion by the end of the project. The original project plan was to overhaul 400 vehicles, but at the advice of the USAID Transport Consultant this target was lowered to 200 vehicles. The money saved by this change was used for motorcycle purchase and is considered fully justified. The Team inspected several repaired vehicles in the Regions visited and was impressed by the workmanship. It should be noted that this vehicle repair programme does commit the RTG in the future to additional expenses of fuel and spare parts for these vehicles. It is, therefore, necessary to make careful selection of the vehicles to be repaired.

Construction

The headquarters research facility has been constructed as planned and was put into use in May, 1981. The plans for the Chiang Mai research laboratory have been completed and this facility is presently under construction. The major construction element of the AID project is the construction of additional training facilities at Prabhuddaohat. The bids for this building were opened during the period of the mid-term evaluation. It is expected that bids will be approved within a three-month period and that actual construction will take up to one and half years or a completion date in the first quarter of CY 1983. The Team visited the proposed construction site and believes that this new addition will up-grade the present training facility greatly.

3.2.2 Problems Impeding Progress

The problems confronting the AID Anti-Malaria Control Project cannot be divorced from the problems of the overall RTG malaria activities, such as low operating budget, qualified personnel, and increased fuel costs. Other portions of the report will go into greater details on the general problems of low operational expense budgets, internal migration and external movement of populations, the impact of vacant field positions and labor practices conducive to malaria transmission and are not repeated here.

As could be expected (and difficult to forecast) is the problem of the differences in the two bureaucratic systems of the RTG and USAID which has resulted in delays in procurement, software material production, training schedules and construction. It is necessary that such differences be accepted and that every effort be made to ensure that the final documentation and procedures are satisfactory to both parties. In spite of delays which occurred, the work to date in melding of the two Government systems has been generally satisfactory. A good deal of credit for the solving of many of the problems connected with this situation can be given to the two AID project monitors and their RTG associates at the Malaria Division. It appears that major differences in procedures are now understood by both parties and the remaining project activities should progress more smoothly. There will still be delays especially in construction and in the translation of documents, but the foreseeable problems are manageable.

It appears that there will be three or four grant funded U.S. Academic (MPH) fellowships remaining in the

project which will not be used. Even if these MPH fellowships are used promptly, the estimated completion date for these academic studies will exceed the present life of the project. While the project completion date can be extended by mutual agreement, it is considered more appropriate to simply transfer these grant funds to some other areas or concerns. There also seems to be a need for the concerned agencies of RTG to coordinate their efforts in approving regional/third country observation tours as names submitted for such fellowship experiences have been slow to receive RTG approval in the past. The team feels that such regional observation tours are useful, but must be carefully planned and carried out to meet the specific needs of the programme and the participants involved. The Team suggests that selection for observation tours be made to include outstanding malaria officers who have demonstrated superior field service, but who may not have long seniority of service to provide encouragement to them.

During this evaluation the Team heard a number of reports on the payment of bills for supplies and work done in connection with the rehabilitation of selected motor vehicles. The problem is recognized and an advance system to expedite payments has recently been initiated. The procedure described to the Team for this new advance system appears suitable but has yet to function as expected.

The construction phase of the program will exceed the life of project. Again, the life of the project will have to be extended or some other procedure worked out to cover the actual construction period.

The grant budget sheet and the loan budget sheet providing status of expenditures as of June 30, 1981 show a projected project balance of \$94,400 and Baht 5,202,000 respectively at the end of the project period. The grant funds are thus about one-third expended as of June 30. These monies need to be re-programmed into various assistance categories and the extension of the project to use these funds could be considered. It was the general consensus of the Team that applied field research assisted by the USAID should be grant funded instead of loan funded. It appears that this change might be an appropriate mechanism to use the projected end of the project grant fund balance.

In summary, the problems encountered by the Project have been managed well. At the mid-point of the Project's life it is encouraging to see the progress made in this management area. It is expected that the remaining portions of the project period will be easier to be jointly managed.

3.2.3 Future Planning and Activities of the USAID Anti-Malaria Project

During the mid-term evaluation of the USAID Anti-Malaria Project, the Team determined that project activities were generally carried out in a satisfactory manner in spite of delays basically caused by the procedural differences between the two participating Governments in handling procurement, documentation and loan arrangements. It was also determined that by the end of the present project (December, 1982) that there would be a number of project actions which would not be completed. The table below outlines project activities which will exceed the present contract period of the two AID monitors (April, 1982) and the presently planned period of the Project (December, 1982).

Projected Completion Dates of Project Activities
To be Completed After April 14, 1982 and Decemoer 31, 1982

| <u>Activity/ Item</u> | <u>Completion After 4/14 1982</u> | <u>Completion After 12/31 1982</u> | <u>Projected Date of Completion</u> |
|--|---|--|---|
| I. Fellowships | | | |
| 1.1 U.S. Academic | + | + | August 1983 |
| 1.2 U.S. Observ. Tour | + | completed | Sept. 1982 |
| 1.3 3rd Country Observ. | + | + | Sept. 1983 |
| II. Training | | | |
| 2.1 Malaria Clinic Workers | + | completed | Dec. 1982 |
| 2.2 Malaria Clinic Workers Refresher | + | + | June 1983 |
| 2.3 Village Voluntary Collaborator | + | + | Sept. 1983 |
| 2.4 Health Education Techniques | + | completed | May 1982 |
| 2.5 Provincial Health Officials | + | completed | June 1982 |

| <u>Activity/ Item</u> | <u>Completion After 4/14 1982</u> | <u>Completion After 12/31 1982</u> | <u>Projected Date of Completion</u> |
|---|---|--|---|
| III. Research | + | + | - |
| IV. Capital Improvements | | | |
| 4.1 Training Center | + | + | June 1983 |
| 4.2 Research Facility | + | completed | Dec. 1982 |
| V. Vehicle Overhauls | + | completed | Dec. 1982 |
| 6.1 Malaria Film | + | completed | Sept. 1982 |
| VII. Procurement of Motorcycles under the Revolving Fund | + | + | Yearly Procurement |

As can be seen there are a number of major actions pending on portions of important project activities. While these activities represent only remaining elements of each activity it appears that an extension of the monitoring capability until April, 1983 as well as a project extension until December 1983 is required if proper management is to be carried out. The major management task is considered to be the re-programming of the expected fiscal balances in the Project into useful and productive assistance activities. It is estimated that the majority of the Project monitoring actions could be completed by April 1983 and that any project actions pending after that period could be managed directly by the Office of Health, Population and Nutrition of USAID/Thailand and concerned RTG offices on a demand basis rather than a daily basis.

The Team also felt that certain activity revisions to the present project might better serve the needs of the Anti-Malaria activities of Thailand. A limited list of possible revisions to the present project is suggested for joint considerations:

- a) In-country observation tours of exemplary zones and sector operations.
- b) Expand the planned refresher training for malaria collaborators to include all malaria collaborators and village health workers.
- c) Procurement of microscopes for mobile clinics and replace old microscopes in the Zone labs.
- d) Procure tape recorders and essential furniture for existing malaria clinics established before the project.
- e) Provide teaching aids for schools in highly malarious areas.
- f) Consultant services for vector control activities.

Many of these suggestions might be useful and financially possible under the present project without the addition of added funds.

The Team also considered the possibility of add-on activities to the present project if mutually acceptable

to the two Governments. These activities might include:

- a) Academic fellowships (U.S. and in-country); the selection of non-medical professionals for MPH training in the U.S. might be considered, i.e. parasitologist, engineer;
- b) In-service technical training in epidemiology with emphasis on analysis, evaluation and application of corrective measure for region, zone, and sector level personnel;
- c) Workshops and seminars to improve inter-sectoral cooperation;
- d) Seminars for provincial and district hospital directors in selected significant locations;
- e) Seminars for village leaders in problem areas;
- f) Seminars for district health officials in highly malarious areas;
- g) Expand malaria clinics in strategic locations;
- h) Train additional malaria clinic workers in order to provide 2 qualified personnel for each clinic;
- i) In-service technical training for entomological workers;
- j) Training in management and supervision techniques for zone chiefs and assistants;
- k) In-service training in technical aspects of malaria control;
- l) In-service training for malaria laboratory microscopists and hospital laboratory technicians;
- m) Replacement of spray equipment, microscopes, etc.;
- n) Grant funding for applied field research;
- o) Construction of permanent zone offices in long-term control areas;

p) Operational support funds for additional control measures in problem and border areas;

As can be seen there are a number of ways to increase the productivity of the present project and the Team encourages the RTG to provide direction and guidance to Project and Malaria Division personnel on the question of extending the project's completion dates and project monitoring services as well as reprogramming expected project balances into meaningful assistance areas.

4. Alternative Methodology

4.1 Biological, Chemical, Physical and Mechanical

Alternative methodologies offer an effective way for a malaria control program to co-evolve with the constantly changing vectors, socio-economics of the people, and changing ecaphic and geographic conditions. Therefore, their constant study and field testing is paramount to the ultimate success of the Malaria Control Program. More frequently than not the introduction of new alternative control methodologies can result in substantial financial savings in program costs and can improve efficiency and effectiveness. Alternative methodologies are discussed below under the categories of: chemical control, biological control, physical control, equipment and strategy.

4.1.1 Chemical Control. Chemical control with insecticides remains the single most effective weapon in any malaria control program. Of course the proper insecticide, at the proper dosage, must be accurately applied, with the correct equipment, and at the right place (in space and time) to coincide with the biological characteristics of the vector species. For purposes of this discussion chemicals will be sub-divided into adulticides, larvicides and repellents.

A. Adulticides. There are some new adulticides that offer promise, namely, bendiocarb (Ficam) and the synthetic pyrethroids (as several products); however all are many times more expensive than DDT. In fact, there are no adulticides presently on the market that are as inexpensive as DDT - nor is there ever likely to be. Where DDT is effective against endophilic species, its use should be continued on the basis of both economy and for the purpose of reserving other residual adulticides for future use in case resistance develops.

Adulticides that can be successfully used as thermal fogs and/or ULV sprays include: malathion, dibrom, fenthion, propoxur, pyrethrin, fenitrothion and synthetic

pyrethroids. These are listed in their approximate order of present cost with malathion being the least expensive. The use of thermal fogs and ULV sprays should be seriously considered as an appropriate control strategy against exophilic and/or exophagic vectors such as An.balabacensis, An.minimus, and An.maculatus, which are considered the 3 principal malaria vectors in Thailand. There is a new development in the use of ULV sprays in the U.S.A. which involves combining two adulticides (of different chemical groups) in a solvent and applying as a ULV spray with extremely effective results. The combination is more economical than when either insecticide is used alone. One such combination is malathion and resmethrin (a synthetic pyrethroid) in H.A.N. (High Aromatic Naptha) on a volume ration of 4:1:7. It is applied at the rate of 5.5 fluid ounces per minute from a Leco ULV machine at a vehicle speed of 10 m.p.h. Further it is felt that such a combination may forestall the development of resistance since a smaller quantity of each insecticide (malathion and resmethrin) are being used and they are from different classes of insecticides. However, additional testing is required to confirm this supposition.

It should be mentioned here that if and when new insecticides are incorporated into the Malaria Control Program in Thailand that the following minimum precautions be taken:

- a. Field trials against all vector and suspected vector species be carried out in advance of large scale general use;
- b. Susceptibility tests on all vector and suspected vector species be carried out in each Region;
- c. Rigorous retraining of spray personnel in the use of the new insecticide with special attention towards safe handling, storage, and application;
- d. If the insecticide is a cholinesterase inhibitor, all spray personnel should be tested for normal cholinesterase level prior to any exposure (handling, use or testing) of the insecticide. This is mandatory if any subsequent cholinesterase testing is to be meaningful. Consequently an adequate number of cholinesterase test kits should be made available. Adequate stocks of atropine sulfate (antidote) should be made available at Sector level; and
- e. Once the new insecticide is incorporated into the operational program it should be under continuous entomological monitoring and evaluation.

d. Larvicides. Chemical larvicides offer a very efficient tool in controlling certain species of anopheline mosquitoes. When larviciding is possible it is a much preferred method to adulticiding. This is so since larvae are in a confined aquatic habitat, the breeding site. Whereas the adult is dispersed over a much greater area both in space and time. For the same expenditure of funds for manpower and materials, greater control of mosquito populations can be achieved by effective larviciding than by effective adulticiding. It is realized that larviciding is not a cureall measure - not all breeding sites can be found in a timely fashion or can be satisfactorily treated to effect control. What we recommend is that a control strategy be developed that incorporates anti-larval measures against vectors and suspected vectors when and where possible.

There are many effective larvicides. Oils such as diesel and kerosene can be effectively employed in many situations. Paris green has been used for more than 50 years. There are also many synthetic chemicals that are effective larvicides including chlorpyrifos, temephos (Abate), parathion, and several others. Each of these are formulated as emulsifiable concentrates, powders or dusts, and in slow release forms. It is recommended that carefully controlled small scale field tests be conducted with these larvicides to prove their efficacy and safety in Thailand before any large scale general use.

C. Repellents. The successful use of repellents has been proven against both vector and pest species of mosquitoes. However, repellents for personal protection provide only short-term protection generally measured in terms of hours. The use of repellents on the exposed parts of one's body cannot be expected to prevent anopheline biting and thus malaria transmission during a long time interval, for example, all night. Repellents can be effectively used to prevent biting for a short time period when exposure is great and until such time as another type of protection, such as, mosquito netting or house screens can be obtained. Also mosquito repellents have been effectively used on wide mesh netting of jackets or parkas as well as bed netting to prevent the entry and biting of mosquitoes. When repellents are impregnated in such netting their repellency effect is much longer than when skin applied.

There are also area repellents that can be ground applied. One such area repellent is "Mosquito Beater", a granular which contains polymethylated naphthalenes, naphthalene, diethylether, glycol, and petroleum distillates. It comes in 1 pound 10 ounce bags that treat an area of 5,000

square feet. It can be completely effective for up to 48 hours and significantly effective for up to 8 days after application.

All repellents should be considered as very short term aids in preventing biting. And their potential beneficial use in malaria control depends on other ancillary control measures carried out in conjunction with their use.

4.1.2 Biological Control. Biological control has gained wide interest on a worldwide level because of insecticide resistance, public concern about insecticide safety, and escalating insecticide costs. However, there are no biological control methods for mosquitoes, including malaria vectors that will work better than conventional larvicides and/or adulticides that are cost effective. There have been many field tests and laboratory tests of biological control agents against mosquitoes however none have proven to be operationally effective and efficient. At best biological control methods against anopheline vectors should be looked at as a supplementary method for very special situations. Accordingly we cannot recommend expanded research in biological control because the probability and potential for successful anopheline control is extremely low.

4.1.3 Physical Control (Source Reduction). By physical control we mean altering the physical environment in such a way as to reduce or eliminate the breeding source of a particular species of mosquito. Hence it is often termed source reduction, which we will utilize here. Since source reduction may be and often is permanent, it is frequently referred to as permanent control. Source reduction, when and where it is applicable to a particular breeding source should be favored in any control program because it produces long-term effects. There is frequently a high initial cost but a very low annual cost when the cost of the source reduction measure is prorated over the effective life of the project. Source reduction covers a wide range of measures from simply filling in a tree hole breeding source with sand to constructing a dam or channelizing a stream. Essentially it involves making a mosquito breeding source unsatisfactory to the mosquito by elimination of the breeding medium (water) altogether or by altering the conditions of the breeding medium to make it completely or partially unsatisfactory to the mosquito. When effective source reduction can be carried out, there can be huge savings in larval and adult control costs - and these savings continue to accrue each year that the source reduction measure remains effective.

Some suggested source reduction measures for Thailand include: stream channelization, stream sluicing and flushing (with automatic siphons), vegetation control, filling in breeding sites, subsoil drainage, etc. There are many success stories in the literature where vector and disease control has been achieved through properly conceived and executed source reduction methods. The British proved that malaria could be controlled by source reduction techniques in Malaysia. And there have been several source reduction successes in Thailand. A water reservoir was cleaned of shoreline vegetation in Korat Province, Chokechai District, Nongbuakhok and malaria transmission was stopped. Many Zones and Sectors do some streambank cleaning apparently with some success. But it involves very little of their total effort and is not being done in a planned systematic manner. Another source reduction example is An.sundaicus control in Indonesia. Since An.sundaicus needs direct sunlight, when mangrove plants and other saline tolerant plants that produce shade were planted in sundaicus breeding sites, the breeding potential was markedly decreased.

4.1.4 Equipment. New and improved spray equipment is coming on the market each year. Therefore it is important that the staff of the Malaria Control Division maintain a constant vigilance for information on new and improved spray equipment. When a particular piece of equipment is deemed as having potential application in Thailand it should then be obtained and field tested. There are many new backpack ULV units on the market now. The ULV spray unit is recommended in open cleared situations whereas the thermal fogger is recommended where dense vegetation exists.

4.1.5 Control Strategy. Presently the 3 primary malaria vectors of Thailand are all acknowledged to be highly exophilic. Accordingly it would seem likely that residual house spraying with DDT or any other residual adulticide is not capable of achieving effective control. Therefore it would seem prudent to plan, test and adopt a different control strategy against the adults of these species. However any control strategy must be based on the sound knowledge of the vector species. A strong scientific base is a prerequisite. And the control strategy must encompass all stages of the vector species - not only the adult stage. We will refer to a comprehensive control strategy which will include source reduction, larviciding and adulticiding. This comprehensive control strategy should be flexible for each particular vector species to encompass any differences in behavior and/or geographical variation in its distribution throughout Thailand. We propose that whenever and wherever a vector breeding source is located, it should be eliminated whenever it

is financially and physically feasible. Whenever a larval breeding source is located, the first question asked should be, "Can it be eliminated or significantly reduced by one or more source reduction measures? If the answer is "yes", then the project should be planned, budgeted, scheduled, and completed as promptly as possible. If the answer is "no", then the next question which should be asked is "Can it be effectively larvicided?". If the answer to this question is "yes", then the larviciding method should be planned, scheduled, and executed as promptly as possible to effect control before adults are produced. If the answer is "No. the breeding source cannot be effectively or economically larvicided.", then the next question is "What is the best method(s) to control the adults?" What control techniques? What kind of spray equipment? What time of day? What insecticide to use? What formulation of insecticide to use? How should it be applied? As a thermal fog? ULV spray? Residual house spray? These are all very relevant questions. When the particular spray technique(s) and insecticide(s) are selected then the precise spray strategy should be carried out against the adult vector as promptly as possible. With this kind of comprehensive control strategy, effective vector control can be achieved and probably at a very feasible cost.

One of the major reasons for the resurgence in malaria morbidity during the last 10 years in Thailand is that the control successes with residual house spraying and chemotherapy were not consolidated with anti-larval and source reduction measures in the areas not being sprayed. Without the adoption and application of effective mosquito control techniques in the areas of consolidation and partial integration malaria vector populations quickly return to their previous population levels, then parasites are introduced and transmission recurs.

4.2 Drug Treatment

Since the commencement of the National Malaria Eradication Programme in 1965 three forms of treatment are recognized, namely presumptive, radical and mass drug administration. In the early years of the programme chloroquine, Pyrimethamine and Primaquine were the 3 main drugs used in these different forms of treatment for the 3 species of malaria parasite with intravenous quinine in severe cases of P.falciparum infections.

With regard to P.vivax and P.malariae infections there has been no change in the treatment schedules in the 3 different forms of treatment though the relapse rate with the 5-day primaquine treatment is high. The extension of the

primaquine treatment to 14 days would be desirable particularly in the consolidation and partial integration areas, where operationally feasible.

However with regard to P. falciparum infections treatment problems have arisen with the increasing resistance of this parasite to chloroquine and its rapid spread throughout the country resulting in chloroquine being replaced by a combination of sulfadoxine and pyrimethamine (Fansidar) in the radical treatment of falciparum malaria in 1974 though chloroquine continued to be used with pyrimethamine in presumptive treatment. With the change of drugs in the radical treatment regimen the proportion of falciparum infections declined from 74% in 1974 to 52% in 1977 but from 1978 it has again shown an upward trend reaching 69% in 1980. This increase in P. falciparum proportion may be indicative of a loss of efficacy of sulfadoxine-pyrimethamine combination in P. falciparum infections which has been confirmed by clinical studies. The development of P. falciparum resistance to the sulfadoxine-pyrimethamine combination and its lowered response to quinine has presented serious problems to the programme.

This perplexing situation has given rise to a variety of treatment regimens, enumerated below, being carried out in different Regions for radical treatment of this parasite species.

1) Region 1

- a) Fansidar 2 tabs (1000 mg Sulfadoxine + 50 mg Pyrimethamine)
Primaquine 1 tab (15 mg) daily for 5 days.
- b) Camoquine 8 tabs (200 mg) in 3 days
Primaquine 1 tab (15 mg) daily for 5 day.
- c) Quinine 6 tabs (300 mg) daily for 7 days
Primaquine 1 tab (15 mg) daily for 5 days.

2) Region 5

- a) Fansidar 2 tabs
Primaquine 1 tab daily for 5 days.
- b) Fansidar 3 tabs
Quinine 8 tabs (6 tabs on second day and
2 tabs on third day).
Primaquine 1 tab daily for 5 days.

3) Region 4

- a) Fansidar 2 tabs
Primaquine 1 tab daily for 5 days
- b) Quinine 6 tabs daily for 7 days
Primaquine 1 tab daily for 5 days

It is reported that in Region 2 when parasitaemia occurs within 7 days with the above lines of treatment quinine (7 days) with tetracyclines (10 days) is given. Variations in treatment schedules were also observed in a district hospital and health center in Region 5 and at the Kamput Refugee Camp in Region (1) which were visited.

1) District Hospital

First day - Fansidar 2 tabs,
Quinine 6 tabs (300 mg)
Tetracycline 2 capsules

Second day - Quinine 6 tabs and
Tetracycline 2 capsules

Third day - Quinine 6 tabs and
Tetracycline 2 capsules

2) Health Center

Fansidar 2 tabs
Quinine 10 tabs (6 tabs (first day) and
4 tabs (second day))

3) Kamput Refugee Camp

Quinine 6 tabs daily for 7 days
Tetracycline 4 capsule (250 mg) for 10 days

No Primaquine was given at these medical institutions.

However in District Hospital - Mae Sot (Region 1) the treatment regimen was in conformity with that recommended by the Malaria Division which was:

Fansidar 2 tabs
Quinine 6 tabs daily for 7 days
Primaquine 1 tab daily for 5 days

This regimen was repeated on subsequent visits.

Presumptive treatment consists of Chloroquine (600 mg) and Pyrimethamine (50 mg) but in areas where the API is over 5 and P.falciparum proportion exceeds 65% Fansidar (2 tabs) and Primaquine 1 tab (15 mg) is administered. However in Malaria Clinics the need for presumptive treatment does not arise as radical treatment is given on the results of microscopic examinations.

Mass drug administration is carried out as a special activity with spray operations and among migrants in areas of intense transmission. It consists of two regimens: (1) Chloroquine (600 mg) with Pyrimethamine (50 mg) and Fansidar (2 tabs) with Primaquine (30 mg). Mass drug administration would be particularly suitable in isolated groups (hill tribes) not within easy reach of health facilities, labor aggregations in development projects and migrant groups but with expanding multiple falciparum resistance its usefulness with the available drugs is not without reservations.

A recent study (1980) carried out by the Programme in one selected centre in each of the 5 Regions has revealed varying degrees of responses to 5 regimens of treatment tried out with Quinine-Tetracycline combination of 7 days producing the maximum cure rate. It is therefore apparent that a single treatment regimen would not be applicable throughout the country. It would seem appropriate to expand this study to more centers which would be representatives of the Region and on the basis of the results to formulate treatment regimens for radical and presumptive treatment on a Zonal/Provincial basis. The organization with the programme of monitoring the sensitivity of P.falciparum to different drugs could assume an advisory role to the Provincial Health Services in the treatment of falciparum malaria through close coordination between the Regional Director of the AMP and Provincial Chief Medical Officer. This arrangement would ensure the same treatment regimen being given by the AMP and the Health Services at the provincial level.

It should be emphasized that the MOPH strictly control the usage of Mefloquine when it is introduced in Thailand, preferably by restricting its distribution through the Malaria Division.

With the prospect of Mefloquine being available in the near future on a commercial scale the AMP has embarked on a programme of obtaining baseline information of the sensitivity levels of P.falciparum which is highly commendable. This information would be invaluable in the future monitoring of P.falciparum sensitivity when Mefloquine is available for use in the Programme.

Treatment has become complicated and an increasing number of drugs are now in use because of multiple resistance of P.falciparum, yet there were ample supplies of drugs at all levels from the Village Voluntary Collaborators to Malaria Clinics and Sector Offices of the AMP and at the Health Centers and District Hospitals of the Provincial Services, which is a tribute to the efficiency of the distribution systems of the two services.

The increasing numbers of patients attending the Malaria Clinics is proof of its high acceptability by the population and these together with the Programme's efforts to have Voluntary collaborators in every village would ensure the ready availability and accessibility of anti-malarial drugs which would help in reducing malaria mortality and frequency and duration of fever episodes and suffering. In the frontier areas of gem mining, forest clearing, etc. by migrants away from settled villages, the deployment of mobile clinics to such areas on a regular (weekly) basis would provide treatment facilities within reasonable reach.

5. RECOMMENDATIONS

5.1 Epidemiology and Surveillance

5.1.1 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.

5.1.2 Administrators at the field level should understand the benefits of surveillance data in planning, directing operations and in following up results of those operations.

5.1.3 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.

5.1.4 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.

5.1.5 In the area of community participation, village health volunteers and communicators who have been trained as malaria collaborators have yet to produce good

results. An effort should be made to encourage these health volunteers to produce better results.

5.1.6 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.

5.1.7 In the cases where P.falciparum is becoming the predominant parasite species, statistics 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 comparison of species data can be made.

5.2 Spraying

5.2.1 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.

5.2.2 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. As a possible incentive for better spray coverage, they might be paid more for each completely sprayed house.

5.2.3 Whether temporary spray personnel are used or not, all direct field supervision should be by permanent personnel.

5.3 Entomology

5.3.1 A new Entomology Section protocol should be prepared as expeditiously as possible and implemented prior to 1982.

5.3.2 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.

5.3.3 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.

5.3.4 Basic research on vector and suspected vector bionomics and behavior should be planned and started on all Regions.

5.4 Health Education and Training

5.4.1 Project Related

Health education and training objectives under the USAID Anti-Malaria Project are being achieved on schedule, except for U.S. academic training.

a. Training

1) As noted elsewhere in this report, it is recommended that the length of project be extended one year so that the Malaria Division can try to recruit qualified candidates for U.S. training. If not accomplished by the end of 1981, funds should be shifted for use in other training categories.

2) To improve training, it is recommended that training staff review and evaluate the training completed and revise curriculum or teaching methods for the training of the remaining 5,000 VVMC's and for future refresher training.

3) It is recommended that VVMC training manuals be revised if necessary to include recent changes in procedures, such as drug treatment.

4) VVMC's deployed without complete malaria kits should be supplied as soon as possible.

5) The policy of recruiting village health services volunteers to be trained as volunteer collaborators has worked well and should be continued. Village health volunteers previously trained in making blood slides should be given appropriate refresher training and provided with malaria kits. To the extent possible the malaria collaborator should be trained as a village health volunteer, thus strengthening the integration of health and malaria.

6) For refresher training programmed under this project for zone and 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.

7) To strengthen the teaching capability of the National Training Center at Phrabuudabhat 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" lectures.

b) Health Education

As with training, the health education activities suggested by this Project should be evaluated and "successful" activities fed back to improve the remaining work to be done.

1) 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.

2) 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) 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.

4) The Malaria Division should consider producing weather-proof signs warning migrating people of high malaria transmission and they should be posted along traveled routes of Thais going into Kampuchea for gem mining and other border areas or agricultural areas employing migrants, e.g. rubber tapping in the Southern provinces. Project funds are available to do this on an experimental basis.

5.4.2 Long-Term Program Improvement

As recommended in 1980 in the review of health education and training components of the Malaria Division, the Division should continue to upgrade National, regional and zone staff responsible for these activities. It is strongly recommended that professionally trained personnel should be carefully selected for their interest and potential qualifications for health education and/or training and be

provided with short-term courses in these disciplines at Mahidol or other universities. One such course is included under the USAIU project, but the need to provide strong in-service training throughout the life of the malaria program will continue.

The Evaluation Team observed excellent health education and training activities in several zones and sectors visited. They recommended that activities found to be successful in the Zone Pak Chong be adequately documented and shared with the rest of the zones.

5.5 Fiscal/Budget

5.5.1 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.

5.5.2 The Bureau of the Budget should consider increasing the per diem for personnel working in the field supervising spraying operations and malaria surveys, especially in control areas, because the amount of work in control areas is more than in other areas and it must be done regularly. However, in determining per diem various conditions should be considered, such as:

- Accurate data concerning control, consolidation and partial integration areas which should be revised to compatible with the actual facts and data on the number of zones and personnel carrying out operations in these areas.

- Data concerning the number of days in a month that personnel can perform their work in a fiscal year in various areas and the different geographical and environmental variations.

5.5.3 In the area of using loan funds to repair and overhaul vehicles, it should be requested that USAID change the methods of repair and overhaul. The methods should be determined by the RTG implementing agencies according to RTG regulations. In the case that the methods of repair and overhaul cannot be changed, USAID should consider the following course of action:

- Allow the use of other spare parts to replace genuine spare parts.

- Allow the replacement of the Jeep engines with engines of other types which reduce the cost of repair and conserve gasoline.

5.5.4 Concerning the shortage of typewriters, a method of solution could be considered as follows:

- Short term solution. Typewriters could be procured using loan funds.

- Long term solution. Request regular budget for purchasing typewriters.

The Malaria Division should survey the needs of the various zones as to the number of typewriters needed and make a plan of requisition accordingly. Moreover, some zone offices have a rather heavy administrative workload in the management of complicated statistics and therefore calculating machines are absolutely necessary for these offices.

5.5.5 In areas where there is a high turnover of temporary wage personnel, for example with spraymen in the South, permanent wage employees should be hired.

5.6 Administration

5.6.1 Conduct a campaign to expedite radical treatment in order to stop transmission.

5.6.2 Train malaria personnel to set priorities in performing their duties.

5.6.3 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.

5.6.4 Closely follow-up and support the activities of the malaria voluntary collaborators, especially at the initial stage of the operations. The village malaria collaborators mostly live in remote villages. The malaria personnel should follow-up and support them regularly and give them additional training as needed so that they can be relied upon by the villagers when they become ill with malaria.

5.6.5 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.

5.6.6 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).

5.6.7 Some zones and sectors received inadequate manpower to carry out the workload, for instance in Zone 6 Trat, 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.

5.6.8 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.

5.6.9 There should be more cooperation and coordination from other government agencies.

5.6.10 The village malaria collaborators did not receive some important equipment such as needles after complete training. Thus, the collaborators were not very keen in performing their duties and lacked experience. This should be improved.

5.7 Research

5.7.1 The Applied Research Section should be strengthened with additional qualified personnel and budget support.

5.7.2 The Malaria Division should establish closer cooperation and coordination with other institutions which have mutual interest in research in malaria and its related fields.

5.8 Impact of the USAID Anti-Malaria Project on Thailand's Malaria Control Activities

The team recommends the following actions be taken in regards to the USAID Anti-Malaria Project.

5.8.1 The completion date for the Project should be extended from December 1982 to December 1983.

5.8.2 The contracts for the two malaria monitors should be extended from April 1982 to April 1983.

5.8.3 Reprogramming of funds budgetted for U.S.

academic training should be done if qualified candidates cannot be found by the end of FY 1981..

5.8.4 Funding of applied field research carried out under this project should be supported by grant funding and not loan funding.

5.8.5 The research project of larvivorous fish now in progress under loan funding should be eliminated from USAID assistance.

5.8.6 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.

5.8.7 If the extension of the project is mutually approved, there should be a 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.

5.9 Alternative Methodologies

5.9.1 Biological, Chemical, Physical, Mechanical

a) New insecticides should be field-tested on a regular basis as residential house sprays in order to be prepared to change insecticides in the event insecticide resistance should develop.

b) Thermal fogging and ULV spraying should be extensively tested to take full advantage of these two invaluable adult control techniques.

c) A field manual for effective use of thermal foggers and ULV sprayers should be developed for distribution to all Regions and Zones.

d) 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.

e) Both new and old larvicides should be extensively field tested throughout Thailand.

f) A field manual on acceptable anti-larval measures for Thailand should be developed for distribution to all Regions and Zones.

g) An intensive field training program on the selection and implementation of anti-larval measures should be conducted throughout Thailand.

h) Pilot source reduction projects should be extensively planned, designed, and implemented in all Regions.

i) A field manual on effective source reduction techniques for Thailand should be developed for distribution to all Regions and Zones.

j) 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.

5.9.2 Drug Treatment

The programme is faced with an acute technical problem of expanding multiple falciparum resistance to anti-malarial drugs which has infused an urgency for formulation of appropriate treatment regimens depending on the sensitivity of the falciparum parasites to the available anti-malarials. Hence, the following recommendations are made:

a) Expand the treatment study initiated in 1980 to more centres in each Region to formulate treatment schedules on a Zonal/Provincial basis.

b) Coordination between the Malaria Division through its Regional Services and the Provincial Health Services to be further strengthened 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.

c) Development and implementation of intensified P. falciparum control in South Eastern part of the country (Trat and Chanthaburi) of increased spray coverage and surveillance to interrupt, if not to reduce transmission of multiple resistance falciparum strains to the other parts of Thailand.

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Table 1
Results of Surveillance Activities (1974-1980)

| | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 |
|------------------------------------|---------------------|------------|------------|------------|------------|------------|------------|
| Population covered by Surveillance | 34,365,724 3,608 | 36,013,664 | 39,743,090 | 40,947,698 | 41,981,290 | 42,701,040 | 44,230,291 |
| Blood Smears examined* | 3,608,342 | 3,589,238 | 3,600,475 | 3,973,513 | 4,101,469 | 4,287,282 | 4,852,911 |
| Positives | 238,950 | 267,534 | 287,547 | 315,431 | 329,512 | 302,721 | 395,442 |
| SFR % | 6.6 | 7.4 | 7.9 | 7.9 | 8.3 | 7.0 | 8.1 |
| ABER % | 8.9 | 8.7 | 7.4 | 7.9 | 7.6 | 7.2 | 8.1 |
| API** | 6.6 | 7.4 | 7.2 | 7.7 | 7.7 | 7.1 | 8.9 |

* Blood smears taken by ACD, PCD, Mass blood survey.

** API = Annual Parasite Incidence per thousand population

Table 2 Operational Phasing

| YEAR | POPULATION IN CONSOLIDATION AND PARTIAL INTEGRATION AREAS |
|------|---|
| 1966 | 6,559,044 |
| 1969 | 17,657,753 |
| 1972 | 26,587,817 |
| 1975 | 31,498,634 |
| 1978 | 33,064,126 |
| 1979 | 33,368,776 |
| 1980 | 34,407,035 |

In 1978, for the first time, areas under the control programme were clearly delineated. The populations under the various phases in 1979 are as follows :

| PHASE | POPULATION | % OF TOTAL |
|---------------------|------------|------------|
| Control | 9,301,666 | 21.78 |
| Late attack | 31,628 | 0.07 |
| Consolidation | 2,196,404 | 5.14 |
| Partial Integration | 31,173,042 | 73.01 |
| Total | 42,701,740 | 100.0 |

Table 1

Slides Examined, Positives, and Slide Positivity Rate (SFR)

Annex 1

By Region from the Malaria Division Yearly Report

(from the Laboratory Services Section)

| Year | Region I | | | Region II | | | Region III | | | Region IV | | | Region V | | |
|------|-----------|----------|-------|-----------|----------|------|------------|----------|------|-----------|----------|-------|----------|----------|-------|
| | Examined | Positive | SFR | Examined | Positive | SFR | Examined | Positive | SFR | Examined | Positive | SFR | Examined | Positive | SFR |
| 1965 | 747,503 | 69,435 | 3.28 | 835,547 | 24,528 | 2.93 | 735,010 | 24,430 | 3.32 | 413,289 | 19,807 | 4.79 | 621,524 | 28,748 | 4.62 |
| 1966 | 689,096 | 49,517 | 7.19 | 750,663 | 20,669 | 2.75 | 698,032 | 16,086 | 2.30 | 445,243 | 21,482 | 4.82 | 744,444 | 20,388 | 2.73 |
| 1967 | 850,490 | 33,150 | 3.89 | 1,026,889 | 31,208 | 3.03 | 853,952 | 14,863 | 1.74 | 570,607 | 22,334 | 3.91 | 770,534 | 14,583 | 1.89 |
| 1968 | 948,292 | 40,382 | 4.25 | 1,057,751 | 32,305 | 3.05 | 1,040,873 | 25,894 | 2.48 | 768,175 | 19,372 | 2.52 | 902,910 | 17,684 | 1.95 |
| 1969 | 1,120,255 | 40,982 | 3.65 | 1,250,167 | 26,097 | 2.02 | 1,241,519 | 21,775 | 1.75 | 806,701 | 17,131 | 2.12 | 997,093 | 25,463 | 2.55 |
| 1970 | 918,485 | 50,565 | 5.50 | 1,118,602 | 30,047 | 2.68 | 1,083,155 | 24,082 | 2.22 | 757,985 | 23,041 | 3.04 | 833,532 | 41,824 | 5.02 |
| 1971 | 998,331 | 58,000 | 5.81 | 1,167,467 | 36,790 | 3.15 | 1,044,795 | 30,249 | 2.89 | 662,062 | 24,490 | 3.69 | 765,069 | 50,891 | 6.65 |
| 1972 | 896,217 | 26,392 | 2.94 | 958,953 | 17,397 | 1.81 | 793,157 | 19,835 | 2.50 | 463,618 | 19,196 | 4.14 | 618,757 | 43,539 | 7.03 |
| 1973 | 894,840 | 45,262 | 5.05 | 1,178,182 | 41,211 | 3.49 | 752,868 | 21,820 | 2.89 | 545,460 | 36,142 | 6.62 | 629,600 | 56,668 | 9.00 |
| 1974 | 1,001,808 | 79,266 | 7.91 | 1,053,732 | 41,845 | 3.97 | 832,064 | 36,575 | 4.40 | 536,448 | 50,275 | 9.37 | 634,107 | 78,792 | 12.43 |
| 1975 | 935,095 | 90,426 | 9.67 | 1,104,800 | 39,641 | 3.59 | 813,623 | 43,995 | 5.41 | 614,807 | 66,919 | 10.88 | 647,640 | 71,135 | 10.98 |
| 1976 | 816,910 | 88,276 | 10.81 | 967,188 | 25,707 | 2.66 | 731,941 | 42,004 | 5.74 | 583,529 | 73,527 | 12.60 | 603,278 | 69,716 | 11.56 |
| 1977 | 887,264 | 58,460 | 11.10 | 1,162,066 | 38,047 | 3.27 | 736,676 | 36,154 | 4.97 | 607,692 | 73,888 | 12.16 | 660,781 | 70,612 | 10.69 |
| 1978 | 882,898 | 97,235 | 11.01 | 1,100,795 | 37,570 | 3.41 | 721,398 | 41,941 | 5.81 | 694,629 | 70,452 | 10.14 | 651,894 | 78,743 | 12.08 |
| 1979 | 863,755 | 70,238 | 8.13 | 1,131,763 | 24,114 | 2.13 | 721,523 | 31,437 | 4.37 | 783,808 | 90,026 | 11.49 | 601,645 | 74,022 | 12.51 |
| 1980 | 824,069 | 84,171 | 10.21 | 1,328,927 | 22,937 | 1.72 | 839,931 | 39,500 | 4.70 | 832,660 | 125,035 | 15.01 | 730,033 | 110,385 | 15.12 |

Table 1

Annex 2

Summary of DDT spraying operations for the whole country of Thailand
Year 1976 - 1980

| Details | 1976 | | 1977 | | 1978 | | 1979 | | 1980 | |
|---|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | Cycle 1 | Cycle 2 |
| No. provinces sprayed | 59 | 56 | 59 | 56 | 60 | 58 | 60 | 58 | 59 | 59 |
| No. districts sprayed | 366 | 305 | 389 | 302 | 415 | 333 | 425 | 363 | 413 | 354 |
| No. villages sprayed | 9,038 | 4,319 | 8,671 | 4,507 | 8,766 | 5,022 | 8,455 | 5,056 | 8,624 | 5,885 |
| Total houses sprayed | 1,064,517 | 374,900 | 1,030,835 | 434,106 | 996,643 | 400,041 | 717,291 | 378,854 | 648,670 | 343,791 |
| Total incompletely sprayed houses | 275,119 | 184,294 | 563,044 | 216,444 | 517,461 | 178,851 | 323,076 | 150,676 | 233,019 | 113,715 |
| Percentage of incompletely sprayed houses | 46.57 | 44.17 | 48.45 | 45.75 | 46.36 | 40.47 | 40.73 | 36.16 | 32.75 | 30.70 |
| Total unsprayed houses | 150,454 | 42,375 | 131,321 | 49,563 | 119,611 | 41,933 | 75,994 | 37,863 | 62,808 | 26,573 |
| Percentage of unsprayed house | 12.16 | 10.16 | 11.30 | 10.25 | 10.72 | 9.48 | 9.58 | 9.09 | 8.83 | 7.17 |
| Total huts sprayed | 238,893 | 203,207 | 231,163 | 151,509 | 260,812 | 200,449 | 289,016 | 194,318 | 284,092 | 250,567 |
| Population in sprayed houses | 5,594,958 | 1,892,860 | 5,293,578 | 2,149,967 | 5,030,057 | 1,949,433 | 3,497,168 | 1,846,423 | 3,201,986 | 1,668,952 |
| DDT 75% used (Kgm.) | 760,882.5 | 294,143.5 | 679,223 | 269,666 | 657,624 | 302,775 | 561,854 | 317,538 | 461,095 | 267,872 |
| DDT 25% used (Lts.) | - | - | - | - | - | - | - | - | 100,871 | 66,250.5 |
| Average DDT used per capita (gm.) | 135.99 | 155.40 | 126.31 | 138.08 | 130.73 | 155.31 | 160.66 | 171.97 | 163.28 | 190.01 |

TABLE 1

Results of Training Village Voluntary Collaborators (as of 31 May 1981)

| Region | Control Area | | | Eradication Area | | | Total for All Areas | | | Remarks |
|--------|----------------------------|----------------|--------|-------------------------|----------------|----------|-----------------------|----------------|----------|--------------------------------|
| | Total Villages (target) | Actual Trained | | Target Number of VVC | Actual Trained | | Total VVC (target) | Actual Trained | | |
| | | Villages | VVC | | VVC | Villages | | VVC | Villages | |
| I | 1,438 | 1,755 | 2,385 | 1,500 | 514 | 431 | 2,938 | 2,899 | 2,186 | |
| II | 3,871 | 3,439 | 4,387 | 1,500 | 2,737 | 2,377 | 5,371 | 7,124 | 5,816 | |
| III | 3,288 | 3,303 | 3,312 | 1,500 | 1,668 | 1,668 | 4,788 | 4,980 | 4,971 | |
| IV | 2,869 | N/A | N/A | 1,500 | N/A | N/A | 4,369 | N/A | N/A | Not Available In Progress |
| V | 1,311 | - | - | 1,500 | - | - | 2,811 | - | - | Scheduled for June and July |
| Total | 12,777 | 8,497 | 10,084 | 1,500 | 4,919 | 4,476 | 20,277 | 15,003 | 12,973 | as of 30 May 1981 |

Annex 3

Table 2

Training Activities Within Thailand

| <u>Course</u> | <u>Total Planned Participants</u> | <u>Actual To Date</u> | <u>Comments</u> |
|---|-----------------------------------|-----------------------|-------------------------|
| 1. Malaria Clinic Workshop | 50 | 54 | 4-8 February 1980 |
| 2. Malaria Clinic Workers | 250 | 123 | 30 persons now training |
| 3. Malaria Clinic Workers Refresher Prototype | 45 | 45 | 3-7 November 1980 |
| 4. Malaria Clinic Workers Refresher | 220 | 91 | 8 June - 20 July 1981 |
| 5. Financial management | 39 | 39 | 20-21 Oct. 1980 |
| 6. Mechanics | 60 | 60 | 1 April - 3 May 1980 |
| 7. Mechanics Refresher | 60 | 0 | Eliminated |
| 8. Health Education Workshop | 25 | 45 | 15-19 April 1980 |
| 9. Instructors of Trainers | 50 | 92 | 19-23 May 1980 |
| 10. Trainers of Volunteers | 400 | 522 | 14 July - 19 Sept 1980 |
| 11. Instructors of Refresher | 50 | 0 | Eliminated |
| 12. Trainers of Volunteers Refresher | 100 | 0 | Eliminated |

| <u>Course</u> | <u>Total Planned Participants</u> | <u>Actual To Date</u> | <u>Comments</u> |
|---|-----------------------------------|-----------------------|---|
| 13. Village Voluntary Collaborators | 20,000 | 15,003 | As of 31 May 1981; on-going |
| 14. Village Voluntary Collaborators Refresher | 20,000 | 0 | Planned for FY 1983 |
| 15. Malaria II (Regional and Service Zone Level Personnel) | 188 | 188 | 17-23 June 1981 |
| 16. Malaria I (Sector Level Personnel) | 738 | 0 | Planned for FY 1982 (3 weeks) |
| 17. Health Education Techniques (National, Regional and Zone H. Edu. Staff) | 55 | 0 | Planned for FY 1982 |
| 18. Audio-Visual Equipment Use and Maintenance | 30 | 0 | Planned for Sept. 1981 (Equipment now Arriving) |
| 19. Provincial Health Officials | 144 | 0 | Planned for FY 1982 |
| 20. Research Workshop | 35 | 0 | Planned for FY 1981 |
| 21. Electrical Equipment Repair | 3 | 3 | 4 Dec. 1980 - Sept. 1981 |

Annex 3

Table 3

Fellowships (Grant-Funded)

| <u>Category</u> | <u>Planned</u> | <u>Actual To Date</u> | <u>Comments</u> |
|--------------------------------------|----------------|---------------------------|--|
| 1. U.S. Academic - M.P.H. | 7 | 2 | 1 began study August 1980 at Tulane Univ. 1 began August 1981 at Tulane Univ. |
| 2. In-Country Academic - M.S. | 7 | 4 | Began study March, 1980 at School of Tropical Medicine, Mahidol University |
| 3. U.S. Observation Tour | 12 | 4 | Began tour Sept. 6 completed Oct. 18, 1980 |
| 4. Third Country Observation Tour | 35 | 12 | Group 1, Sri Lanka and India - Dec. 80 Group 2, Indonesia, and Philippines - Jan. 1981 |

- * Difficulty in finding qualified candidates will require extension of training period or a change from academic training to Third Country Observation.

Annex 3

Table 4

Health Education Materials

| <u>Item</u> | <u>Total</u> | <u>Actual To Date</u> | <u>Comments</u> |
|---|--------------|---------------------------|---|
| 1. Report of Malaria Clinic Workshop | 250 | 250 | Distributed to Regions, Zones |
| 2. Malaria Clinic Handbook (Draft) | 500 | 500 | Distributed to Regions, Zones, Clinics |
| 3. Malaria Clinic Handbook (Final) | 1,000 | - | Under Revision |
| 4. Report of Health Education Workshop | 450 | 450 | Distributed, Regions, Zones, Sectors |
| 5. Jeep Repair and Maintenance Manual | 65 | 65 | Distributed to Mechanics |
| 6. Handbook for the Identification of Anopheline Larvae | 1,500 | - | Prototype developed, invitation for bids announced |
| 7. Voluntary Collaborator Handbook | 42,000 | 25,000 | Distributed to Volunteers, Staff (the remaining 12,000 are being revised) |
| 8. Malaria Control and Eradication Manual | 2,000 | - | Contents in Planning Stage |
| 9 Posters | 814,000 | 664,000 | Distributed to Regions, Zones, Sectors, Villages, Rural Health Facilities |

| <u>Item</u> | <u>Total</u> | <u>Actual To Date</u> | <u>Comments</u> |
|--|--------------|---------------------------|---------------------------------------|
| 10. Pamphlets | 812,000 | 512,000 | Distributed to Regions |
| 11. Staple Guns | 342 | 342 | Received |
| 12. Cinema Slides | 1,550 | - | Invitation for Bids Announced |
| 13. Flip Charts (For Health Education and Training) | 400 | - | Content Developed, Cost Estimated |
| 14. Exhibition Sets | 39 | - | Content Developed, Cost Estimated |
| 15. Cassette Tapes (For Malaria Clinics and Radio Stations) | 2,985 | 2,985 | Distributed to Regions (partially) |
| 16. Reel to Tapes | 10 | 10 | Distributed to Zones |
| 17. Text Books | - | - | List in Preparation |
| 18. Malaria Program Film (copy existing film) | 35 | - | Requested DTEC to Implement |
| 19. Malaria Program Film, 15 minutes (new) | 50 | - | Requested DTEC to Implement |
| 20. Entertainment Films (For use by Mobile Teams) | 50 | - | Requested DTEC to Implement |
| 21. Voluntary Collaborator Meritorious Achievement Certificates (after years of satisfactory performance) | 20,000 | 20,000 | Received |

TABLE 5**Annex 3****Poster Distribution Plan - Initial Printing**

| Subject of Poster | Target Area By Phase | Number of Villages | Number per Village | Sub - Total | Quantity for Malaria Offices and Health Services Facilities | Total |
|---|--|-----------------------------------|-----------------------------------|--------------------|--|----------------|
| Malaria Prevention and Personal Protection Measures | Control, Late Attack, Consolidation | 15,000 | 6 | 90,000 | 10,000 | 100,000 |
| 2. D.D.T. Spraying Information | Control | 13,000 | 6 | 79,000 | 10,000 | 88,000 |
| 3. Malaria Symptoms and Advice to Have Blood Examined (including sites) | All Phases | 56,000 | 6 | 336,000 | 10,000 | 346,000 |
| 4. Advice to Utilize Village Voluntary Collaborators' Free Services If Symptoms Occur | Villages with VVC's in All Phases | 24,000 | 5 | 120,000 | 10,000 | 130,000 |
| | | | | | Total | 664,000 |

Annex 3

Table 6

Health Education Equipment (Loan-Funded) (January, 1981)

| | | <u>7/15/81 Status</u> |
|--|-----------|---------------------------|
| 1. 16 mm Movie Projector with anamorphic lense | 12 units | shipping |
| 2. Slide Projector | 12 units | shipping |
| 3. Radio/Cassette Tape Recorder | 313 units | distributed |
| 4. Overhead Projector | 6 units | bids opened |
| 5. Projection Screen | 7 units | shipping |
| 6. Outdoor Projection Screen | 6 units | received |
| 7. Easel | 7 units | being procured |
| 8. Amplifier 200 watts | 7 units | shipping |
| 9. Microphone Mixers | 7 units | shipping |
| 10. Microphone | 63 units | shipping |
| 11. Microphone Stand | 58 units | being procured |
| 12. Sound Column Speaker | 18 units | received |
| 13. Amplifier 150 watts | 6 units | received |
| 14. Horn Speaker with Stand | 10 units | received |
| 15. Generator 3 kW | 6 units | shipping |
| 16. Mobile Loudspeaker Set | 200 units | shipping |
| 17. 35 mm Camera and Electronic Flash | 6 units | shipping |

Annex 3

Table 7

Training Equipment (Loan Funded)*

| <u>Item</u> | <u>Number</u> | <u>Status</u> |
|----------------------------------|---------------|--|
| Electric Stencil Scanner | 1 | Out for Rebids |
| Electronic Stencil Duplicator | 2 | Received (one at head- quarters, one at Training Center) |
| Water Coolers | 4 | Received (at Training Center) |
| Typewriters (bi-lingual) | 2 | Received (one at Headquarters, one at Training Center) |

* Source: USAID Anti-Malaria Project Monitors (17 July 1981)

ANNEX 4

(Page 1)

USAID ANTI-MALARIA PROJECT
MID-TERM EVALUATION
JULY 1-23, 1981

HEADQUARTERS

| Category | Selected Planned Program Targets to June 1981 | Accomplishments To Date | | Problems (if any) Impeding Progress |
|----------------------------------|--|-------------------------|-----------------|--|
| | | On Schedule | Behind Schedule | |
| I. Technical Assistance | 1) Project Monitors - 2 2) Consultants - 6 | 2 on site 6 | - - | none none |
| II. Fellowships | 1) In-Country M.S. - 3 2) U.S. Observation - 3 3) 3rd Country Observation - 1 | 2 studying 1 - | 1 2 1 | Failed entrance exam. Language testing DTEC approval |
| III. Training | 1) Financial Management - 18 2) Mechanics - 5 3) Malaria II - 29 | 18 5 29 | - - - | none none none |
| IV. Research | Radical Treatment Project - 1 | 1 | - | none |
| V. Capital Improvement | 1) H.Q. Research Bldg. - 1 2) Insectary Improvements - 1 | 1 90% complete | - 10% | none Delay in procurement of goods and services |
| VI. Commodities | 1) Research Equipment 2) Spray Tips - 20,000 | 10% 20,000 | 90% - | Delay in specification delivery none |
| VII. Vehicle Overhauls | - | - | - | - |
| VIII. Health Education Materials | 1) Posters - 3,600 2) Pamphlets - 10,000 3) Voluntary Collaborator Handbooks - 130 | 3,600 10,000 130 | - - - | none none none |
| IX. Revolving Fund | - | - | - | - |
| X. Motorcycles | - | - | - | - |
| XI. Evaluation | Mid-Term Evaluation | on Schedule | - | none |

USAID ANTI-MALARIA PROJECT

MID-TERM EVALUATION

JULY 1-27, 1981

REGION I

| Category | Selected Planned Program Targets to June 1981 | Accomplishments To Date | | Problems (if any) Impeding Progress |
|-------------------------|---|-------------------------|-----------------|-------------------------------------|
| | | On Schedule | Behind Schedule | |
| I. Technical Assistance | | | | |
| II. Fellowshps | 1) U.S. Academic - No Target | - | - | Non-availability of Candidates |
| | 2) In-country Academic | - | - | |
| | 3) U.S. Observation - 2 | 1 | 1 | Language Testing, DTEC |
| | 4) 3rd Country Observ. - 4 | 2 | 2 | DTEC approval |
| III. Training | 1) Malaria Clinic Workers - 30 | 32 | - | - |
| | 2) Village Voluntary Collaborators FY 1981 - Target: 2,938 | 2,899 | - | - |
| | 3) Trainers of Volunteers - 80 | 99 | - | - |
| | 4) Malaria II - 33 | 33 | - | - |
| | 5) Mechanics - 12 | 12 | - | - |
| | 6) Malaria Clinic Workers Refresher - 23 | 23 | - | - |
| | 7) Financial Management - 5 | 5 | - | - |
| IV. Research | 1) Larvivorous Fish Rearing Project - 1 | on-going | - | Non-availability of fish |
| V. Capital Improvements | 1) New Training Facility - 1 | - | 1 | Delay in completion of blueprints |
| | 2) Existing Training Facility - 1 | 75% complete | 1 | Delay in Goods and Services |
| | 3) Insectary | 60% complete | 1 | " " |
| VI. Commodities | 1) Microscopes - 80 | - | 80 | Delay in specifications |
| | 2) Volunteer Kits - 2,900 | 64% complete | 4 items | Lack of responsive bidders, delays |
| | 3) Malaria Clinic Furniture FY 1981 Target: -30 | | | |
| | 4) Sprayers - 400 | 400 | - | - |
| | 5) Spray Tips - 4,000 | 4,000 | - | - |
| VII. Vehicle Overhauls | 1) Vehicles - 30 | 8 | 9 in progress | Cash flow, documentation |

ANNEX 4

(Page 2-a)

REGION I (Cont'd)

| Category | Selected Planned Program Targets to June 1981 | Accomplishments To Date | | Problems (if any) Impeding Progress |
|----------------------------------|---|-----------------------------|-------------------------|--|
| | | On Schedule | Behind Schedule | |
| VIII. Health Education Materials | 1) Posters - 130,600 2) Pamphlets - 100,000 3) Voluntary Collaborator Handbooks - 3,370 | 130,600 100,000 3,370 | - - - | |
| IX. Motorcycles Revolving Fund | Motorcycles - 100 | Bids Evaluated | Awaiting USAID Approval | Delay in receiving purchase commitment from Region |
| X. Motorcycles | Motorcycles - 60 | 60 | - | |

USAID ANTI-MALARIA PROJECT

MID-TERM EVALUATION

JULY 1-27, 1981

REGION II

| Category | Selected Planned Program Targets to June 1981 | Accomplishments to | | Problems (if any) Impeding Progress |
|-------------------------|---|---|---|---|
| | | On Schedule | Behind Schedule | |
| I. Technical Assistance | | | | |
| II. Fellowships | 1) U.S. Academic - No Target 2) In-Country - No Target 3) U.S. Observation - 1 4) 3rd Country Observ. - 4 | - - 1 2 | - - - 2 | Non-Availability of Candidates DTEC Approval |
| III. Training | 1) Malaria Clinic Workers - 30 2) Village Voluntary Collaborators FY 1981 Target: - 5,371 3) Trainers of Volunteers - 80 4) Malaria II - 30 5) Mechanics - 12 6) Malaria Clinic Workers Refresher - 40 7) Financial Management - 4 | 30 7,124 78 30 12 40 4 - | - - - - - - - | |
| IV. Research | - | - | - | |
| V. Capital Improvements | 1) Research Facility 2) Improve Training Facility - 1 | in progress 1 | - - | |
| VI. Commodities | 1) Microscopes - 55 2) Volunteer Kits - 5,300 3) Malaria Clinic Furniture FY 1981 Target: - 30 4) Sprayers - 752 5) Spraytips - 4,000 | - 64% complete 12 752 4,000 | 80 4 items On-going - - | Delay in specifications, shipping Lack of responsive bidders Cash flow, documentation |
| VII. Vehicle Overhauls | Vehicles - 30 | 6 | 6 in progress | Cash flow, documentation |

ANNEX 4

(Page 3 - a)

REGION II (Cont'd)

| Category | Selected Planned Program Targets to June 1981 | Accomplishments to Date | | Problems (if any) Impeding Progress |
|----------------------------------|---|-----------------------------|-------------------------|--|
| | | On Schedule | Behind Schedule | |
| VIII. Health Education Materials | 1) Posters - 143,700 2) Pamphlets - 100,000 3) Voluntary Collaborator Handbooks - 8,000 | 143,700 100,000 8,000 | - - - | |
| IX. Motorcycles Revolving Fund | Motorcycles - 100 | Bids evaluated | Awaiting USAID approval | Delay in receiving purchase commitments from Regions |
| X. Motorcycles | Motorcycles - 60 | 60 | - | |

* Differences in figures for participants taken from Vouchers submitted for each of the courses.

ANNEX 4

(page 4)

USAID ANTI-MALARIA PROJECT

MID-TERM EVALUATION

JULY 1-23, 1981

REGION III

| Category | Selected Planned Program Targets to June 1981 | Accomplishments to | | Problems (if any) Impeding Progress |
|----------------------------------|--|---|-------------------------------------|--|
| | | On Schedule | Behind Schedule | |
| I. Technical Assistance | - | - | - | - |
| II. Fellowships | 1) U.S. Academic M.P.H. -1 2) In-Country M.S. - 1 3) U.S. Observation - 1 4) 3rd Country Observ. - 4 | 1 1 1 2 | - - - 2 | none none none DTEC approval |
| III. Training | 1) Malaria Clinic Workers - 30 2) Village Voluntary Collaborators FY-1981 Target: 4,788 3) Trainers of Volunteers - 86 4) Malaria II - 28 5) Mechanics - 11 6) Malaria Clinic Workers Refresher - 6 7) Financial Management - 4 | 29 4,980 86 28 11 6 4 | 1 - - - - - - | none none none none none none |
| IV. Research | - | - | - | - |
| V. Capital Improvements | - | - | - | - |
| VI. Commodities | 1) Microscopes - 55 2) Volunteer Kits - 4,700 3) Malaria Clinic Furniture FY 1981 Target: - 30 4) Sprayers - 336 5) Spraytips - 4,000 | - 64% complete 24 336 4,000 | 55 4 items on-going - - | Delay in specifications shipping Lack of responsive bidders, delivery delays Cash flow (initially) none none |
| VII. Vehicle Overhauls | Vehicles - 30 | 10 | 20 in progress | Cash flow (initially) |
| VIII. Health Education Materials | 1) Posters - 156,400 2) Pamphlets - 100,000 3) Voluntary Collaborators - 6,000 | 156,400 100,000 6,000 | - - - | none none none |

ANNEX 4

(page 4-a)

REGION III (Cont'd)

| Category | Selected Planned Program Targets to June 1981 | Accomplishments To Date | | Problems (if any) Impeding Progress |
|---------------------|---|-------------------------|-------------------------|---|
| | | On Schedule | Behind Schedule | |
| IX. Revolving Funds | Motorcycles - 100 | Bids evaluated | Awaiting USAID approval | Delay in receiving purchase commitments from Region |
| X. Motorcycles | Motorcycles - 60 | 60 | - | none |

ANNEX 4

USAID ANTI-MALARIA PROJECT

MID-TERM EVALUATION

JULY 1-23, 1981

REGION IV

| Category | Selected Planned Program Targets to June 1981 | Accomplishments to Date | | Problems (if any) Impeding Progress |
|-------------------------|--|-------------------------|---|---|
| | | On Schedule | Behind Schedule | |
| I. Technical Assistance | | | | |
| II. Fellowships | 1) U.S. Academic - No Target | - | One student starting study in Sept 1981 | |
| | 2) In-Country Academic - No Target | - | - | |
| | 3) U.S. Observation - 1 | 1 | - | |
| | 4) 3rd Country Observ. - 6 | 3 | 3 | DTEC approval |
| III. Training | 1) Malaria Clinic Workers - 30 | 32 | - | |
| | 2) Village Voluntary Collaborators FY 1981 Targets: - 4,369 | 1,123 | on-going | |
| | 3) Trainers of Volunteers - 80 | 102 | - | |
| | 4) Malaria II - 37 | 37 | - | |
| | 5) Mechanics - 10 | 10 | - | |
| | 6) Malaria Clinic Workers Refresher - 6 | 6 | - | |
| | 7) Financial Management - 4 | 4 | - | |
| IV. Research | Larvivorous Fish Field Trial Project - 1 | on-going | - | flooding, security |
| V. Capital Improvements | | - | - | |
| VI. Commodities | 1) Microscope - 55 | - | 55 | Delay in specifications, shipping |
| | 2) Volunteer Kits - 4,300 | 64% complete | 4 items | Lack of responsive bidders, delivery delays |
| | 3) Malaria Clinic Furniture FY 1981 Target: - 30 | 11 | on-going | Cash flow, documentation |
| | 4) Sprayers - 240 | 240 | - | |
| | 5) Spraytips - 4,000 | 4,000 | - | |

ANNEX 4

(page 5 - a)

REGION IV (Cont'd)

| Category | Selected Planned Program Targets to June 1981 | Accomplishments to Date | | Problems (if any) Impeding Progress |
|----------------------------------|--|-----------------------------|-------------------------|--|
| | | On Schedule | Behind Schedule | |
| VII. Vehicle Overhauls | Vehicles - 30 | - | 32 in progress | Cash flow, documentation |
| VIII. Health Education Materials | 1) Posters - 100,300 2) Pamphlets - 100,000 3) Voluntary Collaborators Handbooks - 4,500 | 100,300 100,000 4,500 | - - - | |
| IX. Motorcycle Revolving Fund | Motorcycles - 100 | Bids evaluated | Awaiting USAID approval | Delay in receiving purchase commitments from Regions |
| X. Motorcycles | Motorcycles - 60 | 60 | - | |

ANNEX 4

(Page 6)

USAID ANTI-MALARIA PROJECT

MID-TERM EVALUATION

JULY 1-23, 1981

REGION V

| Category | Selected Planned Program Targets to June 1981 | Accomplishments to Date | | Problems (if any) Impeding Progress |
|-------------------------|---|-------------------------|-----------------|--|
| | | On Schedule | Behind Schedule | |
| I. Technical Assistance | | | | |
| II. Fellowships | 1) U.S. Academic - No Target | - | - | Nor-availability of candidates Language Testing, DTEC DTEC approval |
| | 2) In-country Academic - No Target | - | - | |
| | 3) U.S. Observation - 1 | - | - | |
| | 4) 3rd Country Observ. - 4 | 2 | 2 | |
| III. Training | 1) Malaria Clinic Workers - 30 | 30 | - | - |
| | 2) Village Voluntary Collaborators FY 1981 Target: - 2,811 | in progress | - | - |
| | 3) Trainers of Volunteers - 80 | 84 | - | - |
| | 4) Malaria II - 32 | 32 | - | - |
| | 5) Mechanics - 12 | 12 | - | - |
| | 6) Malaria Clinic Workers Refresher - 26 | 26 | - | - |
| | 7) Financial Management - 4 | 4 | - | - |
| IV. Research | - | - | - | - |
| V. Capital Improvements | - | - | - | - |
| VI. Commodities | 1) Microscopes - 55 | - | 55 | Delay in specifications, shipping Lack of responsive bidders, delivery delays Cash flow, documentation |
| | 2) Volunteer Kits - 2,800 | 64% complete | 4 items | |
| | 3) Malaria Clinic Furniture FY 1981 Target: - 30 | 16 | on-going | |
| | 4) Sprayers - 272 | 272 | - | |
| | 5) Spraytips - 4,000 | 4,000 | - | |

ANNEX 4

(Page 6 - a)

REGION V (Cont'd)

| Category | Selected Planned Program Targets to June 1981 | Accomplishments to Date | | Problems (if any) Impeding Progress |
|--|---|----------------------------|-------------------------------|--|
| | | On Schedule | Behind Schedule | |
| VII. Vehicle Overhauls | Vehicles - 30 | 12 | 16 in progress | Cash flow, documentation |
| VIII. Health Education Materials | 1) Posters - 129,400 2) Pamphlets - 90,000 3) Voluntary Collaborator Handbooks - 3,000 | 129,400 90,000 3,000 | - - - | - |
| IX. Motorcycle Revolving Fund | Motorcycles - 100 | Bids evaluated | Awaiting USAID approval | Delay in receiving |
| X. Motorcycles | Motorcycles - 60 | 60 | - | - |

ANNEX 5

Table 1

Results of In-Vitro Macro-Tests for the Susceptibility of
P.falciparum to Chloroquine in Thailand 1977-1980

| Area of Study | Year of Study | No. of Subjects | Results, No. and % | | |
|---------------|----------------|-----------------|--------------------|----------------|-----------------|
| | | | Sensitive | Indeterminate | Resistance |
| Kanchanaburi | 1977 | 37 | 8 (22) | 4 (11) | 25 (67) |
| Phrae | 1977 | 45 | 1 (2) | 35 (78) | 9 (20) |
| Tak | 1977 | 29 | 1 (3) | 4 (14) | 24 (83) |
| Phitsanuloke | 1978 | 25 | - | 1 (4) | 24 (96) |
| Yala | 1978 | 30 | 1 (3) | - | 29 (97) |
| Songkhla | 1978 | 28 | 1 (3) | 5 (18) | 22 (79) |
| Chumporn | 1978-80 | 25 | - | 2 (8) | 23 (92) |
| Phang-Nga | 1978 | 23 | - | - | 23 (100) |
| Ranong | 1978 | 30 | 2 (7) | 1 (3) | 27 (90) |
| Krabi | 1978 | 26 | - | - | 26 (100) |
| Mae Hong Son | 1979-80 | 27 | - | 3 (11) | 24 (39) |
| Chiang Mai | 1980 | 23 | - | 2 (9) | 21 (19) |
| Prachinburi | 1980 | 32 | - | 2 (6) | 30 (94) |
| Chantaburi | 1980 | 32 | 1 (3) | 1 (3) | 30 (94) |
| Kalasin | 1980 | 22 | - | - | 22 (100) |
| Sakhon Nakorn | 1980 | 25 | 2 (8) | 1 (4) | 22 (88) |
| Surin | 1980 | 29 | - | - | 27 (100) |
| Buriram | 1980 | 27 | - | - | 27 (100) |
| Uttaradit | 1980-81 | 27 | - | 3 (11) | 24 (88) |
| Payao | 1980 | 15 | 1 (7) | - | 14 (93) |
| TOTAL | 1977-80 | 557 | 18 (3) | 64 (12) | 475 (85) |

Annex 6

Sites and Persons Visited by the Team

7/2/81

Region 4 Songkhla

Briefed and accompanied by:

| | |
|---------------------------|-------------------------------|
| Dr. Thawati Keaosanit | Regional Director |
| Dr. Saravudh Suvannadabha | Asst. Regional Director |
| Jiera Boonyoung | Chief of Spraying |
| Pornpimol Vejavit | Chief of Epidemiology |
| Yanyong Mungvicha | Asst. Chief, Health Education |

Zone 2 Songkhla

Briefed by:

| | |
|-----------------|------------|
| Chua Yimprasert | Zone Chief |
|-----------------|------------|

7/3/81

Zone 1 Yala

Briefed and accompanied by:

| | |
|--------------------|------------------|
| Chaiporn Thipila | Zone Chief |
| Virasak Tantananta | Asst. Zone Chief |
| Chang Suphanphong | Health Educator |

Malaria Voluntary Collaborators

Visited:

| | |
|-----------------------------|---|
| Lek Thonkaen | Village 4, Tambon Poh Seng, Muang District, Yala Province |
| Useng Saleh | Village 1, Tambon Yala, Muang District, Yala |
| Pol. Serg. Chare Dulyachart | Village 4, Tambon Pohn Seng, Muang District, Yala |

Malaria Clinics Visited

Malaria Clinic Tambon Lamprai, Sector 6 Thepha

| | |
|------------------|-----------------------|
| Banphot Choolert | Malaria Clinic Worker |
|------------------|-----------------------|

Malaria Clinic, Sector 5, Nathawee

| | |
|-------------------|-----------------------|
| Charuh Saeng Ravi | Sector Chief |
| Cha Chooniam | Malaria Clinic Worker |
| Chamroon Hemsiri | Malaria Clinic Worker |

7/4/81

Zone 3 Phang-nga

| | |
|---------------------------|---------------------------|
| Chao Poolsawat | Zone Chief |
| Manu Laosam | Asst. Zone Chief |
| Manit Suphasie | Asst. Zone Chief |
| Pramote Silpavetchayanond | Leader, Investigaton Team |

7/5/81

Sector 8 Phuket

Somsak Sithichoke

Sector Chief

Health Center Village 3, Tambon Patong, Krathu District, Phuket

Ekachai Nuansiethong

Junior Sanitarian

The Team also visited Panchax Habitat, Village 3, Tambon Krathu, Krathu District, Phuket Province

Region 5 Bangkok

The Team was accompanied by:

Dr. Sunchai Ketrungsee

Regional Director

SaweK Piinyapol

Asst. Regional Director

Supranee Morichart

Chief of Epidemiology

Suwanna Tansopharaks

Chief of Lab.

7/8/81

Zone 5 Rayong

Briefed by:

Prateep Tongchit

Zone Chief

Charoon Patipaksiri

Asst. Zone Chief

Prasert Soonlee

Health Educator

Chalee Niyomsamarn

Asst. Health Educator

Sector 4, Klaeng District, Rayong

Sunthorn Yongsamir

Sector Chief

(A Malaria Clinic is attached to the Sector Office).

7/9/81

A courtesy call - Governor of Tak Province, Somphong Suwan)

Zone 6 Trat

| | |
|--------------------|------------------|
| Sathien Hiranbutr | Zone Chief |
| Kua Ngarmphiew | Asst. Zone Chief |
| Choochart Laliew | Asst. Zone Chief |
| Yuthana Charoensuk | Health Educator |

Sector 4, Bor Rai District, Trat Province

| | |
|---------------------|-----------------------|
| Dork Rak Thongkhong | Sector Chief |
| Sayan Siesawat | Asst. Sector Chief |
| Samat Payaprachum | Malaria Clinic Worker |

Health Center, Tambon Pa-or, Bor Rai District

| | |
|---------------------|-------------------|
| Yongyut Wongphaibul | Junior Sanitarian |
|---------------------|-------------------|

Malaria Voluntary Collaborators

Visited at Tambon Pa-or

Eam Prasarnphan

Miss Phongphan

Yorm Saowanam

Zone 7, Chantaburi

| | |
|-----------------------|--------------------------|
| Songkhram Ngamprathom | Zone Chief |
| Chart Chai Pokalanont | Asst. Zone Chief |
| Ratree Nikrommunin | Chief of Entomology Team |
| Cindy Joe Sedlund | American PCV |

Kampuch Refugee Camp

Captain Nissai Limcharoen, R.N. Chief of Thai Security Unit

Steve BJORKE

Malaria Technician

Earl Goatcher

Coordinator, Thailand Baptist
Mission

Cambodian Refugee Camp, Ban Laem

The Team was accompanied by Captain Nissai, RN

Region 1, Phra Phutthabat, Saraburi

The Team was accompanied by:

Dr. Somthas Malikul

Regional Director

Wiwat Chatacharoen

Asst. Regional Director

Uthai Traitharn

Chief of Spraying

Aporn Laomeephul

Chief of Lab

Prapruet Boonrasi

Chief of Training Center

Chaiwat Phong-Aksara

Chief of Mechanic

Timothy Lockwood

American PCV

Zone 7 Pak Chong

Chom Phetnarong

Zone Chief

Sueb Artchaicharn

Asst. Zone Chief

Chalerm Sermklin

Asst. Zone Chief

Mary Ettlign

American PCV

7/14/81

Malaria Voluntary Collaborators

Visited

Chuk

Village 5, Tambon Musie, Pak Chong

Thongma

Village 4, Tambon Musie, Pak Chong

Malaria Clinic Village 5, Tambon Musie

Malakorn Siephiphat Sector Chief

Malaria Voluntary Collaborators

Visited

Tnawai Village 8, Tambon Muak Lek

The Team also visited a spraying squad in Village 8, Tambon Muak Lek.

7/19/81

Zone 1 Tak

Phuttha Wongvichit Zone Chief

Chamnong Nimsiri Asst. Zone Chief

Sant Poolsantnakorn Asst. Zone Chief

Chaowalit Boonlue Health Educator

Jon Karpilow American PCV

Malaria Voluntary Collaborators

Visited

Serg. Boonmak Phakdee Village 13, Tambon Chiangthong,
Muang District, Tak

The Team also visited a spraying squad in this village

Sector 4 Mae Sot

Kharob Suta Sector Chief

Bunchoo Rienthap Asst. Sector Chief

Mae Sot Hospital (202-bed hospital)

Dr. Komol Saichum-in Medical Director

Dr. Somsie Chanchoenkit Malaria Therapy

Dr. Thavorn Kasemsarn

Dr. Lek Nopadolratana

In Bangkok and during field trips, the Team was given valuable advice and consultations by Dr. Nadda Sriyabha, Director-General, Department of Communicable Diseases Control, Dr. Suwan Wongsarajana, Deputy Director-General, Department of Communicable Diseases Control, and Dr. Surin Pinichpongse, Director, Malaria Division and Regional Directors of other Regions, viz., Dr. Udom Chitprarob of Region 2 and Dr. Preeda of Region 3. Chiefs of various sections of Malaria Division were very helpful to the Team. The Team would like to express great appreciation for the full cooperation of Dr. E. B. Doberstein, Dr. C. T. O'Connor and Mr. J. R. Cullen of WHO Malaria Consultation Team, Thailand.

ANNEX 7

MAP SHOWING TRAVEL ROUTE

