



 **VECTOR BIOLOGY & CONTROL**

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**REPORT OF THE FINAL ASSESSMENT
TIMOR MALARIA CONTROL PROJECT, INDONESIA
AUGUST 31 - SEPTEMBER 28, 1987
(PROJECT NO. 497-0326)**

by

Puthalpet G. Kesavalu, M.D.

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TABLE OF CONTENTS

	<u>Page</u>
ACKNOWLEDGEMENTS	i
GLOSSARY	ii
PREFACE	iii
A. Work Scope	iii
B. Assessment Team	iii
C. Field Visits	iii
D. Debriefing and Review Sessions	v
EXECUTIVE SUMMARY	1
1. Introduction	1
2. Project Inputs and Outputs	1
3. Assessment	2
4. Future Strategies	3
5. Further Assistance to Project	6
I. BACKGROUND INFORMATION	8
A. Establishment of Malaria Control Demonstration and Training Project	8
B. Launching of Malaria Eradication Program	8
C. Setbacks and Reversals	8
D. Formation of Integrated Malaria Control Program	8
E. Expansion of Malaria Control Program to the Outer Islands	9
II. TIMOR MALARIA CONTROL PROJECT: NO. 497-0326	10
A. Project Goal	10
B. Project Purpose	10
C. Special Feature	10
D. Methods Employed	10
III. PROJECT ASSESSMENT	12
A. Implementation Plan	12
B. Personnel Trained	12
C. Entomological Surveys and Investigations	13
D. Malarimetric Surveys	14
E. DDT Spray Coverage	16
F. Complementary Measures	19
G. Persons Treated	19
H. Monitoring Susceptibility Status of Vector/ Parasite	21
I. Malaria Monitoring System	22

TABLE OF CONTENTS cont.

	<u>Page</u>
IV. CONCLUSION AND RECOMMENDATION	23
A. Problems Faced	23
B. Impact of Malaria Control Measures	24
C. Coverage Levels	26
D. Future Strategies	26
E. Operational Field Studies	28
F. Further Assistance to Project	29
 <u>ANNEXES</u>	
1 MAP OF TIMOR ISLAND	31
2-A LIST OF KABUPATEN AND KECAMATAN, EAST AND WEST TIMOR	32
2-B BASIC INFORMATION, EAST AND WEST TIMOR, 1986	33
3 PERSONNEL TRAINED (by Province and Year)	34
4 CROSS-CHECK FINDINGS OF PROVINCIAL LABORATORY SERVICE, EAST TIMOR	35
5-A DDT SPRAY COVERAGE IN EAST TIMOR (by Year of Operation)	36
5-B DDT SPRAY COVERAGE IN WEST TIMOR (by Year of Operation)	37
6-A PROPORTION OF CLINICALLY DIAGNOSED MALARIA CASES TO TOTAL OUTDOOR ATTENDANCE AT HEALTH INSTITUTIONS, EAST TIMOR (by Year)	38
6-B PROPORTION OF CLINICALLY DIAGNOSED MALARIA CASES TO TOTAL OUTDOOR ATTENDANCE AT HEALTH INSTITUTIONS, WEST TIMOR (by Year)	39
7 LIST OF OFFICIALS CONTACTED	40

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Puthalpet G. Kesavalu, M.D., is a malariologist and a VBC consultant.

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GLOSSARY

A.I.D.	-	Agency for International Development
CDC	-	Communicable Diseases Control
DG	-	Director General
EH	-	Environmental Health
FY	-	Fiscal Year
GOI	-	Government of Indonesia
MCP	-	Malaria Control Program
MEP	-	Malaria Eradication Program
MOH	-	Ministry of Health, Republic of Indonesia
NIHRD	-	National Institute of Health Research and Development
OPH	-	Office of Population and Health
PCD	-	Passive Case Detection
WHO	-	World Health Organization

PREFACE

Upon the request of USAID/Jakarta, to A.I.D. Vector Biology & Control (VBC) Project, Dr. P.G. Kesavalu was appointed to serve as a consultant for MSCI to produce a final assessment of the Timor Malaria Control Project, Indonesia with particular attention being given to document impact of the project, the implementation process and lessons learned.

A. Work Scope

1. Lead and organize team of health professionals during final assessment of West Timor Malaria Control Project;
2. Make recommendations to GOI to maintain project goals;
3. Brief GOI and donor agency representatives on findings of evaluation; and
4. Submit final report to USAID/VBC and GOI.

Upon further request from the Directorate General, CDC and EH, MOH, Jakarta to the USAID Mission and with the concurrence of the Mission, the scope of work was broadened to cover East Timor and included assessment of strategies followed and recommendations for revisions to maintain gains achieved.

B. Assessment Team

The following members comprised the team:

1. Dr. P.G. Kesavalu, Consultant, A.I.D./VBC/MSCI
2. Dr. Zeil Rosenberg, Medical Epidemiologist, OPH/A.I.D., Jakarta
3. Mr. Muharyoto, SKM, Staff Officer, Directorate-VBDC, D-G, CDC and EH, MOH, Jakarta

C. Field Visits

East Timor was visited from September 10-16, 1987 and West Timor from September 16-21, 1987.

The field itinerary in East Timor:

September 10	Briefing and discussions with Kakanwil DepKes, Chief of CDC DepKes and Project Manager, and Project Malaria Consultant.
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- September 11 Field visits to Dili Kota to observe complementary measures of source reduction, biological control and larviciding.
- September 12-13 Field visits to villages in Kabupaten Dili, Manatuto and Baucau to observe spray performance and problems faced. Visits to Provincial General Hospital, Laboratory Service, Health Office and Warehouse and to Kabupaten Health Office and Puskesmas.
- September 14 Field visits to villages to observe spray performance and visits to Puskesmas and Health Office in Kabupaten Aileu.
- September 15 Field visits to villages to observe spray performance and visits to Puskesmas and Health Office in Kabupaten Ermera and Liquisa.
- September 16 Participation in the inter-sectoral meeting, that was specially requested for by the team, attended by representatives of 8 provincial services and the provincial planning board.

The field itinerary in West Timor:

- September 16 Briefing and discussions with Kakanwil DepKes and Section Officer CDC, Provincial Health Service.
- September 17 Visits to Provincial Health and CDC Offices and Health Services Offices, Laboratory Service and Warehouse; visit to Kabupaten Health Office, Kupang; field visits to villages and Kabupaten Health Office, T.T.S.
- September 18 Field visits to villages to observe spray operation and visit to Kabupaten Health Office, T.T.U.
- September 19 Field visits to villages to observe spray operation and visit to Kabupaten Health Office and Hospital, Belu.
- September 20 Discussions on CHIPPS Study proposals and work out on details along with Kakanwil DepKes and the NIHRD representative.

September 21 Participation in the inter-sectoral meeting, specially requested for by the team, attended by representatives of five provincial services; final discussions with the malaria consultant.

The list of officials contacted is included in Annex 7.

D. Debriefing and Review Sessions

September 22 Director-VBDC and Chief, Malaria Sub-Directorate

September 25 Director General, CDC and EH, MOH, jointly with Director-VBDC and Chief, Malaria Sub-Directorate

September 26 Chief, Entomology Sub-Directorate

September 28 Representatives of USAID Mission; Executive Summary presented

September 29 Director-VBDC, Chief, Malaria Sub-Directorate; likelihood of sharing of operational costs discussed as arose from the proceedings of the meeting with USAID representatives the previous day. The subject was immediately taken up with the Director General, CDC and EH, MOH, and Chief, Health Planning Division, MOH.

October 7 Chief, OPH/USAID and other representatives.

October 8 Final report presented.

EXECUTIVE SUMMARY

1. Introduction

For the reason that the "economic and social development of East Timor Province could not proceed until malaria was effectively controlled in the priority areas of higher productivity", a \$5.546 million loan agreement was signed in September 1980, USAID contributing \$3.6 million and GOI \$1.946 million. The Project goal was "to improve significantly the health status and productive potential of the rural poor on Timor Island". And the Project purpose was "to develop a self-sustaining malaria control program ... that will reduce the prevalence of malaria in the priority areas to 2% or below in 40% of the population of East Timor and 30% of the population of West Timor by 1985-86". Upon completion of the Project, "continuous surveillance and limited local spraying will be conducted by regular GOI health services personnel" and that "a management system that will enable health personnel and communities to plan, implement and maintain an effective malaria control program" would be put in place.

A special feature of the Project was loan financing of wages of spray teams owing to inability of the MOH to employ laborers needed during the Project period. This arrangement also provided the much needed employment opportunities on "this long neglected island".

The Project inputs required that malaria control services would follow the guidelines enumerated in the approved Plan of Operations signed by GOI and WHO in 1975. This Plan provided the basis for the USAID Development Loan No. 497-U-034, with an amendment prepared for Timor Island.

2. Project Inputs and Outputs

The Project inputs related to planning, training, supervision, epidemiology, equipment, commodities and supplies, operations, health education and community participation, evaluation and operational field trials. Technical assistance would be derived from WHO and the National Institutes of Health Research and Development, not financially attributed to the Project.

Although preliminary activities were set in motion beginning in 1980, regulatory, administrative, financial and other constraints entailed delays especially in ordering and procuring

commodities including DDT and recruitment and placement of senior and mid-level provincial teams. Except for such activities as entomological and parasitological surveys and collection and analysis of institutional and other data by the central CDC teams, most others had to be rescheduled or postponed by a year or more. An A.I.D. consultant was in place from the start for nearly two years.

With the completion of training courses during the first half of 1982, malariometric surveys and organized institutional services commenced. The first of the planned DDT spray cycles was also accomplished that year. All these activities were gradually expanded year after year, in a step ladder fashion. However, the continuing constraints especially in regard to financial releases were such that scheduled spray and other operations undertaken were delayed. Travel and supervisory restraints precluded expertise and advisory services, available only at the central level and much needed by the provincial health services even now, reaching the island. Thus, enhancing the quality of overall performance and in-depth program analyses became harder and intensification of epidemiological, entomological and other investigations only partially accomplished. Also, the institution of action/demonstration operational field trials including community involvement had to be postponed for the same reasons.

3. Assessment

The midterm assessment brought some positive results. In view of the delayed start, the life of the Project was extended for two years from December 1985. Under TA, a malaria consultant was recruited for the Project and placed in Dili. Some transport and other supplies were provided as well as training and supervisory support. The midterm assessment while pointing out the problems faced by the program also concluded that "malaria prevalence has gone down appreciably in those areas which have been under house spraying".

This final assessment revealed too that the impact of malaria control measures undertaken between 1982 and 1986, and continuing in 1987, could well be considered satisfactory. The extent of clinically diagnosed malaria cases, among all diseases attending health institutions, was progressively getting reduced: from 18.2% in 1982 to 12.07% in 1986 in East Timor, and from 18.6% in 1982 to 10.6% in 1986 in West Timor. Spot-check of malariometric survey data of villages that had received six or more cycles of spraying since 1982, tested in three Kabupaten in East Timor and three in West Timor, showed that the parasite

rates had reached levels below 2% in many instances, especially in West Timor. In view of the errors still being extensively committed by the field laboratory staff in the microscopic diagnosis of presence of parasites in the blood films of the sampled population, it is rather difficult to precisely determine the extent of decline achieved. Immediate arrangements, therefore, will be required to confirm the position with certainty.

A disturbing feature of the malaria situation in East Timor was the discovery of the prevalence of chloroquine resistant falciparum malaria, through in vivo and in vitro techniques applied in two localities during 1981, one locality in 1985 and two others in 1986, spread over four Kabupaten. The proportion of P. falciparum infection to other species while declining significantly in some of the regularly treated areas, continued to be high, ranging between 48.3% to 73.5%, in partially treated areas.

The maximum number of houses sprayed in any of the two cycles in East Timor during 1982 and 1986 had been 15,397 and 51,825 respectively; similarly, the 1982 and 1986 figures for West Timor were 31,497 and 80,477. The total of 132,302 houses sprayed in 1986 had thus exceeded the target output by 32.3%.

By 1986, the population protected in East Timor reached an extent of 42.1% and the proportion protected in West Timor, 31.9% -- slightly above the target set.

Besides spraying operation, all cases clinically diagnosed as malaria by health institutions received suppressive drug treatment, as also fever cases encountered during surveys and investigations.

The recording and reporting procedures followed on Timor Island are patterned on the same system as adopted by the integrated malaria control program.

Supplemental anti-vector measures such as source reduction, drainage and biological control using larvivorous fish had been introduced in 11 locations in East Timor and 18 locations in West Timor.

4. Future Strategies

Based on geophysical characteristics, climatological, entomological, epidemiological and ecological features, and past experience of similar situations within the country and elsewhere

in Asia, it can be concluded that Timor Island, unprotected, will be prone to focal epidemic outbreaks with dissemination of malaria and a build up of post-epidemic endemicity, followed by lessening of herd immunity, addition of new arrivals including the newly born and a resurgence of epidemic-endemic cycle now and again.

The protection so far afforded had indeed been significant as compared with the malaria situation that existed when the Project started. However, on completion of the Project this December, financial resources will dwindle, and an operational inability will descend heavily on the malaria control program. Therefore, it seems inevitable that future strategies be redesigned to at least minimize risks.

One approach is to withdraw spraying, subject to a resurvey by a central laboratory team in order that the rate of prevalence of malaria be redetermined. However, areas that were only included in the recent past for spray protection, areas of potential malariogenicity and persisting problem foci, will be such situations as may not lend themselves to withdrawal of spraying at present.

At the same time, it should be noted that sizable parts of priority areas in five of the eastern Kabupaten in East Timor, not sprayed even once (50,000 population), may deserve adequate spray protection at least now.

A revised strategy will be application of a single spray cycle in areas currently under operation, and a second cycle only in identified problem areas and those that are yet to be protected. Of the two cycles now adopted, the September-October cycle should be considered as the more important of the two on grounds of entomological and epidemiological overview. Spray withdrawal should necessarily be supported by supplemental anti-vector measures in all potentially problematic situations, advantageously through active community participation.

It has to be further supported by a well organized drug control procedure undertaken by health institutions that should begin to include PCD and radical treatment of positive cases. Vulnerable groups such as mothers and children and traditionally mobile sections of population and problem pockets in the operational as well as non-operational areas will need special attention.

The time is ripe for the dynamic involvement and participation of the community, through the well recognized

Posyandu, in anti-malaria activities. It is in this context that the proposals now being generated by A.I.D. and GOI for implementation in West Timor, through the auspices of CHIPPS, can trail blaze the initiation of community-based malaria control on Timor Island and elsewhere in Indonesia.

One essential aspect to keep in mind will be to enable a composite central team to periodically visit East and West Timor to monitor the epidemiological situation as and when spraying is partially withdrawn.

The planning for further withdrawal should be determined by undertaking an in-depth analysis of the program situation, as indicative evidence begins to unfold.

Before any attempt is made to withdraw a spray round, it is imperative that a laboratory team from the central level be urgently sent to East and West Timor in order that malaria prevalence be precisely determined by launching a well organized malariometric survey to enable future planning and program implementation. Thereafter, it may suffice to carry out malariometric surveys once a year, instead of twice a year. With the time saved, the microscopists can devote more attention to PCD procedure in health institutions.

Undoubtedly, the availability of a malaria consultant (MA) from 1985 onwards had been most valuable. In the absence of malaria expertise locally and the inability of the central organization to frequently visit the provinces and the periphery for advice, guidance and support, the assistance provided by him on all aspects of the program had helped achieve progress in a large measure. His assistance will be required for at least another two years to maintain the gains made and solve problems as they arise, as well as to train and develop local talent at the provincial and peripheral levels. Additionally, he can be well utilized toward implementing and supervising the West Timor study currently proposed.

In order that the revised strategies be adequately designed and properly implemented so as to maintain the gains achieved and accomplish further progress, operational field studies in the following areas are worth considering:

1. Application of a single cycle of spraying at a dosage of 2 g/m² in a year as compared with similar applications twice a year.
2. Application of a single cycle of spraying at a dosage of 1 g/m² in a year as compared with similar applications twice a year.

3. Detection of sporozoite presence by monoclonal technique for mapping the distribution of malaria vectors on Timor Island.
4. Operational evaluation of zooprophylaxis as a malaria control measure.
5. Operational evaluation of sociological and ecological aspects concerning population movements and dissemination of malaria on Timor Island.
6. Continuation of operational evaluation of the use of permethrin impregnated bed nets for malaria control, after completion of the one year CHIPPS study, should it be found necessary.

In this connection, it has to be borne in mind that neither the central CDC Sub-Directorates nor the provincial CDC services, which are primarily executive branches of the CDC organization, are directed toward undertaking research and development studies per se. Therefore, provision of financial and technical assistance will be necessary to bring these studies on board. But, the outcome of these studies will of course be beneficial not only to Timor Island but the Outer Island malaria program as a whole.

5. Further Assistance to Project

The possibility of limited further assistance to the Project emerged during discussions held. In view of the fact that DDT now available on Timor Island would be adequate to carry out three more spray cycles, and that the malaria control program is also in a position to divert unused DDT available on Java and other areas to cope with additional spray cycles as may be required, and in view of the likelihood of a partial withdrawal of spray in the near future and the prospect of further withdrawal in due course, operational expenditure will certainly begin to slide down. Nonetheless, it may still be a big enough burden to be borne by the national authority.

A compromise situation that could lead not only to maintenance of gains achieved but also attaining some practical and progressive improvements in reducing malaria prevalence to such a level as could be realistically handled by community-based malaria control efforts can be the sharing of operational and supervisory costs that seem to be the major hurdle arising from the cessation of A.I.D. assistance. A.I.D. may, therefore, wish to consider provision of operational cost for West Timor and

continuance of TA for malaria control on Timor Island together with the implementation of CHIPPs operational field study for the next two years while GOI may wish to handle the cost of East Timor operation, make provision for travel and per diem expenses in connection with the visits of the malaria consultant to East Timor and ensure adequate provision toward meeting travel and per diem costs of the central CDC teams to frequently visit Timor Island. The progress can be jointly assessed later on in order to decide future alternatives.

I. BACKGROUND INFORMATION

A. Establishment of Malaria Control Demonstration and Training Project

USAID's association with and assistance provided to the malaria program in Indonesia had been longstanding. It started with a field trial of intradomiciliary DDT application in 1947 that channelled into the establishment of a jointly sponsored (GOI/USAID/WHO) malaria control demonstration and training Project in 1951 that gradually expanded to cover a population of over 18 million by 1958.

B. Launching of Malaria Eradication Program

Encouraged by the marked decline in malaria prevalence (parasite rate reduced from 28.4% in 1954 to 6.4% in 1958) a malaria eradication program (MEP) was launched in 1959 on the islands of Java, Bali and Madura and Lampung province in Sumatra together with the establishment of five national training centers for manpower development. The MEP budgetary allocation by USAID was \$27.6 million in 1963. Consequent to the reduction of Annual Parasite Incidence to 0.13 per thousand population by 1965, spraying was withdrawn from 85% of the areas covered and the initial phases for expansion of the program to some of the Outer Islands set in motion.

C. Setbacks and Reversals

Despite all these successes, owing to political and worsening economic situations and cessation of bilateral assistance, the MEP began to fold-up. The gains achieved could not be maintained and the spread of malaria from residual foci could not be checked, as evidenced by a seven-fold increase in the incidence of cases between 1963 (5,062 cases) and 1973 (346,233 cases). By then, the MEP service was integrated with the general health services and the Ministry of Health (MOH) restructured.

D. Formation of Integrated Malaria Control Program

Upon evaluation of the malaria situation by GOI and WHO and the request of the former for credit purchase of commodities, a joint GOI/USAID/WHO program appraisal was made in 1972 that resulted in the GOI/USAID long-term loan agreement of \$24.7 million in 1975. Basing a tangible Integrated Malaria Control

Program (MCP) on a sound footing thus became possible, effective FY 1975-76. The criteria for program management were also suitably revised.

E. Expansion of Malaria Control Program to the Outer Islands

A joint GOI/USAID/WHO in-depth program analysis was undertaken in 1976 to ensure progress of the MCP especially in the resurgent areas of the central islands and its speedy expansion to the Outer Islands. The ensuing recommendations led to elaborate preparations, jointly by GOI/USAID/WHO, to document essential requirements of malaria control operations in the Outer Island areas that emerged as a five-year - \$169 million program proposal for consideration by GOI. Negotiations halted primarily on the realization that the overall inadequacy of the health infrastructure and supervisory services then obtaining could not permit an effective implementation of organized malaria control activities. Nonetheless, the authorities were looking forward to initiating a smaller and feasible version of the program should such an opportunity arise. Indeed it so happened following the emergency situation in East Timor.

II. TIMOR MALARIA CONTROL PROJECT: NO. 497-0326

For the reason that the "economic and social development of East Timor Province could not proceed until malaria was effectively controlled in the priority areas of higher productivity", a \$5.546 million loan agreement was signed in September 1980, USAID contributing \$3.6 million and GOI \$1.946 million.

A. Project Goal

The Project goal was "to improve significantly the health status and productive potential of the rural poor on Timor Island".

B. Project Purpose

The Project purpose was "to develop a self-sustaining malaria control program on Timor Island that will reduce the prevalence of malaria in the priority areas to 2% or below in 40% of the population of East Timor and 30% of the population of West Timor by 1985-86".

An added purpose was to encourage GOI "to support similar efforts on other Outer Islands".

C. Special Feature

A special feature of the Project was loan financing of wages of spray teams since the MOH could not employ on its rolls the number of laborers needed during the Project period. It was also considered that it would provide the "much needed employment opportunities on this long neglected island".

D. Methods Employed

- The well-tested anti-vector measure of residual, intra-domiciliary DDT spraying would be applied twice a year at a dosage of 2 g/m², supplemented where necessary by feasible anti-larval measures.
- Entomological and malariometric surveys would be initially carried out to establish baseline data and periodic follow-up surveys to determine impact of the measures undertaken.

- All clinically diagnosed malaria cases (not necessarily confirmed microscopically) attending health institutions and fever cases among population surveyed or reached otherwise would be given presumptive/suppressive drug treatment to alleviate suffering and prevent spread of the disease.
- Undertaking operational field trials in action/demonstration areas on the application of complementary and alternative methods for malaria control, such as source reduction, water management and drug regimen.
- Health educational activities to generate a high level of community participation in the program.

III. PROJECT ASSESSMENT

A midterm assessment of the Project was carried out in 1984 as a result of which several improvements were effected. The important one pertained to the inclusion of a resident Indonesian malaria consultant and the Project extension for two years beyond December 1985.

This final assessment was undertaken prior to completion of the Project in December 1987. The accomplishment of the Project goal and purpose, Project inputs and outputs, impact of the malaria control measures taken, future strategies and further prospects in accordance with the terms of reference of USAID and GOI were areas dealt within the time frame available.

A map of Timor Island denoting the Kabupaten comprising East and West Timor is attached (Annex 1). The Kecamatan, by Kabupaten and Province, including basic information are listed in Annex 2-A and B.

A. Implementation Plan

Although preliminary activities started in 1980 as scheduled, regulatory, administrative, financial and other constraints had to be faced that entailed delays in ordering and procuring commodities, equipment and supplies including DDT. The recruitment and placement of senior and mid-level supervisory teams in 1981 were none the easier for a multiplicity of reasons.

Except for those activities scheduled for the central CDC teams such as entomological and parasitological surveys, most others had to be rescheduled or postponed. Some of the commodities and supplies needed were diverted to the Project from other provinces in 1981 to overcome delays to some extent.

A malaria consultant was available from the start until 1982, stationed in Kupang. He was able to coordinate very well with the provincial government authorities in Dili and Kupang in stabilizing the organizational structure of the Project and with the central level CDC and A.I.D. in setting the Project in motion.

B. Personnel Trained

Some local training began in 1981, but only marginally. Organized training courses for provincial and Kabupaten level

senior supervisors (60 in all) were held at Ciloto and Jakarta, and for mid-level supervisors, microscopists and others (a total of 76) at Dili and Kupang, in 1982.

Subsequent to 1982, 91 new entrants of various categories were locally trained at Dili and Kupang, supported by central level expertise. After placement of the malaria consultant, 26 operational supervisors of East Timor were retrained in 1985. Annex 3 furnishes particulars.

The problem of turnover of staff especially in the peripheral health services -- Kabupaten and Puskesmas -- continued unabated particularly in East Timor. The fresh assignees would certainly need orientation to Project purpose and program activities as and when staff changes occurred and this indeed would be an onerous task. This task had been partly accomplished on such occasions as the annual and other periodic review meetings scheduled each year. Financial constraints had not permitted holding of planned orientation courses for the newcomers, as found necessary.

C. Entomological Surveys and Investigations

Entomological investigations began in 1981 with two stations established across the border between East and West Timor in Kabupaten Covalima and Kabupaten Belu, respectively. The investigations revealed that the most likely vectors in the coastal and inland areas are An. subpictus and An. barbirostris. Although these vectors have been incriminated elsewhere in the country, they are yet to be so proven on Timor Island.

Due to lack of local staff or turnover of those already engaged, the pace of the studies was in slow motion until 1985 when an entomologist could be found for East Timor and two assistant entomologists for West Timor. The activities had enlarged to include studies on mosquito fauna, impact of residual spraying, susceptibility status of vectors to DDT and presence of other suspect vectors. The latter study revealed that An. maculatus could be yet another vector on the island and possibly An. sundaicus, too.

Susceptibility tests carried out in East Timor in 1986 indicated that An. barbirostris and An. subpictus continued to be susceptible to DDT. Areas covered by supplemental anti-larval measures were periodically monitored for impact determination in East and West Timor and the investigations had been in progress. The biting densities of An. sundaicus and An. barbirostris in sprayed areas were found to be insignificant both in East and West Timor in the catching stations tested.

D. Malariometric Surveys

Basic malariometric surveys were carried out by the central and provincial teams beginning in 1982 in East and West Timor. Areas of higher prevalence of malaria, those prone to epidemic outbreaks, and priority areas of socioeconomic importance were identified and selected villages surveyed in stages to determine their endemicity level in order that holo/hyperendemic areas could be speedily included for coverage by the expanding Project to derive maximum benefit.

Villages that were previously surveyed and sprayed were resurveyed after each spray cycle to ascertain the degree of impact and trigger epidemiological investigation should the impact be insignificant.

Depending on accessibility, availability of trained microscopists, provision of transport or funds for travel, the extent of malariometric survey coverage ranged between 4.5% and 12.5% of the total number of villages sprayed during the period 1982-87.

The malariometric survey data had all along been presented in terms of a Kecamatan as the smallest operational unit. It should be noted that except in the case of Kabupaten T.T.U. and Belu in West Timor, nowhere else had a whole Kecamatan been taken up for spraying at any time. Villages were picked up for coverage on the basis of holo/hyperendemicity or other priority reasons initially and more and more added on as years went by. The program expansion was exactly similar even in Kabupaten T.T.U. and Kabupaten Belu.

By this way, a group of villages surveyed in a Kecamatan in any year comprised those that received several cycles of spray protection, or merely a cycle or two, or even none if they had been included for survey for the first time prior to spraying. Thus, the semi-annual malariometric survey results represented a conglomerate of responses, ranging from a status of no protection to that of continual spray protection by several cycles, on an average, vitiating findings relatable to specific spray impact.

To overcome this insufficiency, the survey records of individual villages sprayed six times or more had to be culled out separately for spot check while on visits to the periphery for purposes of situation analysis. (Incidentally, such records would not be available either in the province or in the center in view of implementation of the decentralized national information and data pooling system) These studies, lengthy and time consuming as they were, revealed that the impact of spraying,

over six or more cycles, was quite significant on the whole, particularly in West Timor, despite the fact that new arrivals in the villages previously surveyed had also been included along with the sampled groups. But, the errors committed by the field microscopists in the past had been continuing and in some instances worsening since 1985, the year midterm assessment was made. Their results varied widely from the findings of the provincial cross-checking laboratories in both East and West Timor.

In East Timor, during 1986, the error rates in respect of the positive results furnished by the field microscopists ranged from 38.6% in Kabupaten Liquisa to 92.3% in Kabupaten Viqueque; in respect of their negative results, the error rates ranged from 6.6% in Kabupaten Baucau to 32.1% in Kabupaten Manatuto.

Not all the four Kabupaten in West Timor furnished their microslides for cross-checking by the provincial laboratory service. Over the years, while one or two Kabupaten had furnished their cross-check slides to this laboratory, the others sent theirs to the health service laboratory manned by a senior microscopist. Occasionally, parts of the slides of one Kabupaten had been sent to both the laboratories and the cross-check findings of either of these tended to vary in respect of the same Kabupaten. For instance, the health service laboratory found an error rate of 2% among the positive results furnished by the field microscopists of Kabupaten T.T.U. in 1986, but the laboratory service in 1987 found an error rate of 38.8% among the positive results. Among negatives, the difference was not significant. The cross-check errors noticed in East Timor during 1985 and 1986 are shown in Annex 4. (Information on this subject was rather incomplete as regards West Timor and hence not presented).

It was further observed that the provincial cross-checking laboratories in East and West Timor had not forwarded their own cross-check findings of 1986 for re-cross-check by the central laboratory service attached to the Sub-Directorate of Malaria.

With a flaw of this nature, it is rather difficult to measure the impact of malaria control activities with any degree of precision. However, on the assumption that the findings of the provincial cross-checking laboratories in Dili and Kupang are passable (based on their performance during 1984 and 1985 as determined by re-cross-check by the central laboratory), it can be surmised that, most of the positive results of the field microscopists turning negative, malaria prevalence had indeed been considerably reduced.

E. DDT Spray Coverage

The insecticide decided for usage was DDT, applied at a dosage of 2 g/m² for indoor residual spraying, twice a year, in accordance with the guidelines of the malaria control program. One of the two cycles of spraying was meant to be accomplished during March-April and the other during September-October each year. Hudson X-pert Sprayers were used.

Although planned for a year earlier, the Project coverage started in 1982. The problems faced related mainly to procurement delays and staff recruitment and placement difficulties. While this activity was initiated in East Timor only in 1982, it was ongoing to a limited extent in some of the priority areas of West Timor since 1975; 53 villages spread over 13 Kecamatan, a few in each of the four Kabupaten, had been so covered.

In East Timor, the earliest cycle of spraying commenced in April 1982 in six Kabupaten involving 18 villages and 2,838 houses, distributed in eight Kecamatan. The same year, the second spray cycle of September-October was extended to cover 15,397 houses in 72 villages, distributed in 20 Kecamatan in eight of the 13 Kabupaten. Then, incremental expansion of spraying continued, cycle after cycle.

Lautem, Viqueque, Manufahi, Ainaro and Covalima were the five Kabupaten left out in 1982 and 1983. One Kecamatan in Kabupaten Covalima was picked up for spraying during the first cycle of 1984 and one more during the second cycle. The other four Kabupaten were included for partial spraying during the second cycle of 1984 - one Kecamatan in Kabupaten Lautem and three each in the rest.

Only a single spray cycle could be carried out during 1985. Regulatory constraints that led to protracted delays in obtaining release of funds for meeting operational costs resulted in abandoning the March-April cycle that year. However, the extent of spraying accomplished during the September-October cycle of 1985 was nearly the same as reached during the second cycle of 1984. Delayed fund releases had upset the scheduled spray operations since the latter part of 1983 when this problem crept in. Thus, the timings of spray cycles in 1984 and 1986 got delayed by two months or more, jeopardizing operational efforts and project impact. The second cycle of 1987 due to start in September could not be implemented for this very reason; alternate arrangements are being made to get it going soon.

DDT spray coverage in East Timor during the period 1982-86 is summarized in Annex 5-A. As is bound to happen in any

selective spray coverage designed to obtain maximal impact in a short span of time, villages known to be highly malarious were taken up at the earliest opportunity and spray activity expanded in accelerated stages by inclusion of more such villages. Although the targeted spray coverage had been accomplished in this manner by 1986, an estimated population of 50,000 living in the priority malarious areas of the partially covered five Kabupaten, noted above, is yet to receive spray protection.

Spray performance was assessed in a few villages in each of the following Kabupaten: Dili, Aileu, Liquisa, Baucau, and Manatuto. Except for one village in Manatuto, the quality of spraying was uniformly satisfactory. Spray refusals had begun to crop up in the urban fringes of Kecamatan Dili Timor and Dili Barat that will need diligent handling.

The population protected by the end of each year of operation was as follows: 1982 - 73,188; 1983 - 147,741; 1984 - 216,278; 1985 - 235,775; 1986 - 260,493. Thus, the population protected in East Timor reached an extent of 42.1% by 1986 (260,493 out of a total of 618,711), slightly exceeding the target set at 40%.

The DDT warehouse in Dili is in good shape and well maintained, the cartons properly stacked and accounted for. Of the sub-depots visited, storage space was found inadequate and insecure in Kabupaten Aileu, but the stock was very limited. The quantity of DDT available in the province should suffice for at least three spray cycles at the current level of operation. Spray cans and equipment were found in a satisfactory condition. Shortage of motor vehicles for transport of DDT, men and materials had been one of the worrisome logistic problems faced by the province.

The spray operation in West Timor started on a different note, endowed as it was with a fairly stabilized infrastructure, some availability of higher and mid-echelon supervisors at the provincial and peripheral levels and some facilities. As spraying was introduced earlier in a few villages in all the four Kabupaten, the field and supervisory staff had been somewhat exposed to this activity, too.

When the Project operation started in 1982, most of the villages sprayed in the past were included for coverage and additional villages taken up. In all, 14 out of 39 Kecamatan, involving 123 out of 627 villages in West Timor had been sprayed by the time the second spray cycle of 1982 concluded. By the end of 1983, 54,906 houses in 202 villages, distributed in 16 Kecamatan in all the four Kabupaten, were covered.

Kabupaten T.T.U. had a setback in 1984; one of the two spray cycles could not be accomplished owing to administrative causes. During the preceding cycle, the number of houses sprayed in that Kabupaten had been substantial - 13,526 houses in 83 villages, distributed in five Kecamatan.

West Timor also faced the same problem of delayed release of operational funds that precluded undertaking two spray cycles in 1985. Hence, only one cycle could be accomplished that year, as in the case of East Timor. Due to financial stringency, operational schedules had to be variously delayed during the Project period. The situation changed for the better in 1987 in respect of West Timor that was the recipient of a portion of the special government subsidy earmarked for anti-malaria operations in the province of N.T.T., of which West Timor is a part.

The particulars of DDT spray operations in West Timor during the period 1982-86 is summarized in Annex 5-B. The Project expansion occurred in such a way that contiguous areas began to be included over a period of time, largely due to the compact nature of West Timor and concentration of population, as compared with East Timor. Thus, during the year 1986, the entire Kabupaten of T.T.U. had been covered, as had practically all of Kabupaten Belu and nearly two-thirds of Kabupaten T.T.S.; leaving aside the capital city, in Kabupaten Kupang too, almost half of the rural areas had been dealt with.

Two villages that were being sprayed in Kabupaten T.T.U. and Belu were visited for observation. It was noticed that the field staff were adequately trained and the quality of performance and techniques followed satisfactory. Record keeping was good. Past performance checked in a few villages in all the Kabupaten was also found satisfactory. Bed bug nuisance was cited as an operational problem particularly in Kabupaten T.T.U.

The population protected by the end of each year of operation was: 1982 - 161,588; 1983 - 296,701; 1984 - 325,251; 1985 - 307,233; 1986 - 363,238. Thus, the total population protected in West Timor by 1986 was 31.9% (363,238 out of 1,139,790), marginally exceeding the set target of 30%.

The DDT warehouse in Kupang is also maintained well. The stacking of cartons was done properly and the record keeping was satisfactory. No subdepots could be visited for want of time. Spray cans and equipment are maintained fairly satisfactorily. Shortage of transport facilities is a problem in West Timor as well. The stock of DDT will be ample for the next spray cycle.

F. Complementary Measures

Besides spraying, a few complementary vector control measures were also introduced, but to a limited extent, beginning in 1984 in West Timor and in 1986 in East Timor.

In East Timor, source reduction operation commenced in the coastal area of Kabupaten Dili during 1986, in cooperation with the Public Works Services. Two permanent drains were constructed to deal with sizable water collections breeding An. subpictus and two more had been planned to be taken up this fiscal year. The larvivorous fish, Panchax-Panchax, had been successfully employed in 11 locations in Kabupaten Dili to control breeding of An. subpictus as well as An. barbirostris. Panchax was multiplying very well in the stock tank constructed near the provincial warehouse. Oiling of water collections had also begun in Kabupaten Dili.

Trials with various larvivorous fish began in West Timor in 1984. Panchax-Panchax, Tilapia, Guppy and Carp were utilized in over nine locations in Kabupaten Kupang and T.T.U. Panchax was preferred as it was found to survive and multiply more satisfactorily than the other species, both in water collections and streams. Therefore, it was introduced to cover additional locations, 18 in all, distributed in five Kecamatan in Kabupaten Kupang, T.T.U. and T.T.S. Source reduction through drainage had been successfully attempted in one Kecamatan in Kabupaten Kupang and extension of this operation had been planned.

G. Persons Treated

All health institutions were actively involved in malaria control. Fever cases clinically diagnosed as suffering from malaria among the daily outdoor attendance at these institutions were given 4-aminoquinolines for suppressive and presumptive treatment. In some situations where microscopes and trained microscopists were available, laboratory confirmation of highly suspect cases was selectively made and cases found positive for malaria parasite administered the standard treatment regimen of 4-amino/8-aminoquinolines for radical cure (Passive Case Detection-PCD-Procedures). The institutions involved included Puskesmas (health centers), Puskesmas Pembantu (subhealth centers), polyclinics and hospitals.

During the Project period, the number of persons treated for malaria by health institutions was getting proportionately reduced. Clinically diagnosed malaria cases that used to be ranked foremost among the top 10 diseases receiving ambulatory

treatment began to slide down to lower ratings between 1982 and 1986. While malaria attendance for 1986 in the various Kabupaten ranked second or third to other diseases in East Timor, it rated second in Kabupaten Belu, third in Kabupaten Kupang and T.T.U. and fourth in Kabupaten T.T.S. in West Timor the same year. Clinical malaria that accounted for 18.2% of the total outpatient attendance in 1982 in East Timor went down to 12.0% in 1985. In West Timor, clinical malaria attendance fell from 18.9% in 1982 to 14.2% in 1986.

The particulars of clinical malaria visits to total outdoor attendance at health institutions from 1982 to 1986 in East Timor and West Timor are summarized, respectively, in Annex 6-A and 6-B. It will be interesting to note that the quantum of outpatients attending health institutions for all ailments nearly equalled or even exceeded that of the provincial population in three of the five years in East Timor, and roughly ranged between 60% and 80% of the population in West Timor.

The number of persons treated between 1982 and 1986 far exceeded the targeted figure of 1.1 million.

The Indonesian Red Cross Society had been involving community participants to some extent in surveillance and suppressive treatment of fevers in five Kecamatan (one each in the eastern Kabupaten) in East Timor since 1986, besides supporting spray activity in these areas. Aside from this, community participation in malaria control activities had been minuscule or nonexistent either in East Timor or in West Timor.

The fabulous situation that is emerging in regard to the development of organized community-based malaria control efforts in West Timor, especially in the areas of malaria surveillance, drug treatment and complementary personal protection measures, is the blossoming of the CHIPPS program that is leading toward implementation of the joint GOI/A.I.D. field study. Following elaborate discussions at the central and provincial levels, details have been worked out, costing done and proposals finalized. The outcome of this study is bound to be of enormous importance and relevance in the present context of Timor Malaria Control Project, especially toward ensuring generation of self-sustaining malaria control management by the communities themselves in coordination with the peripheral health services which is essentially a Project purpose. In these circumstances, it has been suggested (in the section, Future Strategies) that operational evaluation of this study be prolonged beyond the period of 15 months now projected.

In view of the developmental nature of the health infrastructure on Timor Island, especially in East Timor, and the late start of the malaria control program, PCD activity and treatment for radical cure did not receive priority attention at the outset. However, it did get started and began to expand gradually when staff and facilities became available. Nonetheless, the point has been reached now when PCD procedures should be assigned the priority deserved, particularly in the context of a likely withdrawal of spraying from areas hitherto protected. In such situations, PCD will be the sheet anchor in triggering rapid investigatory and remedial activities so essential to contain and prevent episodic events.

Because of the patchy nature of the PCD procedures so far followed and the inability of the microscopists to provide reliable laboratory diagnosis until now, it will be inadvisable to attempt to analyze or interpret PCD information, as available. Data presentation in this regard has, therefore, been avoided.

H. Monitoring Susceptibility Status of Vector/Parasite

After placement of an entomologist in East Timor, susceptibility status of vectors to insecticides was determined in 1986. In Kabupaten Covalima, susceptibility tests performed in October and November 1986 in locality Salele indicated that 100% mortality was obtained in respect of An. subpictus and An. barbirostris with 4% DDT as well as 1% Fenitrothion. Similarly, in locality Salindung in Kabupaten Manatuto, tests made in September 1986 on An. barbirostris also revealed susceptibility to DDT and Fenitrothion.

A disturbing feature of the malaria situation in East Timor was the discovery of prevalence of chloroquine resistant falciparum malaria. The cause for investigation was the realization that some of the P. falciparum infections probably disseminated through Armed Forces returnees from Timor in Java and elsewhere failed to respond adequately to standard chloroquine treatment regimen. In vivo and in vitro micro-techniques applied in locality Los Palos in Kabupaten Lautem and locality Atauro in Kabupaten Dili in 1981, locality Sirai in Kabupaten Covalima in 1985 and localities Natarbora and Laclubar in Kabupaten Manatuto established the presence of chloroquine resistant P. falciparum in these areas and perhaps others too. It added a new dimension to operational policies on Timor Island toward determining appropriate remedial measures to effectively deal with this parasite species. Management of drug resistant falciparum malaria was, therefore, stressed in the training courses, review meetings and personal contacts. Areas that

continued to record higher proportions of P. falciparum infections were asked to be specially monitored and guidelines issued to help ascertain field determinations. Prevalence of drug resistant falciparum malaria in West Timor had not been so far noted.

I. Malaria Monitoring System

The recording and reporting procedures adopted in East and West Timor are patterned on the same formats as adopted for the integrated malaria control program.

Although noted in the Project document that field data be regularly communicated to the provincial and central levels toward instituting monitoring efforts, enabling corrective actions and periodic evaluations, what emanated from the periphery was minimal and, therefore, inadequate for epidemiological analyses. Then, in accordance with the policy of the national health information system, the periphery is expected to submit no more than prescribed formats of summarized monthly data to higher levels which, of course, will not suffice for specific programs such as malaria control. Hence, field data for in-depth studies have to be obtained only by visiting the Kabupaten concerned and patiently working through the records. Fortunately, a lot of information is still available at the peripheral level although maintained haphazardly.

IV. CONCLUSION AND RECOMMENDATION

In the Project analyses section of the document on Timor Malaria Control Project, it was concluded that "the Project objective of reducing the malaria prevalence to 2% or less in the designated Project areas is considered difficult, but technically feasible". Even now it stands to be true. The two year extension of the Project, necessitated because of the delayed start, had indeed helped achieve considerable progress. While gains made had been noteworthy in some areas, achievement in others had only been partial. This was bound to be so in as much as the Project had to be developed in bits and stages, in a step ladder fashion.

A. Problems Faced

The lack of a health infrastructure in East Timor was a serious setback to start with. It almost seemed that the Project, as well as the health structure, were developing side by side. In this respect, West Timor had a head start with a fairly developed and expanding infrastructure on the one hand and a compact size with a concentration of population in the priority areas, on the other.

The lack of staff, especially in East Timor, was another handicap. While it was not that difficult to recruit local candidates in West Timor, it was quite difficult to do so in East Timor except for spray squads. The trainers and supervisors had to be recruited from Java and other provinces that was not an easy task, and holding them over for any length of time was not easy either owing to financial and other causes.

A.I.D. fund release in 1980 pertained to procurement of DDT and TA. In 1981, GOI funds were released for construction of warehouses and purchase of commodities and equipment and A.I.D. funds for TA and training of trainers. Thus, there was no field activity during 1981.

A speedy flow of activities started in 1982. Construction of warehouses continued, further orders placed for vehicles, commodities and equipment, DDT received and operational funds released, training courses undertaken and all field activities commenced. The malaria consultant (TA) departed.

All activities continued during 1983 and beyond. However, financial stringencies and regulatory restrictions began to multiply and affect implementation of field operations and

provincial and central supervision with the result that the Project was seriously hampered since 1985.

Nonetheless, the Project inputs in regard to the major program activities of house spraying, malariometric surveys and treatment of cases were substantial, although activities such as action/demonstration operational field trials could not be implemented, and complementary measures only minimally undertaken.

The Project outputs in regard to population protected, houses sprayed, persons treated, surveys made, blood films taken, and personnel trained had all reached the target set or even exceeded in both East and West Timor. Although some community participation was sought and received in regard to complementary measures such as source reduction, drainage and biological control, community organizations like Posyandu are yet to be actively involved in the areas of malaria surveillance and case treatment.

The Timor experience seems to stress how important it is to ensure availability of a viable health structure prior to implementation of a field project of this nature. It also seems to show that a preparatory phase of a year or so prior to Project implementation can be quite helpful in settling many issues that may remain unknown at the outset. It seems to further show that it may be an advantage to taper off assistance than abruptly end on a time frame.

B. Impact of Malaria Control Measures

The impact of anti-malaria measures undertaken between 1982 and 1986 appears to be positive. The extent of clinically diagnosed malaria cases attending the health institutions was proportionally reduced. Thus, malaria that used to be ranked foremost among the top 10 diseases receiving ambulatory treatment in 1982 had slid to lower ratings - ranked 2-3 in East Timor and ranked 2-4 in West Timor during 1986. Clinical malaria that accounted for 18.2% of the total outdoor attendance in 1982 in East Timor was reduced to 12.01% in 1986. In West Timor, clinical malaria attendance fell from 18.9% in 1982 to 14.2% in 1986.

Malariometric surveys had been carried out vigorously. The results of these surveys would indeed constitute the key parameter to measure the impact of malaria control and help design appropriate remedial measures should situations so warrant. Unfortunately, the errors committed by the field micro-

scopists is still continuing and in some instances worsening since 1985. The results of the microscopic examinations by the field microscopists varied widely from the findings of the provincial cross-checking laboratories in both East and West Timor. As for East Timor, in 1986, the error rate in respect of the positive results of the field microscopists varied from 38.6% in Kabupaten Liquisa to 92.3% in Kabupaten Viqueque. In respect to the negative results, the error rate varied from 6.6% in Kabupaten Baucau to 32.1% in Kabupaten Manatuto. Not all the four Kabupaten in West Timor had furnished their microslides to the provincial laboratory service year by year for cross-checking of results of the field microscopists. Of the 202 slides examined by this service in 1987, the error rate among positive results was 8.9%, among negative results, 3.7% and species difference, 8.2%. It was also observed that the provincial cross-checking laboratories in East and West Timor had not forwarded their own cross-check findings of 1986 for recross-check by the central laboratory service.

Owing to a flaw of this nature, it is rather difficult to measure the impact of malaria control activities with any degree of precision. However, on the assumption that the findings of the provincial cross-checking laboratories in Dili and Kupang are passable (based on their performance during the past years as determined by a recross-check by the central laboratory), it was revealed that most of the positive results were negative, indicating that malaria prevalence has been considerably reduced.

However, just to ensure that the situation is indeed so, it is imperative that a central laboratory team carry out malariometric surveys and read results in the field (by way of providing on-job-training to field and provincial level microscopists) in order to speedily determine the current status of endemicity in the operational areas. The findings of this team will be most valuable to formulate strategies, designs, and alternatives.

In four of the ten Kabupaten visited, the assessment team reviewed the malaria prevalence status in the villages that had continually received insecticidal protection by six or seven cycles of spraying. Except in those instances where new hamlets or villages had recently been included for spraying and surveys, or in those facing persisting technical problems, the trend was a significant reduction in the parasite rates in 1986 as compared with 1982 - reduction from a range of 28.1% to 69% to a low of 1.4% to 7.3% in East Timor, and from a range of 17.2% to 41.7% to a low of 0.6% to 4.9% in West Timor. Of course, the review was based on the results of the field microscopists.

C. Coverage Levels

In West Timor, until recently, Kabupaten T.T.U. had been entirely covered, and most of the Kecamatan in Kabupaten T.T.S. and Belu and nearly half of Kabupaten Kupang were covered by spraying.

In East Timor, coastal and inland areas of only eight of the 13 Kabupaten were covered from the start of the Project. In Kabupaten Lautem, Viqueque, Manufahi, Ainaro and Covalima spray operation commenced only during 1984 and slightly expanded thereafter. Thus, the malarious areas in the remaining priority areas of these Kabupaten are still to receive any spray protection; the population involved is estimated to be 50,000.

D. Future Strategies

Based on geophysical characteristics, climatological, entomological, epidemiological and ecological features, and past experience of similar situations within the country and elsewhere in Asia, it can be concluded that Timor Island, unprotected, will be prone to focal epidemic outbreaks with dissemination of malaria and a build-up of post-epidemic endemicity, followed by lessening of herd immunity, addition of new arrivals including the newly born and a resurgence, now and again, of epidemic-endemic cycle.

The protection so far afforded had indeed been significant as compared with the malaria situation that existed when the Project started. However, on completion of the Project this December, financial resources will dwindle and an operational inability will descend heavily on the malaria control program. Therefore, it seems inevitable that future strategies be redesigned to at least minimize risks.

One approach is to withdraw spraying, subject to a resurvey by a central laboratory team, in order to redetermine the prevalence rate of malaria. However, areas that were only included in the recent past for spray protection, areas of potential malariogenicity and persisting problem foci will be such situations as may not lend themselves to withdrawal of spraying at present.

At the same time, it should be noted that sizable parts of priority areas in five of the eastern Kabupaten in East Timor, not sprayed even once (about 10,000 houses), may deserve adequate spray protection at least now.

A revised strategy will be application of a single spray cycle in areas currently under operation, and a second cycle only in identified problem areas and those that are yet to be protected. Of the two cycles now adopted, the September-October cycle should be considered as the more important of the two on grounds of entomological and epidemiological overview. Spray withdrawal should necessarily be supported by supplemental anti-vector measures in all potentially problematic situations through active community participation.

It has to be further supported by a well organized drug control procedure undertaken by health institutions. Vulnerable groups such as mothers and children and traditionally mobile sections of population and problem pockets will need special attention. Unless PCD procedures are implemented vigorously and with regularity in the context of withdrawal of spray protection, the risk of resurgence of malaria from residual foci will indeed be high. One essential element in this regard will be the skill and competence of the Puskesmas/hospital microscopists to correctly identify presence of parasite and species, and the other, the persuasive ability of medical and paramedical staff to ensure completion of radical treatment by the patients. Done this way, PCD activity can be an asset to peripheral management of malaria control in maintaining gains achieved. Besides, wholesome PCD data can be the basis for measuring overall progress, discovering episodes and outbreaks, and unusual events such as influx of cases, and special situations such as occurrence of drug resistant falciparum malaria.

The time is ripe for the dynamic involvement and participation of the community, through the well recognized Posyandu, in anti-malaria activities. It is in this context that the proposals now being generated by A.I.D. and GOI for implementation in West Timor, through the auspices of CHIPPS, can trail blaze the initiation of community-based malaria control on Timor Island and elsewhere in Indonesia.

One essential aspect to keep in mind will be to enable a composite central team to periodically visit East and West Timor to monitor the epidemiological situation as and when spraying is partially withdrawn.

The planning for further withdrawal should be determined by undertaking an in-depth analysis of the program situation, as indicative evidence begins to unfold.

Before any attempt is made to withdraw a round of spray, it is imperative that a laboratory team from the central level be

urgently sent to East and West Timor in order that malaria prevalence be precisely determined by launching a well organized malariometric survey to enable future planning and program implementation. Thereafter, it may suffice to carry out malariometric surveys once a year, instead of twice as of now. With the time saved, the microscopists can devote more attention to PCD activity in health institutions.

Undoubtedly, the availability of a Malaria Consultant (TA) from 1985 onwards had been most valuable. In the absence of malaria expertise locally and the inability of the central organization to frequently visit the provinces and the periphery for advice, guidance and support, the assistance provided by him on all aspects of the program had helped achieve progress in a large measure. His assistance will be continued to be required for at least another two years to maintain gains achieved and solve problems as they arise, as well as train and develop local talent at the provincial and peripheral levels. Additionally, he can be very well utilized toward implementing and supervising the currently proposed West Timor study.

E. Operational Field Studies

In order that the revised strategies be adequately designed and properly implemented so as to maintain successes achieved and accomplish further progress, operational field studies in the following areas are worth considering:

1. Application of a single cycle of spraying at a dosage of 2 g/m² in a year as compared with similar applications twice a year.
2. Application of a single cycle of spraying at a dosage of 1 g/m² in a year as compared with similar applications twice a year.
3. Detection of sporozoite presence by monoclonal technique for mapping the distribution of malaria vectors on Timor Island.
4. Operational evaluation of zoophylaxis as a malaria control measure.
5. Operational evaluation of sociological and ecological aspects concerning population movements and dissemination of malaria on Timor Island.

6. Continuation of operational evaluation of the use of permethrin impregnated bed nets for malaria control, after completion of the one year CHIPPS study, should it be found necessary.

Note: No priority is intended in the line up above.

In this connection, it has to be borne in mind that neither the central CDC Sub-Directorates nor the provincial CDC services, which are primarily executive branches of the CDC organization, are directed toward undertaking research and development studies per se. Therefore, provision of financial and technical assistance will be necessary to bring these studies on board. The outcome of these studies will, of course, be beneficial not only to Timor Island but the Outer Island malaria program as a whole.

F. Further Assistance to Project

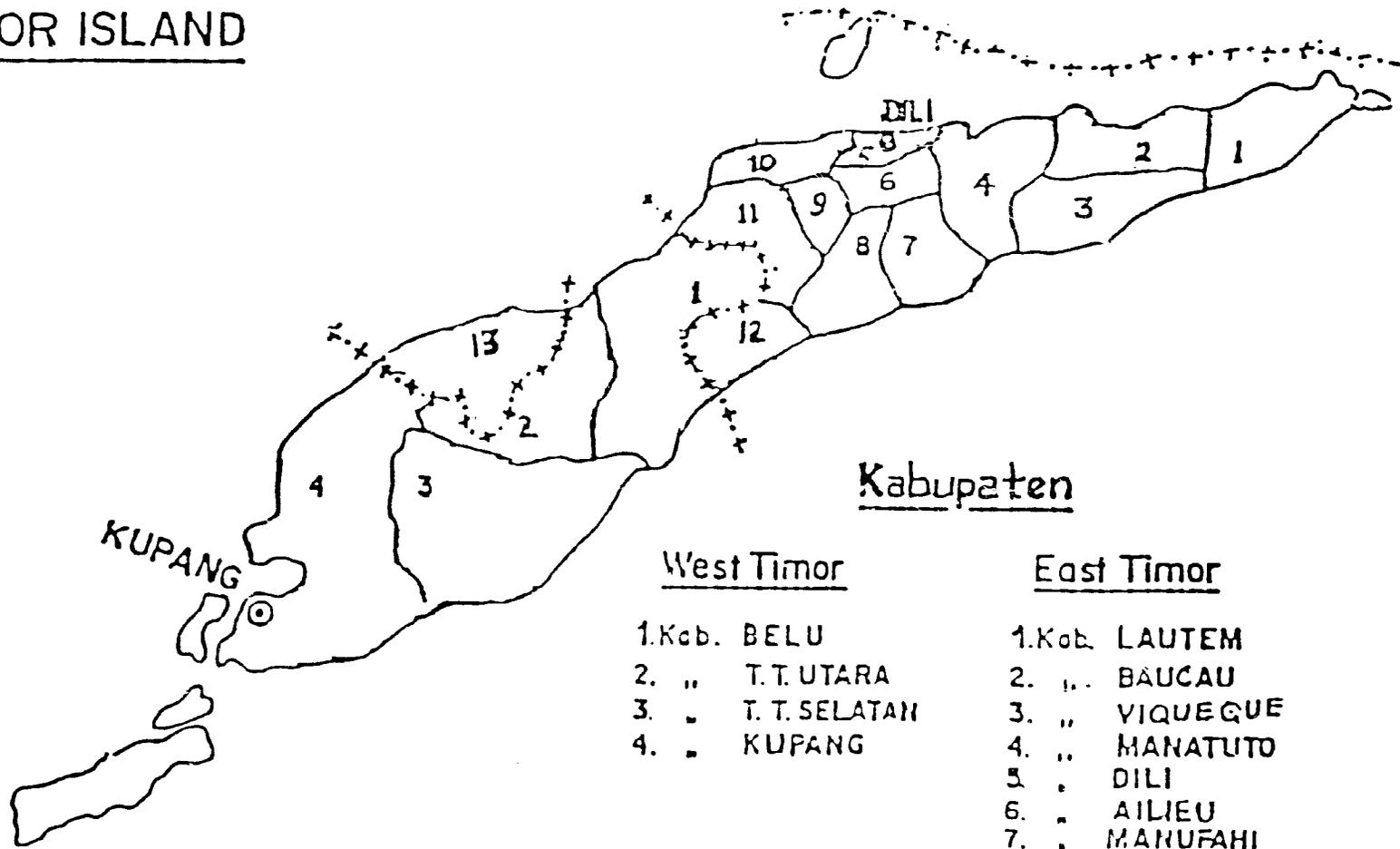
The possibility of limited further assistance to the project emerged during discussions held. In view of the fact that DDT now available on Timor Island would be adequate to carry out three more spray cycles and that the malaria control program is also in a position to divert unused DDT available on Java and other areas to cope with additional spray cycles as may be required, and in view of the likelihood of a partial withdrawal of spray in the near future and the prospect of further withdrawal in due course, operational expenditure will certainly begin to slide down. Nonetheless, it may still be a big enough burden to be borne by the national program.

A compromise situation that could lead not only to maintenance of gains achieved, but also to attaining progressive improvement in reducing malaria prevalence to a level that could be realistically handled by community-based malaria control efforts. The sharing of operational and supervisory costs seems to be the major hurdle arising from the cessation of A.I.D. assistance. A.I.D. may, therefore, wish to consider provision of operational cost for West Timor and continuance of TA for malaria control on Timor Island together with the implementation of CHIPPS operational field study for the next two years. GOI may wish to handle the cost of East Timor operation, make provisions for travel and per diem expenses in connection with the visits of the Malaria Consultant to East Timor and ensure adequate provision toward meeting travel and per diem costs of the central CDC teams to frequently visit Timor Island. The progress can be jointly assessed later on in order to decide future alternatives.

The operational cost to be met by A.I.D., in respect to West Timor during the next two years, is estimated at Rp. 70.8 million and the cost of TA for the same period at Rp. 75.7 million.

In regard to East Timor, the operational cost to be provided by GOI for the next two years will amount to Rp. 124.4 million. GOI's provision for travel costs for TA to visit East Timor and for travel costs of the central teams to visit East and West Timor for the period of two years is estimated at Rp. 7.6 million and Rp. 15.4 million, respectively.

TIMOR ISLAND



West Timor

- 1. Kob. BELU
- 2. " T.T. UTARA
- 3. " T.T. SELATAN
- 4. " KUPANG

East Timor

- 1. Kob. LAUTEM
- 2. " BAUCAU
- 3. " VIQUEQUE
- 4. " MANATUTO
- 5. " DILI
- 6. " AILIEU
- 7. " MANUFAHI
- 8. " AINARO
- 9. " ERMERA
- 10. " LIQUISA
- 11. " BOBONARO
- 12. " COVALIMA
- 13. " AMBENO

+.+ PREVINCIAL BOUNDARY
 — KABUPATEN BOUNDARY

ANNEX 2-A

LIST OF KABUPATEN AND KECAMATAN
EAST AND WEST TIMOR

EAST TIMOR

1. <u>Kab. LAUTEM</u> Iliomar Luro Lautem Tutala Lospalos	2. <u>Kab. BAUCAU</u> Vemase Venilale Ouiliqai Baguia Laga Baucau	3. <u>Kab. VIQUEQUE</u> Dilor Ossu Uatulari Uatucarbau Viqueque	4. <u>Kab. MANATUTO</u> Natar Bura Soibada Laclubar Laclo Lalea Manatuto
5. <u>Kab. DILI</u> Dili Barat Dili Timur Metinaro Atauro	6. <u>Kab. AILEU</u> Laulara Liquidui Aileu Remexio	7. <u>Kab. MANUFAHI</u> Betano Alas Fatuberliu Turiscai Same	8. <u>Kab. AINARO</u> Hatudo Ainaro Mape/Zumalai Hatubulico Maubessi.
9. <u>Kab. ERMERA</u> Atsabe Hatulia Letepoho Pailaco Ermera	10. <u>Kab. LIQUISA</u> Maubara Liquisa Bazartete	11. <u>Kab. BOBONARO</u> Batu Gade Balibo Atabae Cailako Maliana Bobonaro	12. <u>Kab. COVALIMA</u> Fatumean Fatululic Rohorem Tilomar Suai
13. <u>Kab. AMBENO</u> Nitibe Pasabe Oesilo Pante Nakasar			

WEST TIMOR

1. <u>Kab. BELU</u> Malaka Barat Malaka Tengah Malaka Timur Tosifeto Barat Tosifeto Timur Lamaknen	2. <u>Kab. T.T.U.</u> Miomafu Barat Miomafu Timur Insana Biboki Selatan Biboki Utara	3. <u>Kab. T.T.S.</u> Mallo Utara Mallo Selatan Amanuban Barat Amanuban Selatan Amanuban Tengah Amanuban Timur Amanatun Utara Amanatun Selatan	4. <u>Kab. KUPANG</u> Kupang Kota Kupang Barat Kupang Tengah Kupang Timur Amarasi Fataleu Amfoang Selatan Amfoang Utara.
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ANNEX 2-B

BASIC INFORMATION
EAST AND WEST TIMOR, 1986EAST TIMOR

<u>Kabupaten</u>	<u>No. Kec.</u>	<u>No. Vill.</u>	<u>No. Houses</u>	<u>Popu- lation</u>	<u>No. Hosp.</u>	<u>No. Puskes.</u>	<u>No. PusPem</u>	<u>No. Posvandu</u>
1. Lautem	5	35	8678	44104		2	15	27
2. Baucau	6	60	15756	74298	1	3	15	39
3. Viqueque	5	34	10303	54194		2	12	24
4. Manatuto	6	28	5579	27769		2	10	28
5. Dili	4	33	16597	33726	1	5	11	43
6. Aileu	4	32	4967	19212		3	9	23
7. Manufahi	4	31	4897	28265		2	10	17
8. Ainaro	5	28	9203	47254		2	10	18
9. Ermera	5	52	20406	64870		3	10	46
10. Liquisa	3	23	6871	34121		2	9	23
11. Bobonaro	6	51	14671	70290	1	1	13	35
12. Covalima	5	21	4557	29542		1	12	21
13. Ambeno	4	18	7432	41066		2	11	18
Total :	62	446	129867	618711	3	30	147	362

WEST TIMOR

<u>Kabupaten</u>	<u>No. Kec.</u>	<u>No. Vill.</u>	<u>No. Houses</u>	<u>Popu- lation</u>	<u>No. Hosp.</u>	<u>No. PusKes.</u>	<u>No. Pus.Pem.</u>	<u>No. Po- syandu</u>
1. Belu	7	73	40937	200379	2	7	25	165
2. T.T.U.	6	113	30256	144894	1	9	23	185
3. T.T.S.	9	166	68976	324110	1	12	22	251
4. Kunang	17	275	92899	470407	5	18	55	306
Total :	39	627	233068	1139790	9	46	125	907

Note : Kec. = Kecamatan
 Vill. = Village
 Hosp. = Civil Hospital
 Puskes = Puskesmas (Health Center)
 Pus.Pem = Puskesmas Pembantu (Sub-Health Center)
 Posyandu = Voluntary Village Health Service Post

ANNEX 3

PERSONNEL TRAINED

(by Province and Year)

Categories of Personnel Trained	Training Course Days	Number Trained, By year and Province									
		1982		1983		1984		1985		1986	
		<u>E.T.</u>	<u>W.T.</u>	<u>E.T.</u>	<u>W.T.</u>	<u>E.T.</u>	<u>W.T.</u>	<u>E.T.</u>	<u>W.T.</u>	<u>E.T.</u>	<u>W.T.</u>
1. Medical Officer											
. Provincial level	15	1	-	-	-	-	-	-	-	-	-
. Kabupaten "	15	4	4	-	11	-	-	-	12	-	-
. Paramedical "	7	-	-	-	17	-	-	-	-	-	-
2. Microscopist											
. Provincial Level	30	3	2	-	-	2	-	-	-	-	-
. Kabupaten Level	30	26	12	12	-	14	-	13	20	5	-
3. Wasor Malaria, Kab.	15	9	4	-	-	-	-	6	-	-	-
4. Assistant Operation	15	14	-	-	4	-	-	12	-	-	-
5. Assistant Evaluation	15	19	-	-	4	-	-	8	-	-	-
6. Asst. Entomologist											
. Provincial Level	15	2	2	-	-	-	-	-	-	1	-
. Kabupaten Level	15	-	-	-	-	-	-	-	-	5	-
7. Supervisor, Prov. Level	15	3	2	-	-	-	-	-	-	-	-
	Total :	81	26	12	36	16	-	39	32	11	-

Note : E.T. = East Timor, W.T. = West Timor.

ANNEX 4

CROSS-CHECK FINDINGS OF PROVINCIAL LABORATORY SERVICE
EAST TIMOR

<u>KABUPATEN</u>	<u>1985</u>						<u>1986</u>					
	<u>No. Pos.</u> <u>Cross-</u> <u>checked</u>	<u>No.</u> <u>found</u> <u>Neg.</u>	<u>Err.</u> <u>Rate</u> <u>%</u>	<u>No. Neg.</u> <u>Cross-</u> <u>checked</u>	<u>No.</u> <u>found</u> <u>Pos.</u>	<u>Err.</u> <u>Rate</u> <u>%</u>	<u>No. Pos.</u> <u>Cross-</u> <u>checked</u>	<u>No.</u> <u>found</u> <u>Neg.</u>	<u>Err.</u> <u>Rate</u> <u>%</u>	<u>No. Neg.</u> <u>Cross-</u> <u>checked</u>	<u>No.</u> <u>found</u> <u>Pos.</u>	<u>Err.</u> <u>Rate</u> <u>%</u>
1. Lautem	263	231	87.8	77	12	15.6	-	-	-	-	-	-
2. Baucau	-	-	-	-	-	-	123	112	91.1	76	5	6.6
3. Viqueque	332	300	90.4	155	11	7.1	39	36	92.3	29	2	6.9
4. Manatuto	-	-	-	-	-	-	124	77	62.1	144	23	15.9
5. Dili		No	Data					No	Data			
6. Aileu		"	"					"	"			
7. Manufahi	-	-	-	-	-	-	77	32	41.6	109	35	32.1
8. Ainaro	132	100	75.8	95	23	24.2	180	148	82.2	154	26	16.9
9. Ermera		No	Data					No	Data			
10. Liquisa	10	5	50.0	16	5	31.3	88	34	38.6	156	29	18.6
11. Bobonaro	-	-	-	-	-	-	37	22	59.5	32	4	12.5
12. Covalima	149	126	84.6	149	8	5.4	392	336	85.7	395	39	9.9
13. Ambeno		No	Data					No	Data			
Total :	886	762	86.0	492	59	12.0	1060	797	75.2	1095	163	14.9

Note : Pos. = Positive , Neg. = Negative, Err. = Error

ANNEX 5-A

DDT SPRAY COVERAGE IN EAST TIMOR

(by Year of Operation)

KABUPATEN	Spr. Cyc.	1982			1983			1984			1985			1986		
		No. Kec.	No. Vill.	Houses Spr.	No. Kec.	No. Vill.	Houses Spr.	No. Kec.	No. Vill.	Houses Spr.	No. Kec.	No. Vill.	Houses Spr.	No. Kec.	No. Vill.	Houses Spr.
. Lautem	I	-	-	-	-	-	-	-	-	-	-	-	-	2	16	4546
	II	-	-	-	-	-	-	1	6	2283	1	6	2268	2	16	4181
. Baucau	I	1	3	406	4	8	1679	4	14	3653	-	-	-	4	20	6335
	II	4	8	2746	4	8	3665	4	16	4678	4	15	4788	4	17	4437
. Viqueque	I	-	-	-	-	-	-	-	-	-	-	-	-	2	11	3300
	II	-	-	-	-	-	-	3	11	3208	3	11	3409	4	16	4655
. Manatuto	I	2	4	383	3	9	1529	3	13	2429	-	-	-	4	16	2772
	II	3	9	1503	3	9	2321	3	13	2303	3	12	2392	4	16	2906
. Dili	I	2	2	715	4	10	4131	3	16	6410	-	-	-	3	18	9627
	II	3	10	4571	4	14	6980	3	18	7298	3	19	7893	4	23	6562
. Aileu	I	-	-	-	1	3	457	1	8	977	-	-	-	3	15	1719
	II	1	3	437	1	3	1047	3	10	1517	3	10	1451	3	11	1569
. Manufahi	I	-	-	-	-	-	-	-	-	-	-	-	-	3	15	2513
	II	-	-	-	-	-	-	3	14	2547	3	14	2507	3	18	2185
. Ainaro	I	-	-	-	-	-	-	-	-	-	-	-	-	4	16	3964
	II	-	-	-	-	-	-	3	8	1030	3	8	2254	2	8	2648
. Ermera	I	-	-	-	2	8	700	3	14	1693	-	-	-	4	17	2111
	II	2	8	554	2	8	1643	3	12	1711	3	12	1724	3	10	1047
. Liquisa	I	1	5	420	3	9	1591	3	11	846	-	-	-	3	17	2904
	II	3	9	1702	3	11	2216	3	13	2818	3	13	2755	2	11	1503
. Bobonaro	I	1	2	503	4	14	2578	4	22	4947	-	-	-	5	24	4302
	II	3	14	2435	4	14	5241	5	24	5533	4	24	5710	4	18	3636
. Covalima	I	-	-	-	-	-	-	1	9	2531	-	-	-	2	12	3830
	II	-	-	-	-	-	-	2	10	2613	2	10	2842	2	12	4216
. Ambeno	I	1	2	421	1	11	1633	3	11	2772	-	-	-	3	12	3137
	II	1	11	1449	1	11	2732	3	12	3226	3	12	3120	4	13	3902
Total	Cycle I	8	18	2843	22	72	14298	25	118	26258	-	-	-	42	209	51825
	Cycle II	20	72	15397	22	78	26875	39	167	40765	38	166	43113	41	189	42682

ANNEX 5-B

DDT SPRAY COVERAGE IN WEST TIMOR

(by Year of Operation)

ABUPATEN	Spray Cycle	1982			1983			1984			1985			1986		
		No. Kec.	No. Vill.	Houses Spr.												
Belu	I	2	10	5257	5	42	15323	5	55	22332	3	24	9263	6	70	22834
	II	2	10	5397	4	34	15961	3	32	12695	-	-	-	6	46	14516
T.T.U.	I	3	38	6017	5	66	10674	5	83	11184	5	112	20682	5	118	24740
	II	5	67	10451	5	83	13526	-	-	-	-	-	-	5	77	14636
T.T.S.	I	3	9	5287	4	24	9654	4	33	13796	4	34	10434	5	67	24767
	II	4	24	9542	4	33	13721	4	33	13649	-	-	-	5	42	15653
Kupang	I	3	19	5669	3	52	12506	3	58	12241	4	52	13192	3	37	8136
	II	3	22	6089	3	52	11698	3	57	12923	-	-	-	7	67	15393
Total	Cycle I	11	76	22230	17	184	48157	17	229	59553	16	222	53571	19	292	80477
	Cycle II	14	123	31479	16	202	54906	10	122	39267	-	-	-	23	232	60198

ANNEX 6-A

PROPORTION OF CLINICALLY DIAGNOSED MALARIA CASES
TO TOTAL OUTDOOR ATTENDANCE AT HEALTH INSTITUTIONS
EAST TIMOR

(by Year)

KABUPATEN	1982			1983			1984			1985			1986		
	Total Outdoor Attend.	Clin. Mala- ria	Rate %												
. Lautem	43924	6762	15.3	29658	5341	20.0	37615	2821	7.5	45768	5166	11.3	29919	1140	4.0
. Baucau	40459	9220	22.7	32018	11112	34.7	57381	7861	13.7	39924	4350	10.9	66475	6249	9.4
. Viqueque	42027	7826	18.6	23169	4385	18.9	88068	17251	19.6	95559	16079	16.8	118090	15079	12.8
. Manatuto	42334	5366	12.6	35232	4917	13.9	23883	5254	22.0	34414	5854	17.0	51317	7264	14.1
. Dili	115478	10913	9.4	63991	10654	16.6	126984	19047	15.0	122711	15204	12.4	110278	15635	14.2
. Aileu	10832	4122	38.0	10885	2799	25.7	11537	1892	16.4	16918	962	5.7	11306	994	8.8
. Manufahi	160404	29549	18.3	51602	4385	8.4	42840	7154	16.7	52731	5031	9.5	20107	3701	18.4
. Ainaro	39780	8681	21.8	17282	5170	29.9	25655	4130	16.1	31239	4565	14.6	43101	4625	10.7
. Ermera	41508	7477	18.0	17463	4731	27.1	17948	2046	11.4	26527	2432	9.2	37503	3051	8.1
. Liquisa	36600	4311	11.7	21333	2916	13.6	18371	3013	16.4	14560	2013	13.8	21856	2627	12.0
. Bobonaro	45263	8450	18.6	45100	3334	7.3	55704	6127	11.0	31241	2975	9.5	43269	3992	9.2
. Covalima	47394	12141	25.6	51360	12795	24.9	57862	9489	16.4	8461	1372	16.2	39307	6450	16.4
. Ambeno	54272	16424	30.2	52066	11010	21.1	39153	5799	14.8	29817	4680	15.7	36151	4539	12.6
Total	720785	131242	18.2	451159	84147	18.6	603031	91894	15.2	549870	70683	12.8	626679	75646	12.1

ANNEX 6-B

PROPORTION OF CLINICALLY DIAGNOSED MALARIA CASES
TO TOTAL OUTDOOR ATTENDANCE AT HEALTH INSTITUTIONS
WEST TIMOR

(by Year)

ABUPATEN	1982			1983			1984			1985			1986		
	Total Outdoor Attend.	Clin. Mala- ria	Rate %												
Belu	198429	39306	19.8	209169	33761	16.1	260316	37418	14.4	269809	37804	14.0	260371	35803	13.7
T.T.U.	121057	16414	13.6	125846	15686	12.5	127473	15821	12.4	126090	11958	9.5	90729	7916	8.7
T.T.S.	103293	22055	21.4	115379	25229	21.9	170959	27112	15.9	203418	29105	14.3	152229	22169	14.6
Kupang	253587	49900	19.7	135073	23704	17.5	320436	58404	18.2	203445	32838	16.1	335620	53226	15.9
Total :	676429	127675	18.9	595467	98180	16.8	879184	138755	15.8	802762	111795	13.9	839449	119119	14.2

ANNEX 7

LIST OF OFFICIALS CONTACTED

August 31, 1987

1. Dr. Zeil Rosenberg, Medical Epidemiologist - OPH/USAID/Jakarta
2. Dr. Emmanuel Voulgaropoulos, Chief - OPH/USAID/Jakarta
3. Ms. Kathleen McDonald, Health Officer - USAID/Jakarta

September 1, 1987

1. Dr. Arwati Soepanto, Director-VBDC, Dit. Gen. CDC and EH, MOH, Jakarta
2. Dr. P.R. Arbani, Chief-Malaria Sub-Directorate, Dit, VBDC, Jakarta
3. Dr. R.K. Jung, WHO Malariologist, Jakarta

September 2, 1987

1. Mr. Muharyoto, SKM, Staff Officer, Dit. VBDC, Dit. Gen. CDC and EH, MOH, Jakarta
2. Mr. I.B. Windia, BSc., Staff Officer, Malaria Sub-Directorate, Dit. VBDC, Jakarta
3. Mr. Djumali, BSc., Staff Officer, Malaria Sub-Directorate, Dit. VBDC, Jakarta

September 3, 1987

1. Mr. Santiyo K., MSc., Chief-Entomology Sub-Dit., Dit. VBDC, Jakarta
2. Mr. Pranoto, MSc., Staff Officer, Entomology Sub-Dit., VBDC, Jakarta
3. Mr. Hazwar, BSc., Staff Officer, Malaria Sub-Dit., VBDC, Jakarta

September 4, 1987

1. Dr. Ratna P. Ludiarmo, MSc., Ecology Division, NIHR and D, MOH, Jakarta
2. Dr. N. Kumara Rai, Secretary to Director General, CDC and EH, MOH, Jakarta

ANNEX 7 cont.

September 10, 1987

1. Dr. M. Sasongko, MPH, Kakanwil, DepKes, East Timor Province
2. Dr. Arie H. Gultom, MPH, Chief-CDC, DepKes and Project Manager, East Timor
3. Mr. Sujud Tarkojosopuro, Malaria Consultant, Timor Malaria Control Project

September 11, 1987

1. Mr. Norbekto De Araujo, Chief-CDC, Provincial Health Service, East Timor
2. Mr. Upik Trenggono, MSc, Entomologist, Provincial Health Service, East Timor

September 12, 1987

1. Dr. Mardiono, Ag. Dokabu, Kabupaten Health Service, Dili
2. Mr. Rukman Aritonang, Chief-CDC Section, Kabupaten Health Service, Dili
3. Dr. Ani Daryulina, Chief-Puskesmas, Bairopite, Kecamatan Dili Barat.
4. Dr. Rienarmy Usfinit, MPH, Chief-Laboratory Service, East Timor
5. Dr. Fahrizal Harahap, Provincial General Hospital, Dili

September 13, 1987

1. Chief of Operation and Wasor Malaria, Kabupaten Health Service, Dili
2. Village Head, Fatuhada, Kec. Dili Barat, Kabupaten Dili
3. Village Heads, Kecamatan Dili Timor, Kabupaten Dili
4. Village Heads, Kabupaten Manatuto and Kabupaten Baucau

September 15, 1987

1. Dr. Moch. Syamsuri Ali, Chief-Health Office, Kabupaten Ermera
2. Mr. Nyoman Mudra, Wasor Malaria, Kabupaten Health Service, Ermera
3. Drs. Susarto Subianto, Chief-Kabupaten Health Service, Liquisa
4. Mr. I. Wayan Dana, Wasor Malaria, Kabupaten Health Service, Liquisa
5. Dr. Agi Satria P., Chief-Puskesmas, Kec. Liquisa, Kab. Liquisa

ANNEX 7 cont.

September 16, 1987

1. Mr. Farukin Hasmar, Representative, Provincial Service-Statistics, East Timor
2. Mr. Soepadyo T.W.S, Representative, Provincial Service-Public Works, East Timor
3. Mr. Ruslin Dahry, Representative, Provincial Service-Highway and Bridges, East Timor
4. Mr. Marikon, Representative, Provincial Service-Irrigation, East Timor
5. Mr. Jazir, Representative, Provincial Service-Transmigration, East Timor
6. Mr. Asa Petrus, Representative, Veterinary Development, East Timor
7. Representative, Provincial Agriculture Service, East Timor
8. Representative, Community Development, East Timor
9. Dr. H.D. Kurniady, Representative, Provincial Planning Board, East Timor
10. Dr. Derven J. Lada, Ag. Kakanwil DepKes, Nusa Tenggara Timor Province
11. Mr. Abusaeri Muhtar, Staff Officer-CDC, Provincial Health Service, N.T.T.

September 17, 1987

1. Mr. H.Y. Sale, BSc., Chief-Administration, Provincial Health Service, N.T.T.
2. Mr. Damruddin Toda, Assistant-Administration, Provincial Health Service, N.T.T.
3. Mr. Dodo Ermaya, Assistant-Supplies and Services, Provincial Health Service, N.T.T.
4. Dr. Husein, Chief-Kabupaten Health Service, Kabupaten Kupang
5. Mr. J.J. Balle, Wasor Malaria, Kabupaten Health Service, Kupang
6. Mr. Binu, Wasor Malaria, Kabupaten Health Service, Soe
7. Mr. Paulus Banu, Chief of Operation, Kabupaten Health Service, Soe

September 18, 1987

1. Dr. Rihi Herewila, Chief-Kabupaten Health Service, Kabupaten T.T.U.
2. Mr. B. Solokada, B.A., Chief-Administration, Kabupaten Health Service, Kefa
3. Mr. Fras Palla, Wasor Malaria, Kabupaten Health Service, Kefa

ANNEX 7 cont.

4. Mr. Demi Netsal, Assistant to Wasor Malaria, Kabupaten Health Service, Kefa
5. Mr. Simon Tabati, Chief-Operation, Kabupaten Health Service, Kefa
6. Mr. Paulus Tabati, Assistant-Operation, Kabupaten Health Service, Kefa

September 19, 1987

1. Dr. Feliciannus P.P., Chief-Kabupaten Health Office, Kabupaten Belu
2. Dra. Niken T.W.K., Chief-CDC Section, Kabupaten Health Office, Kabupaten Belu
3. Mr. Balthasor Klau, Chief-CDC Section, Kabupaten Health Service, Atambua
4. Mr. Alfons Nahak, Wasor Malaria, Kabupaten Health Service, Atambua
5. Mr. Emanuel Ati, Chief-Operation, Kabupaten Health Service, Atambua
6. Mr. Melki Paru, Microscopist, Kabupaten Health Service, Atambua

September 20, 1987

1. Dr. Sumengen, Dr. Ph., Senior Research Officer, NIHR and D, MOH, Jakarta

September 21, 1987

1. Mr. S. Pirhadi, Representative, Provincial Service-Agriculture, N.T.T.
2. Mr. P. Sandale, Representative, Provincial Service-Public Works, N.T.T.
3. Mr. H.J. Samoy, Representative, Provincial Service-Statistics, N.T.T.
4. Mrs. Betty Khuana, Representative, Provincial Service-Veterinary Development, N.T.T.
5. Mrs. Evy Linfeto, Representative, Provincial Service-Community Development, N.T.T.
6. Dr. Surjadi Gunawan, MPH, Secretary to Director General, NIHR and D, MOH, Jakarta

ANNEX 7 cont.

September 23, 1987

1. Dr. Arwati Soepanto, Director-VBDC, DG-CDC and EH, MOH, Jakarta
2. Dr. P.R. Arbani, Chief-Malaria, Sub-Directorate, Dit. VBDC, Jakarta
3. Dr. N. Kumara Rai, Secretary to Director General, CDC and EH, MOH, Jakarta

September 25, 1987

1. Dr. S.L. Leimena, MPH, Director General, CDC and EH, MOH, Jakarta
2. Mr. Soeroto Atmosoedjono, US-NAMRU II, Jakarta

September 28, 1987

1. Ms. Joy Riggs Perla, Health Officer, USAID/Jakarta
2. Ms. Kathleen McDonald, health Officer, USAID/Jakarta
3. Dr. Steven Solter, Consultant, USAID/Jakarta
4. Dr. Zeil Rosenberg, Medical Epidemiologist, USAID/Jakarta