MID - TERM EVALUATION

of the

PROJECT LOAN AND GRANT AGREEMENT

between

THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

and

THE UNITED STATES OF AMERICA

for

MALARIA CONTROL

APRIL 1986

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BASIC PROJECT IDENTIFICATION DATA

1. Country : Sri Lanka

2. Project Title : Malaria Control

3. Project Number : 383-0043 (Loan and Grant)

4. Project Dates :

   a) First Project Agreement : February 28, 1978

   b) Last Project Amendment : December 28, 1984

   c) Final Obligation : FY 1985

   d) Project Activity Completion Date (PACD): October 31, 1987

5. Project Funding:

   a) AID Bilateral Funding (Loan): $25.5 million

      (Grant): $ 3.0 million

   b) Other Major Donors: England, Japan, The Netherlands, WHO

   c) Host Country Counterpart Funds: 13.7 million

6. Mode of Implementation: Grant and Loan Agreements with the Government of Sri Lanka

7. Project Design: The Government of Sri Lanka
   USAID/Colombo

8. Responsible Mission Officials:

   a) Mission Director: Sara Jane Littlefield, 1978-1984
      Frank D. Correl, 1984 - Present

   b) Project Officer: B. Eilene Oldwine

9. Previous Evaluations: Multi-Donor Review - June 1985

EXECUTIVE SUMMARY

Mission and Purpose: A Mid-term Evaluation Team was requested by USAID/Colombo and selected by VBCP/MSCI/Washington to review progress and direction of the Project Loan and Grant Agreement between Sri Lanka and the United States of America (as amended for 1984-7). Its purpose was to review progress and make recommendations for direction and activities for the remaining length of the project.

Team Approach: The evaluation occurred from March 10 through April 4, 1986. The first week was spent visiting representatives of the Ministry of Health, administrators and scientists of the AMC, WHO, and ISTI, and reviewing documents relevant to the Project. The second and third weeks were spent in 8 AMC Regions, including System H of the Mahaweli Development Scheme, reviewing current operations and data with visits to volunteer operations and health service institutions. The final week was spent reviewing information with AMC members, preparing documentation, debriefing and report preparation.

Conclusions and Recommendations: The results of the teams' review are given in the body of the report with particular emphasis on the following areas: (1) commodities, (2) surveillance systems and epidemiology, (3) vector biology and control programs, (4) training and manpower development, (5) health education, (6) programming, planning and management, and (7) suggested activities for the length of the project.

The major recommendations and conclusions are as follows:

The major objective of the current USAID project as amended is to develop an integrated malaria control program on the basis of existing technology by adding vector control methods, health services, and volunteer programs. Excellent progress has been made in training personnel at headquarters and regional levels toward the primary objective. Training has included both external and internal training and the effort is on schedule.

There is still a dependence on malathion residual house spraying and chloroquine drug treatments as the main tools in the anti-malaria campaign. The graph in Appendix H. illustrates the correlation between insecticide usage and reduction of cases detected. When insecticide usage decreased (or DDT resistance occurred), the number of cases increased and conversely when insecticide usage increased, the number of cases decreased. Although the two chemical interventions are still potent, currently the number of cases continues above an acceptable level as defined by the project, and there is concern about long-term sustainability.

A loss of mosquito susceptibility to malathion has been demonstrated, but this insecticide is still operationally useful. Chloroquine-resistant Plasmodium falciparum has also been detected. The

potential for insecticide resistance in the near future coupled with increasing human resistance to house spraying resulting in reduced coverage confirm the importance of the Project's objective to develop an integrated control program.

The team found excellent progress in training, limited progress in the development of additional vector control methods, and progress in intersectoral coordination of anti-malaria measures.

The team's primary recommendation is the planning and operational implementation of a Regional trial and demonstration of the integrated malaria control program. At present an overall plan for such a project does not exist. The development of such a plan is a major priority.

The team feels that the time allotted to make the transition from the conventional malaria methodology to the integrated system was under-estimated. The team agrees that the long-term technical assistance as designed under the Project remains appropriate. Assistance for final planning and initial implementation for the demonstration can be accomplished with short-term consultants (already provided for under the contract). Ideal timing would be October-November, 1986.

Specific recommendations in specific areas are included under projected needs in each section of the report.

The team recommends the following actions:

(1) The selection of a Region to serve as the area for trial and demonstration.

(2) The development of a plan and modification of staff duties at the Regional level to accomplish this project.

(3) The detail of the Regional Malaria Officer (RMO) in the selected Region to a fully operational mosquito control district in the U.S. for 2-3 months of direct experience in entomological surveillance and control with the return of the U.S. counterpart to Sri Lanka for another 2-3 months.

(4) Modifications in current surveillance system to allow directing the integrated approach and more rapid diagnosis.

(5) Further development of computerization of AMC at the Headquarters and in the Region which is selected as the demonstration area.

(6) Development of a standardized, routine entomological surveillance system to be used in conjunction with epidemiological surveillance at the Regional level.

(7) Project extension with existing resources to provide for system planning and RMO work experience followed by one year to organize and modify the Regional program and accumulate, integrate, and analyze epidemiological and surveillance data over an entire season. The second year of extension would provide for testing and demonstration of the integrated malaria control approach.

(8) If items 1, 2, and 3 have not been accomplished by the end of calendar year 1986, the team recommends that the extension of the Project be reconsidered.

Note: Recommendations #'s 1, 2, 4 and 6 should be primarily the responsibility of the AMC; #3 the responsibility of ISTI; #'s 5 and 7 the responsibility of AMC with assistance of ISTI and USAID #8 the responsibility of USAID.

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I. Introduction:

A. Purpose and Scope of the Mid-term Evaluation Team:

A Mid-term Evaluation Team (MET) was selected by the Vector Biology and Control Project (VBCP) of Medical Services Consultants Inc. (MSCI) at the request of USAID Mission, Sri Lanka. The purpose of the team was to review the progress of A.I.D. support to the Anti-Malaria Campaign (AMC) of Sri Lanka, assess its impact on that program and suggest changes in emphasis or directions, if warranted. The mid-term evaluation involves an analysis of the program as documented in Amendment Number Four to Project Loan Agreement between the Democratic Socialist Republic of Sri Lanka and the Unites States of America for Malaria Control (April 30, 1984). More specifically the team was requested to provide a summary of the AMC along with problems that have impeded progress during this period in light of USAID technical, operational and commodities support. The review focused on the following aspects:

1. Status of malaria with epidemiological summary;

2. Commodities supplied under the loan agreement and activities supported through technical assistance.

These technical assistance activities included:

1. Surveillance;
2. Drug treatment;
3. Vector Biology and Control programs;
4. Training and Manpower Development;
5. Health Education and Community Participation;
6. Planning, Management and Evaluation.

The plan was to summarize the current status and constraints and indicate needs and changes of emphasis or direction. A series of appendices is included to provide background material for the report.

B. Itinerary:

During the first week the team met representatives of the Ministry of Health, and administrators and scientists from USAID, ISTI, WHO and the AMC. The second and third weeks were spent visiting eight AMC Regions as well as System 'H' of the Accelerated Development Mahaweli Program. Among the AMC persons met during the Regional visits were the RMO's, both medical and malaria, the Public Health Inspectors AMC and VU, the officers-in-charge of Sub-Regional Offices, Entomological Assistants of the Regional Entomology Team, Field Assistants who were blood filming agents in institutions as well as those who belonged to Walking Units, Malaria Control

Supervisors and Spray Machine Operators. The team also met persons outside the AMC; these were the Community Development Officer, System 'H' of the Mahaweli Development Program, the Healthworks Operation Engineer of the Mahaweli Authority at Polgolla and the Personnel Manager and Nurse-in-Charge, Health Center of the Pelwatte Sugar Company. The details of the itinerary are given in Appendix B.

C. Background:

For a better understanding of the intersectoral relationships involved in the malaria program Appendix A is included on health care in Sri Lanka.

D. HISTORY OF THE AID MALARIA PROJECT

Anti-malaria activities have been carried out in Sri Lanka since the early 1920s. Since the 1950s there has been a continuous Government of Sri Lanka (GSL) effort that began as a malaria eradication campaign and continues today as the Anti-Malaria Campaign (AMC).

In 1978, AID initiated the Sri Lanka Malaria Control Project, a loan agreement with the GSL to be executed by the Ministry of Health through the Anti-Malaria Campaign. The loan was $12.0 million. Amendment I increased the loan to $16 million.

At the time, Sri Lanka had experienced a large upsurge in malaria incidence. This was due to a breakdown in surveillance and other routine anti-malaria operations, recurrent climatic factors that periodically favor transmission, an extraordinary population movement due to gem mining, and the emergence of DDT resistance in the principal vector mosquito.

The project was defined as "a large-scale five-year effort to reduce the incidence of malaria in Sri Lanka to a minimum of one case per 1000 population per year country wide." The program was divided into three phases:

(1) intensive spraying
(2) selective spraying with surveillance
(3) surveillance with phased integration into the General Health Services

Seven program components were identified:

1. Spraying the vector resting places of rural homes including out houses with residual insecticide to interrupt malaria transmission.
2. Continuous surveillance of the population at risk to malaria to detect cases of the disease.
3. Treatment of cases detected using anti-malarial drugs.
4. Training and supervision to insure modern, effective and safe malaria control techniques are implemented.
5. Research, both basic and applied, to provide epidemiological and entomological knowledge on malaria in Sri Lanka, and
6. Health education to familiarize the general public of the causes, methods of prevention and activities of the malaria control program.
7. Evaluation of program effectiveness through monthly country wide reviews and annual evaluations.

It was hoped to replicate earlier anti-malaria intervention based on residual DDT domiciliary spraying that had brought malaria incidence to near-eradication in the 1960s, using Attack,

Consolidation, and Maintenance phases of a malaria eradication campaign. But it was also hoped that this time implementation of Consolidation and Maintenance phases would occur, whereas earlier they had not. In retrospect, this ambitious scenario ignored several important constraints:

1. The initiative, momentum, staff morale, and public acceptance necessary for an intensive domiciliary spray program were not sustainable.
2. Malathion had to be substituted for DDT, which had been the ideal insecticide for a residual spraying campaign due to cost, effectiveness, safety, and odor.
3. The loss of government support for anti-malaria surveillance and follow-up that occurred during the 1960s, when malaria incidence greatly diminished, was not clearly programmed for improvement after the planned intensive spray campaign of 1977-1981.
4. Statements of AMC needs and covenants with regard to surveillance, evaluation, research, training, and health education were made, but mechanisms to implement these changes were not described or funded. The loan only funded the first component of the seven listed above.

The Plan of Operations for the 1977-1981 period was described as "technically sound" but was considered "operationally optimistic" (USAID, 1977, p.15). The objective of reduction of malaria cases to one case per 1000 population projected to 14,000 cases in 1981. Actual recorded incidence in 1981 was 47,383 cases and 38,000 in 1982, but has since increased to 127,000 in 1985. Another interesting observation was that malaria incidence had fallen from 400,777 cases in 1975 to 262,460 cases in 1977 before the Project began.

The Project proposed "intensive use of malathion during the initial phase of the program (4 to 5 years) to obtain maximum effect before resistance develops," and also stated, "the primary reason for a large scale and intensive malaria control program in Sri Lanka is to control malaria before this vector [An. culicifacies] develops resistance to malathion" (USAID, 1977, p. 17). It was proposed to "use up" malathion, just as DDT had been previously lost as an intervention measure. In spite of this, the Project Description states on p.28, that spraying will continue to be important during the latter stages of the project. Although interruption of transmission was anticipated, the record of 1968-1972 when DDT was used intensively to attack that epidemic clearly showed that loss of insecticide susceptibility coupled with changing sociological and climatic conditions made this outcome unlikely, especially when malathion resistance was anticipated.

Several features of the AMC since 1977 were mandated in the Project Paper:

+ WHO advisors attached to AMC.
+ Plan of Operations to be prepared in cooperation with WHO.
+ Annual evaluations by independent assessment teams.

AMENDMENT 1

In 1979, Amendment 1 to the Project Paper added a third tranche of $4.0 million to the loan amount. The project description was modified by deleting reference to completion within five years. An eighth component was added to the previous seven, calling for specific anti-malaria services in new develcpment and settlement schemes in the Dry Zone (including the Mahaweli Program) over the period 1980-1984. This was the purpose and the justification for extension of the Project.
Specific anti-malaria activities for these new areas were:
(1) Indoor spraying of sprayable structures with malathion.
(2) Treatment of all malaria cases at all medical institutions and voluntary treatment centres.
(3) Regular administration of prophylactic treatment to all GSL personnel in the Mahaweli Project.
(4) Source reduction of mosquito breeding sites.
(5) Larviciding with Abate.
(6) Health education to all personnel in the area
(7) Assessment and monitoring of malaria incidence and the impact of control measures in the project area.

Breakdown of Project Assistance (as of 1979):

	First Tranche	Second Tranche	Third Tranche	Total to date
Insecticide	$4,970,000	$7,000,000	$3,360,000	$15,330,000
Training	30,000		66,000	96,000
Drugs			335,000	335,000
Operational Equipment			39,000	39,000
Local cost support			200,000	200,000
Totals	$5,000,000	$7,000,000	$4,000,000	$16,000,000

Amendment 2

In 1983, Project Paper Supplement Amendment Number 2 was issued. This changed the objectives and the tactics of the AID Malaria Project. Controlling the incidence of malaria remained, but institutionalization of an effective malaria control system was added. This Amendment recognized that malathion residual spraying was not sustainable and attempted to cutback USAID's role as commodity supplier by recommending an additional loan tranche of $10,000,000 for malathion, but with successive cutbacks to 0% in 1987 of the annual proportion of malathion to be supplied by USAID.

A $4,000,000 grant was included to fund technical assistance, training, operational research, pilot projects, planning, management, information, education, regional laboratory equipment, and evaluation with PACD extension of three years until October 31, 1987.

Under institutionalization of an effective malaria control system, three objectives were established:

(a) to improve the effectiveness of insecticide spray operations
(b) to institutionalize effective surveillance
(c) to introduce alternative malaria control activities which minimize the need for house spraying with insecticides

At EOP it is now intended to have a national API of 2 cases per 1000 population (approximately 32,000 cases), and no health region greater than 5 cases per 1000. The contrast of objectives (a) and (c) above is matched by the contrast in the Project loan and grant which are an additional $10,000,000 for malathion residual spraying and $4,000,000 for measures to replace residual insecticiding.

Amendment Four consolidated all agreements and understandings between USAID and the GSL, and Amendment Five detailed the contract for technical assistance which was awarded to International Science and Technology, Inc. (ISTI).

Subsequent sections of this report deal with specific objectives of the Project (loan and grant/contract).

II. USAID Project Impact on the GSL/AMC Malaria Control Effort:

A. Commodities Supplied Under the Loan Agreements:

1. History of the Project Agreement:

The USAID Project was initiated and signed into agreement in 1978. The agreement was subsequently amended for increases in the level of loan assistance by Amendment 1 (August 30, 1979), additional loan funding and the creation for grant funding for a technical assistance component by Amendment 2 (August 26, 1983) and a further extension of the loan ceiling in Amendment 3 (September 29, 1983). Amendment 4 (April 30, 1984) consolidated all conditions of the previous amendments and provided for increases in both the loan ceiling and the Technical Assistance Grant funding. Amendment 5 (December 28, 1984) provided for the implementation in support of the provisions detailed in Amendment 4.

2. Impact of the Commodities on Malaria in Sri Lanka:

Measure of the impact of commodities support (malathion) is summarized on Graph 1 Appendix H. The malathion provided under the first agreement arrived in-country in July 1978 during a time of recovery from an epidemic which began in 1973. Supplies of malathion under the agreement continued routinely through the next 8 years. A fire resulted in the interruption of supplies in 1985. The resulting effect on the program was the withholding of spraying in many of the most malarious area of the country.

Graph 1 (Appendix H) shows the total positive malaria cases from 1962 to 1985 against insecticide usage. DDT was applied during the period 1962 to 1976,

discontinuation of the use of DDT was due to detection of DDT resistance at levels sufficiently high to preclude its further use in the program. Malathion was introduced in 1970 and was the principle insecticide applied from 1970 to 1985.

3. Constraints Associated with the USAID Commodities Input:

The major constraint seen in the commodities input of the Project appears to have been due to a monitory crisis in the GSL finances. The AMC had fulfilled its part in the agreement by providing the required list of commodity needs to the USAID in more than ample time to initiate the purchasing procedure.

Some loss of susceptibility to malathion in certain areas has been shown by susceptibility testing; however, malathion is still effective for program use. The potential for the development of malathion resistance is a major concern.

4. Current Status:

As shown in Graph 1 (Appendix H) the past use of residual house spraying (either DDT before resistance or malathion more recently) is correlated with a reduction in the number of cases. A reduction in the use of insecticide (or resistance to the insecticide in use) is likewise associated with an increase in the number of cases. The switch to a "stratified" residual spraying begun in 1982 appears to have led to an increase in the number of cases and the abandonment of this approach for further use.

5. Projected Needs and Recommendations:

The dependence on the use of residual house spraying as the only method of vector control has been recognized and the development of additional methods of vector control set as a projected goal by amendment number four to the project in 1984. The potential of resistance to malathion and other replacements for malathion as well as the increasing refusals or closures of houses to spraying as documented in the LMRB Study dictates the development of integrated approach to malaria control. Additional vector control methods should be coupled with both epidemiological and entomological surveillance systems, drug treatments, training and health services. Such an integrated system is possible in Sri Lanka. However, the system has to be developed for each area on the basis of existing conditions. A regional test of the new approach with a concurrent demonstration is needed as soon as possible.

B. Activities Supported Through Technical Assistance

1. Surveillance System

a. Objectives and Status

The primary objective was the establishment of an effective and continuous epidemiological, parasitological, and entomological surveillance system with four main aims:
1) provide information required for directing insecticide spraying operations promptly and accurately;
2) provide information required for an effective drug treatment program;
3) monitor the impact of alternative control measures such as vector control;
4) provide current epidemiological status of malaria in the country.

Entomological surveillance is carried out by the Entomological branch of the AMC. The various activities are in support of residual house spraying, such as testing vector susceptibility to insecticides, longevity of the sprayed insecticide effectiveness, and vector densities relative to spraying. The system provides some follow-up for lack of response to residual spraying, primarily due to low or poor coverage.

Alternative vector control measures are not in routine use, so their impact cannot be measured. There is recognition of the need to institute such measures, but implementation is lagging.

Parasitological surveillance is being carried out on drug susceptibility of P. falciparum following the confirmation of chloroquine-resistance in 1984. A drug trial comparing the effectiveness of standard 5-day vs 3-day vs 1-day chloroquine chemotherapy is underway.

[In Sri Lanka, a distinction is made between Passive Case Detection, i.e. blood films collected at medical institutions by non-AMC staff, and Activated Passive Case Detection, i.e. blood films collected at medical institutions by AMC staff posted there.]

Epidemiological surveillance is dependent on passive case detection, i.e. ill people seeking medical attention at a health institution. Blood films are collected from a variety of sources, but the primary source of data on malaria incidence and prevalence is the diagnosis of blood films collected in medical institutions through PCD and APCD. This system does not detect all cases of malaria, but

there is evidence to indicate that at the very least the current detection system is an indicator of malaria incidence (e.g., seasonal peaks) and at the best it is detecting the majority of malaria cases in Sri Lanka (q.v., Lanka Marketing Research Bureau, 1985).

There is a 1-6 week delay between blood film collection and receipt of the diagnosis by field staff. There is also a significant time-delay before the aggregated data become available for epidemiological analysis and action. For example, in mid-March 1986, epidemiological statistics were available for December 1985, but not January 1986.

Although the Regional Laboratories aim for a two-day turnaround in receipt of blood films and dispatch of results, time delays in the current system of blood film collection and diagnosis occur when all blood films are sent by post to one of the nine Regional Laboratories for diagnosis and when results are posted back to the blood film agent. There is no immediate diagnosis of blood films at any medical institution.

In theory, this time delay does not affect treatment. Almost every person blood-filmed is given radical treatment (in Sri Lanka: 3-day chloroquine cum 5-day primaquine). This is a strategy recommended by previous assessment teams to ensure treatment of all malaria patients. Retrospectively, however, less than 20% of all radical treatments are given to blood-film positive patients. This means that the Sri Lanka AMC has a de facto chemoprophylaxis strategy in effect, in that most of the chloroquine distributed is given to non-malarious patients.

The problems that arise from delayed blood film diagnosis include:

+ Chloroquine (and primaquine) is prescribed on a massive scale. With less than 20% of all radically treated patients blood film positive, there seems to be uneconomic use of a uniquely valuable antimalarial. There is no substitute to match chloroquine's advantages.

  This wide-scale and liberal use of chloroquine seriously confounds accurate assessment of malaria prevalence and incidence.

+ Delay in recognition of increased incidence leads to a lack of any timely epidemic response.

+ Lack of prompt diagnosis leads to a lack of urgency in the treatment and follow-up of malaria cases. Especially in the case of P. falciparum infection, the delay in

diagnosis results in patients not targeted for close supervision to ensure completion of radical treatment.

b. Impact, Accomplishments, and Constraints

A preliminary data management study was conducted in October 1985, to determine computer hardware and software needs. This consultant will follow-up in 1986 with purchase and installation of one IBM-AT and software at the AMC HQ.

One Headquarter staff has followed a basic malariology course in 1985. In 1986, two senior staff and one RMO will receive biostatistics and epidemiology training in the U.S., with plans for further staff in 1987.

The epidemiological and entomologic surveillance systems accumulate a tremendous amount of valuable data, but the data management capability still needs to be developed. The team was informed that large amounts of entomological data have been collected over space and time, but never analyzed due to time and staff constraints. Epidemiological data likewise accumulates in abundance. Although a valiant effort is made to analyze it, due to the time delays and the sheer volume of data, there is not now prompt and accurate responses made. Furthermore, the lack of alternate anti-malaria interventions, makes such analysis an academic exercise at present. In other words, improved surveillance and development of alternative control methods must feed each other.

c. Projected Needs

1. Computerization and Management Information System: The first step towards a management information system is expected in 1986 with the purchase of one IBM-AT computer and software for word processing, spreadsheet analysis, data base management, and statistical analysis. If the AMC is to become a responsive, flexible malaria control program based on vector control, timely data must be available for analysis in the field, as well as at Headquarters. This means additional computers at Headquarters and in the Regional Offices, programmed for simple input of data and semi-automatic analysis, as well as easy preparation of routine reporting. If the AMC staff match their current enthusiasm for computer use by actual causing backlogs of work on the first microcomputer, then in very short order, additional computers should be obtained for administrative staff, epidemiological staff, entomological staff, inventory and logistics.

System analysis and ordinary training will be needed from short-term consultants, to get the MIS started and to get people up to speed on using the computers. Some follow-up for modifications will probably be needed.

The IBM-AT is an excellent computer, both appropriate and necessary for use at AMC/HQ. Further computer acquisitions need not all be of that standard and cost. One alternative is the Toshiba T1100 Personal Computer. This computer is described in Appendix L. and any equivalent model with all its features could also be considered.

With a reporting system begun at HQ-level, every effort should be made to get the primary data collection (epidemiological data collected at blood filming and blood film diagnosis; vector control statistics; entomologic monitoring) onto computer storage without the continual recopying from one paper form to another. This will reduce time-delays, reduce errors, reduce drudgery, permit wide-ranging data analysis.

An ideal system would see the biodata and other particulars of all blood-filmed patients logged into a computer, instead of paper forms. All subsequent reports would be abstracted and copied to computer disk, with printing on paper as necessary, by pre-programmed computer, for dispatch to higher levels. This should be a target to test for feasibility in the first operational demonstration of integrated malaria control.

Through operational research and the demonstration project, an epidemic warning system should be programmed using relevant predictors, such as rainfall, raindays, river levels, entomological monitoring, and/or epidemiological data. This would provide analytical evidence for a malaria control strategy of rational application of targeted interventions, as and when appropriate. A short-term consultant will probably be needed to help develop such a computer model.

2. Diagnosis of Blood Films: The AMC currently has 9 Regional Malaria Laboratories at which virtually all malaria blood films are diagnosed. Blood films are collected at medical institutions and dispatched to the labs by post. At time of blood filming, a 3-day or 1-day prescription of chloroquine (cum primaquine) is given. While it may not be feasible in all localities, rapid diagnosis at the time of blood filming by a microscopist in the medical institution can have some

+ reduce the overuse/over-prescription of chloroquine by targeting prescription to malaria positive patients (saving cost and reducing selective pressure towards drug-resistance);
+ ensure immediate species-targeted prescription and follow-up of P. falciparum infections
+ provide immediate feedback to the institutions and the blood film agents, in terms of blood-filming technique, relevance of careful treatment, and in aid of recognizing treatment failures and other epidemiological anomalies;
+ reduce the delay between blood film collection and epidemiological report to the surveillance and case investigation staff, permitting timely intervention to prevent further transmission;
+ eliminate the physical transport of over 1 million glass slides to and from laboratory, reducing loss and breakage, and perhaps cost.

3. Entomological Sampling and Surveillance: Entomological sampling and surveillance requires broad coverage in space and time. The resources of the AMC Entomological section cannot be expected to do everything. The AMC has already trained and supplied malaria treatment volunteers in many rural localities. A similar scheme could identify and train volunteers as entomological monitors to do routine sampling over time and space in their localities. Reports and samples could be regularly collected by AMC supervisory staff.

4. Research Assistants and Associates: A great deal of the needed research for anti-malaria work is entomological fieldwork of a laborious and somewhat routine nature. A source of researchers that need not be slotted or hired to the AMC are undergraduate students who are required to complete a research thesis. There may also be post-graduate students needing a research topic. These people could be recruited to do research on a topic of interest/need to the AMC, and provided with nominal support (e.g., materials, equipment, small expenses).

   Topics of particular merit and suitability would include:
   + survey of all anophelines in a locality
   + incrimination of vectors in a locality
   + complete inventory of vector breeding habits in a locality
   + vector bionomics in a locality and vectorial capacity

By arranging to collaborate with undergraduate or post-graduate students in entomology or related disciplines from Sri Lankan universities, who are required to complete a research thesis, the AMC could obtain valuable field research data while the student could complete his/her graduation requirement in a useful way.

2. Drug Treatment

a. Objectives and Status

The primary objective was the establishment of an effective presumptive, prophylactic, and radical drug treatment system responding accurately to surveillance data. Blood films were to be collected at all malaria drug distribution points. Full dosage requirements were to be met. Also G-6PD deficiency was to be studied.

The program has a standard circular regarding presumptive, prophylactic, and radical drug treatment. In order to ensure radical treatment to all malaria cases within 14 days after blood sampling, treatment is given to all suspected malaria patients at time of blood-filming, regardless of parasitological status. ABER at EOP is supposed to be 10%; in 1985, ABER was 7.2%. Some G-6PD deficiency studies have been carried out.

b. Impact, Accomplishments, and Constraints

A drug regime trial under ISTI funding is underway in Puttalam to test alternative treatment schedules with chloroquine. This indicates satisfactory response with a 3-day regime, as opposed to the previous 5-day regime.

The AMC Parasitologist has completed a training course in Bangkok on in vitro techniques of cultivation and susceptibility testing and immunologic techniques with P. falciparum. This should strengthen AMC capabilities in investigating chloroquine-resistant P. falciparum.

AMC policy is to radically treat all suspected malaria patients from whom a blood film is collected, since diagnosis is carried out remote from blood film collection. This strategy evolved from previous assessment recommendations to treat fever cases immediately, rather that waiting for blood film examination results. The result is wide distribution and large consumption of chloroquine (and primaquine). The following table prepared from AMC statistics indicates that less than 20% of all radical treatments prescribed actually go to blood-film positive patients.

Comparison of Total Number of
Radical Treatments, Presumptive Treatments
Blood Films Examined and Positives Detected
1983-1984

1983	ACD	APCD	PCD	OTHER	VTC	TOTAL
Radical Rx	73,472	608,976	6,146	53,808	13,140	755,542
Presumptive Rx	23,917	153,478	1,402	200,209	10,092	389,098
Total Rx given	97,389	762,454	7,548	254,017	23,232	1,144,640
Total BF examined	82,434	787,061	43,097	143,034	0	1,055,626
Total Positives	5,860	108,824	3,637	8,943	0	127,264
Radical Rx Pos.Rate	8.0%	17.9%	59.2%	16.6%	0%	16.8%

Source: Sri Lanka Ministry of Health (1984), Administration Report of the Anti-Malaria Campaign, 1983, Dr. K. Subramaniam, Director, Anti-Malaria Campaign, Ministry of Health-Sri Lanka.

1984	ACD	APCD	PCD	OTHER	VTC	TOTAL
Radical Rx	76,745	799,167	9,790	11,766	4,682	902,150
Presumptive Rx	29,362	115,160	2,676	222,022	8,569	377,789
Total Rx given	106,107	914,327	12,466	233,788	13,251	1,279,939
Total BF examined	52,634	695,837	35,788	74,919	0	859,178
Total Positives	7,034	129,963	2,579	9,894	0	149,470
Radical Rx Pos.Rate	9.1%	16.0%	26.0%	84.0%	0%	16.0%

Source: Sri Lanka Ministry of Health (1985), Administration Report of the Anti-Malaria Campaign, 1984, Dr. K. Subramaniam, Director, Anti-Malaria Campaign, Ministry of Health-Sri Lanka.

The ready availability of chloroquine is certainly an important factor in preventing malaria mortality. This is an important safety feature of the Volunteer Treatment Centres in villages. At the same time, market research indicates that most people with malaria symptoms seek medical attention at a government or other medical institution. Therefore, provision of trained village volunteers dispensing chloroquine is consistent with restriction of chloroquine prescription in medical institutions to those parasitological confirmed, if ready diagnosis of blood films is available.

c. Projected Needs

1. Timely Diagnosis of Blood Films:
[as detailed above under surveillance]

2. Family Health Worker/Midwife: The team observed (in Weelawaya) that a community-improvement action to eliminate vector breeding sites had been organized by the Family Health Worker/Midwife and the AMC-trained malaria volunteers. The team discovered an anomalous situation in that the FHW/Midwife, a very important grass-roots-level health worker, is not permitted to collect blood films nor distribute anti-malarial treatment, while other grass-roots health workers do so. The principle of primary health care workers carrying out anti-malarial therapy after suitable training is a well-established, well-accepted practice throughout the malaria-endemic world. The FHW/Midwife should be brought on board in this respect, since training has already been given.

3. Adequate and Complete Radical Therapy: The team was informed repeatedly that completion of the full radical treatment does not occur, because the prescribed dosage for subsequent days is given to patients in bulk packet for unsupervised self-medication. Two problems arise: the patient misunderstands or forgets the instructions of how many tablets for how many days; the patient, feeling well before completion of the full course, saves the remainder against future attack. (It is also possible the patient did not have malaria, since prescription is made on fever symptoms.) If the drugs are packaged into individual daily dosages, the first problem is alleviated. This can be done with plastic or paper packaging materials. It may also help the second problem by emphasizing that the prescription is not a bulk amount of drug, but rather a linked series to be taken over several days.

3. Vector Biology and Control Programs:

a. Objectives and Status:

The primary objective was the establishment of an effective vector control program supported by a viable, multi-institutional, operational research program monitored through the existing surveillance system. More specifically, the objective was to test the feasibility of reducing vector populations by research projects expanded to pilot studies using alternate methods of vector control resulting in useful methods under Sri Lankan conditions with a vector census system established in each Health Region.

To date progress in the evaluation of alternative vector control methods has been limited to field trials of the use of a mono-molecular film, the application of temephos (ABATE), the application of Bacillus thurengiensis israeliensis (B.t.i.), river flushing and planning for the use of source reduction and fish. The trials represent efficacy testing only. No pilot studies have been conducted, although one consultant has suggested a pilot project for the Accelerated Mahaweli Development Area. The projection of research trials to pilot studies to an effective vector control program is not progressing satisfactorily largely due to the complexity and difficulty of the undertaking, the need to adapt to local conditions in different areas, the lack of a standardized entomological surveillance system, the lack of entomological resources and personnel and misunderstandings on the need for "operational" vs. "applied" research.

b. Impact, Accomplishment and Constraints:

Field evaluation of larvicidal agents (temephos, B.t.i. - to be effective again Anopheles larvae. The effective use of monomolecular films where these larvae breed is yet to be demonstrated under Sri Lankan conditions. River flushing has been effective in large rivers, but its use in irrigation canals has yet to be tried and demonstrated.

One of the major constraints to the addition of alternative vector control methods to the Sri Lankan

malaria control program appears to be a gross underestimation of the time required to bring about the transition from a program utilizing primarily residual house spraying and drug treatment to one in which a variety of vector methods are included. The new methods are more complex and require more entomological input. Progress has been excellent in training individuals in concepts and the use of additional vector control methods. Two individuals from headquarters have been to the U.S.A. for 6 weeks training at South Carolina. Three additional personnel (one an RMO) are scheduled for the same training in April and May of 1986. Regional seminars transmitting the results of this outside training have already been conducted and is continuing in other regions. Entomological teams have been trained in peridomestic clean-up and reduction of breeding sources. However, entomological teams are largely committed to evaluating the effectiveness of the current residual house spraying campaign, e.g. malathion susceptibility, effectiveness of the residual malathion deposit and cattle-baited traping as a source for test and study mosquitoes. Although progress has been made in identifying larval breeding habitats, the distribution and vector potential of other species of anophelines found in Sri Lanka, and the relative density of mosquitoes, there has been no development of a routine, standardized entomological surveillance method which can be added to and integrated with the existing surveillance system for malaria itself at the regional level. Such an entomological surveillance system is needed to provide guidance to the application of new vector methods. On the surface it appears that entomological resources and personnel are inadequate at this time. However, there has been no attempt to develop a plan for redefining the duties of some of the existing personnel, i.e. machine spray operators, field assistants and entomological teams to develop the new approach to malaria control, i.e. additional methods of vector control added to the current residual wall spraying to reduce wall spraying.

c. **Projected Needs**:

Because of the constraint of time in the remaining A.I.D.-supported project, it appears impossible to implement expanded vector control methods country-wide. There is a need to plan for and institute a 'model' program in at least one Health Region to

both test and demonstrate the cost effectiveness of other methods of vector control in replacing or reducing the dependence on residual wall spraying. A plan for such a "model" program is included in Section III, Summary of suggested Activities through the Length of the Project.

4. Training and Manpower Development:

a. Objectives and Status:

Under the ISTI project USAID has provided substantial technical assistance in support of the training of AMC personnel. The objective has been to help the AMC achieve a sustainable capability to continue adequate and appropriate training of AMC staff necessary to meet program objectives after the EOP.

Amendment No.4 to the Project Loan and Grant Agreement, specified that "a training plan will be developed with Project technical assistance to assure that needs are carefully identified, training is properly scheduled, and linkages are established between out-of-country and in-country training...". The project will finance an estimated 60 months of long-term technical assistance in epidemiology and vector control and approximately 26 person months of short-term technical assistance in such field as operational research, information, training, and surveillance/data management... .

The Project provides for training of AMC personnel in the U.S., third countries and Sri Lanka, including:

- an estimated 30-person months of short-term training for senior AMC headquarters and regional staff in such areas as epidemiology, data and information management, communication skills, operational research and alternate control measures.

- an estimated 30 study tours, one month each, for Public Health Inspectors and Entomology Assistants to study other malaria control programs and related institutions in Asia.

The first step in developing a training plan came in September 1984 with the convening of a "Committee on Training Needs." Decisions were made regarding short-term consultation under the ISTI Project to

conduct a training requirements survey. The committee also considered in-country and out-of-country training needs, and agreed on the frequency and nature of various refresher courses for AMC Field Assistants, Public Health Inspectors, Entomology Personnel, Regional Medical and Malaria Officers. Subsequent meetings considered revised curricula needed both in perservice and inservice training.

The long-term technical assistance in epidemiology and vector control has been met. However, only about half of the 30 months provided for short-term consultants had been taken up by mid-term.

1. In-Country Training:

Short-term ISTI consultants have assisted in strengthening training methodology, a priority need identified by AMC, by:

- conducting a training requirements survey; and

- organizing and teaching in-country courses for the training of trainers (TOT).

The training requirements survey was conducted October 6-9, 1984. The survey assessment was used to design an overall training plan for the AMC.

The survey was followed by two courses conducted by ISTI consultants trainers, May 6-31, 1985, and February 12 March 2, 1986.

The first TOT course, conducted primarily for AMC headquarters staff responsible for policy formulation and direction of the operational program, emphasized and theory of training methodology and the steps necessary to put theory into practice.

The second TOT course was conducted primarily for RMO's and Public Health Inspectors (PHI's). This course stressed easy-to-use, field oriented methods for the training of malaria workers responsible for carrying out regional field operations.

Following on the TOT courses, the AMC trainers have conducted two "Integrated Vector Control" courses, November 26-29, 1985, and March 4-7, 1986 attended by 26 PHI's and 17 Malaria Supervisors (MS).

Thus, in the period from October 1984 to March 1986, some 66 AMC staff have participated in the ISTI sponsored in-country training program.

2. Training Abroad:

Training abroad to date - April 1986 - has been provided for 18 key AMC staff. From headquarters the AMC Deputy Director and the Medical Officer/Entomology attended a six-week course in integrated vector control at the University of South Carolina in 1985. The Medical Officer/Epidemiology attended the National Institute of communicable Diseases in India for an eight-week course in basic malariology, and the Medical Officer/Parasitology, had just completed a three-month course of study in India.

Two groups of seven each - PHI's and Entomology Assistants (EA's) - have completed four-week study tours in Thailand and Malaysia. In addition, the second group observed the malaria program in Singapore.

The AMC is in the process of selecting candidates for further study abroad in the U.S. and third world countries. Three senior AMC staff were preparing to leave for the U.S. in April, 1986.

However, due to a late startup and some delay in the selection of qualified candidates, it may not be possible to complete all training by E.O.P., indicating a need to extend the project on condition firm plans to complete training and candidates are identified no later than October 1986. Appendix I lists the U.S., Third Country and Sri Lanka in-country training, sponsored by the ISTI Project. Appendix I also lists short-term consultants, including those assisting in the AMC training program.

b. Impact, Accomplishments and Constraints:

The impact of ISTI supported training has given the AMC a new direction in the application of effective

training methods. The new methods encourage active trainee involvement by using role playing, case studies, the sharing of experiences and problem solving.

The training abroad has provided key staff with the opportunity to share experiences with participants from other countries and to update new strategies being developed world-wide to make the transition from malaria eradication concepts to the more realistic concepts of malaria control.

The major constraint in manpower development and training has been the difficulty the AMC has had in filling vacancies, particularly for regional malaria officers. In 1982 only 9 of the 16 sanctional RMO positions were filled. Under the ISTI Project the AMC was encouraged to recruit science graduates with majors in entomology or related sciences for RMO positions, to take positions formerly held by Medical Officers. Presently all but 2 of the 14 positions have been filled by science graduates. Currently there are 20 sanctioned RMO positions, still with 6 vacancies. Placement in the 6 regions may be difficult due to poor security or the posts are in remote rural regions unattractive to candidates.

A major constraint in conduct of the AMC training program has been the lack of a position for a training officer to assist the MO/MTC. In addition, to heavy demands to design and coordinate training activities at the MTC, a training officer is needed to assist the regions, where most of the refresher, on-the-job training takes place. The constraint can be resolved if the five-year plan of the Health Education Bureau is implemented.(B5)

c. Training Needs:

It is recommended that collaborative arrangements between AMC and the Ministry of Health proceed without delay to assign a full-time health educator/ trainer to the MTC.

It is recommended that each RMO designate one staff person to coordinate training activities in the region, if this has not already been done.

It is recommended that further review and analysis of training needs based on job functions be conducted to assure that personnel whose job

functions are modified or redirected in the transition from malaria eradication to malaria control are given adequate, timely and appropriate training. Refresher training is needed for most job categories, especially for staff responsible for collection and analysis of entomological and surveillance data, computerization and use of data to guide operations, management and logistics, program planning, supervision, and health education/ public relations.

It is recommended the remaining U.S. third-country and in-country training needs be identified as soon as possible. Training funds are available under the ISTI Project for this purpose.

To meet immediate needs, it is recommended the AMC under the ISTI Project proceed to contract locally for the design and production of appropriate training (and health education) materials. Regional as well as headquarters staff should participate in developing the content and in pretesting the materials.

d. Manpower Development - Staffing:

1. Objective:

The objective in manpower development is to assure that the program is staffed with adequate numbers of personnel, properly trained to carry out specific job functions, appropriately deployed at every level of operations, and supervised to assure continuous job performance of acceptable standards. Lines of authority and delegation of responsibility must be clearly defined and understood by all personnel.

2. Status:

Adequate staffing has been a perennial problem for the AMC, not only at headquarters, but especially in the regions. Appendix G lists sanctioned positions, present strength and vacancies.

3. Impact, Accomplishments and Constraint:

Overall, progress in filling sanctioned positions has been commendable. Supplement No.4 listed additional personnel to be provided to the AMC to strengthen AMC management and implementation capabilities.

With the exception of the six vacant RMO positions, most of the vacancies listed in Supplement 4 have

been filled or candidates are undergoing pre-service training. As program direction changes from emphasis on eradication measures to control, frequent review of staff requirements should become routine. Job functions not already detailed in the revision of job descriptions and training curricula should be identified, added and made available in manual or handbook form for distribution to all AMC field staff.

5. Health Education and Community Participation:

a. Objectives and Status:

Objective of health education in the Anti-malaria Campaign is to improve the information/public relations activities of AMC personnel and thereby obtain the best possible participation and cooperation of the public they serve. Through improved personal contact by AMC field workers and by use of other communication channels, such as group meetings and mass media, the goal is to improve public understanding in a way that will result in changes in individual behavior and community response essential if the Anti-Malaria Program is to be successful.

The strategy of an action program for community participation is outlined in Amendment No.2 of the Malaria Project Paper. The Plan of Action notes that "malaria has been and will continue to be a 'problem disease' of the people" and "to combat it, the interested effort and direct involvement of the community in the target areas is essential."

The document emphasizes the need to organize volunteer community vigillance units through the Sub-Regions (SRO). It also suggests that the AMC/SRO "set apart a suitable community-oriented Field Assistant or an experienced.Spray Opeartor to be the convenor of the CVU and liaise with the SRO."

The AMC has long expressed a need for training of malaria personnel in health education methods and the social/public relations aspects of their work. Of equal importance, the AMC has requested help in providing training and health education materials.

The ISTI is responding to these expressed needs. The first step was to provide short-term consultation to recommend ways of determining reasons for lack of public cooperation. In January

1985 a public opinion measurement specialist nelped the AMC establish a format for a public opinion survey. ISTI then contracted locally with the Lanka Market Research Bureau (LMRB) to conduct a survey in selected areas of villagers' knowledge, attitudes and practices (KAP) related to malaria. Survey questions were comprehensive, with special attention to what villagers know about malaria and why they refuse house spraying and fail to complete drug treatment.

Findings of the KAP survey are presently being analyzed for guidance in shaping a health education/ information/public relations strategy.
AMC staff responsibility for health education has been strengthened through the training of personnel in health-education techniques as noted in the section of this report on training. Particularly in the Mahaweli Project and other rural malarious areas, the RMO's and SMO's have been integrating their efforts in gaining better community participation using health workers and village volunteers.

In the team's field visit to System H of the Mahaweli Project, volunteers were observed "in action," working in concert with AMC and Ministry of Health field personnel. While this may have been the best of what is being accomplished in the initial phase of improved integrated services, it demonstrates a potential for what can be achieved through joint planning and community action.

Volunteers are being organized at the village block level at a ratio of 1 volunteer to 10 families. The volunteers are trained by the RMO/PHI's to take blood slides and administer malaria drugs.

b. <u>Impact, Accomplishments and Constraints</u>:

ISTI's support of the Market Research Survey should have a significant impact on the health education program. The AMC is now at a critical stage in regaining public understanding, acceptance and participation in Anti-Malaria Campaign activities. Of equal significance is the assistance provided by ISTI to improve teaching methods in the training of AMC and related health personnel on ways to work more effectively to gain public cooperation.

Progress to date indicates that the ISTI assistance has been "on track." There is evidence of positive

results in the regions. The health education component of the AMC program can advance if the following constraints are removed.

At present there is no staff person at AMC headquarters to assist the MO/MTC in designing and implementing health education/information activities. The health educator previously assigned by the Health Education Bureau, Ministry of Health, was recalled for other duties. Assistance to the AMC by the NEB has been minimal since the health educator was recalled.

Government policy presently precludes the sanction of new positions. However, the problem at AMC may be resolved if a five-year plan designed by the Health Education Bureau is implemented soon. The plan calls for assignment of a trained health educator in each of the five strategic health programs, of which malaria is one. This health educator for AMC headquarters, with technical backstopping from the HEB.

The HEB plan also calls for assignment of 1 to 3 trained health educators in each of the 20 regions of the Ministry of Health. these regional health educators would be responsible for integrating health education/information/community participation activities for the five strategic health services - malaria, filariasis, family planning, sex-related diseases, and maternal and child health. Prerequisite to fielding an effective service for the AMC would be joint planning by MOH and RMO staff.

In field visits, the Team noted the absence of educational materials - posters, leaflets and other visual aids. In one or two places where posters were present, they were at least five years old. Regional staff expressed the need for new materials for both health education and training.

c. <u>Project Needs</u>:

1. It is recommended that the assignment of a full-time health educator at AMC be expedited.

2. To meet immediate needs for posters, leaflets and other educational materials, it is recommended that the AMC request ISTI to contract locally for production of well designed, attractive as well as informational education materials.

3. It is recommended that ISTI provide short-term consultation, either locally or from the U.S., to facilitate use of the market research survey findings.

6. Planning, Management and Evaluation:

a. Current Status:

"There is recognition both within and outside the AMC that continual operational evaluation (assessment) will also be required to ensure the quality and quantity of output from all levels of the organization" (Malaria control, Project Paper Supplement No.2 p.36, August 1983). The Project Paper continues that although such an evaluation was in progress, they were inadequate and should be strengthened; this was to be done by the AMC utilizing its own resources. The activities which were to be monitored and evaluated ranged from checking the efficacy of ACD and PACD, through parasitological and entomological surveillance and insecticiding, to treatment, including compliance. Presently, supervision and monitoring consists of pre-arranged informal visits from the centre/regions to the periphery, where some of the activities are observed and subjective impressions formed and noted. For this purpose the 16 Regions are divided into 3 areas, to each of which a medical officer at the Center is designated for supervision. However, no systematic observations appear to be made. Visits are not made as often as desirable due to inadequate per diem to the supervisors. This also does not appear to be any follow-up and feed back activity, i.e., discussions of the field observations at a staff conference.

b. Projected Needs:

The team suggests that supervision and monitoring be done both at sub-regional, regional and central levels. For instance if spraying operations are to be supervised at the regional and sub-regional levels, the monthly sequence of activities would be:
1. The RMO or PHI/AMC randomly selects:

a) A PHI-VU area;
b) a village or street in the PHI-VU area selected.

2. The RMO/PHI-AMC informs the PHI-VU of the selected village or street the day before the survey is done.

3. The PHI-VU visits 25 consecutive houses in the selected village completing a questionnaire which give information on:

a) the name of the village/street;
b) the number of the house
c) the householder's name and occupation
d) spraying: 1. Last cycle on whether:
complete;
partial;
refusal with reason
house closed.

2. Previous cycle - same information as above.

The validity of the information collected at these surveys should be checked by the RMO/PHI-AMC, who should visit at least two of the houses surveyed, and cross check his own observations with these made by the PHI-VU.

The findings of these monthly Random Surveys should be discussed as a feed back mechanism, at monthly conferences held by the RMO for his staff. They could also be used for supervision by the AMC headquarters supervising personnel who visit the regions for monthly inspections.

c. The AMC and the Ministry of Health:

Senior personnel of the AMC have in the past had regular meetings with the Ministry of Health at "Malaria Conferences." These were held quarterly or even monthly during epidemics of malaria. In the recent past, the conferences have not been held regularly. The team, considering the necessity for a closer relationship between the AMC and the Ministry, recommends that Quarterly Conference be restored and the Director of the AMC be the convenor of the Conference. The holding of similar conferences are recommended both at the Regional (RDHS) and MOH levels. The latter conferences which are held monthly, should be attended by the RMO or his representative.

III. Summary of Suggested Activities through the Length of the Project

Specific aspects of the A.I.D. support to the AMC, Sri Lanka have been outlined above, recommendations for activities throughout the length of the project are summarized below.

The team feels that A.I.D.-support for research under the areas of pilot studies and operational research has progressed too slowly. Differences of opinion on what types of research can be done are evident between members of AMC and ISTI. The team recommends a more liberal approach to support for research activities so that research activities are expanded "applied" research of a longer term nature as well as strictly "operational" research.

The team supports the procurement of the IBM-AT computer and supporting software. Additional computers are recommended for data storage, analysis, retrieval and production of reports. It further recommends the establishment of computer capabilities at the Regional Level with data transmission between regions and headquarters.

With only limited progress in the implementation of pilot studies to demonstrate an integrated malaria control program the team feels that this is the most important area for development and implementation during the length of the project. Training toward this objective is well underway and limited efficacy testing has been undertaken with new control techniques against larval and adult stages.

However, there is no plan for implementing a testing and demonstration project for the integrated approach at this time. The organizational level responsible for the development of such a plan followed by its implementation has not been designated in spite of the fact that one consultant report recommends such a project.

The team feels that it will be necessary to extend the current A.I.D. program for up to 2 years to plan and develop a testing and demonstration project. such a project should be developed in one selected region.

The Malaria Control Region selected for this trial and demonstration project should meet the following requirements. The RMO should be highly capable and able to undertake active development and direction of the project. The Region should have a resident entomological team or a team should be assigned to the region for the length of the project. To accomplish this project within existing resources it will be necessary to bring about some modifications of functions and duties within the region and its personnel. Appendix J outlines a possible structure within the region although the team does not feel that this is necessarily the final form of the organization.

The chart stresses several important features. The development of a routine, standardized entomological

surveillance system with personnel designated. Such surveillance should be conducted in selected sites on a bi-weekly basis and used to direct vector control activities. It should include detection and mapping of larval breeding sites, dipping to determine presence and number of larval as well as standard adult sampling measures such as man biting rates, pyrethrium catch or cattle-baited traps. The chart also stresses the designation of vector control activities for individuals to accomplish various additional methods of vector control.

The team recommends some modifications in the surveillance operations (see section II.B.1) to speed up the positive identification of cases for treatment which could reduce the requirement for drugs by 70 to 80%. In addition, this modification would, when used at the regional level, provide for more immediate identification of focii of transmission. The integration and analysis of both epidemiological and entomological surveillance data into a routine, standardized system at the regional level would

provide the basis for the application of the additional vector control technology and eventually provide cost effectiveness of the new technology. Studies by AMC have suggested that costs for larvicidal treatment could be high. The team suggests this aspect be a part of the regional trial.

To accomplish the regional trial and demonstration the team recommends that the RMO of the selected region be detailed to a Mosquito Control District in the U.S. and teamed with an operational mosquito control entomologist there for 2 to 3 months during the Spring, Summer or Fall. During this period the RMO can work in the U.S. program following surveillance and control practices. The RMO in cooperation with the U.S. counterpart can, at this time, develop a protocol including a general plan, needed personnel resources, equipment and supplies.

It is further suggested that the U.S. counterpart and the RMO return to Sri Lanka with a 2 to 3 month period provided. At this time the protocol can be finalized with AMC and necessary administrative adjustments made. With the support of AMC the trial and demonstration project should begin. It is visualized that the first 8 to 9. months including the former 4-6 month period would be used to arrange for the training period for the RMO and preparation of plan and protocol in Sri Lanka by AMC. The next 12 months would be devoted to developing organizational structures and modification of functions and duties. This period would provide for planning for the needed vector control equipment and supplies as well as

collecting, analyzing mapping and integrating epidemiological and surveillance data. The final 12 months would be used to both test and demonstrate the system.

Health Care in Sri Lanka

The Democratic Socialist Republic of Sri Lanka is an island of 25,322 square miles (about the size of West Virginia) lying near the south-east tip of India in the Bay of Bengal. The estimated population is 15.5 million (1981), of which 72 percent are Sinhalese, 20 percent Tamils and 7 percent Moors. The predominant religion is Buddhism, with Hindu, Christian and Islamic minorities. In spite of a low per capita income of about $250, life expectancy is 64 years, literacy is high (over 80 percent), and infant mortality low (34.4 per thousand live births). Major exports are tea, rubber and coconuts.

Sri Lanka has a rich tradition of health care which goes back to King Pandukabhaya who founded Anuradhapura and built an Ayurvedic Hospital in 453 B.C. In the early sixteenth century, the Portugese introduced "Western" medicine. The Dutch, who arrived early in the seventeenth century, built several hospitals in Sri Lanka and staffed them with physicians and surgeons.

Ayurvedic care was on the decline and Western medicine was establishing itself firmly when the Dutch handed over 'their' territory to the British in 1796. The British civil medical establishment, which was designed to give services mainly to military personnel, was set up as an independent department to serve civilians as well in 1858.

The Ayurvedic system of medicine had by now deteriorated to a disorganized system practised by untrained persons. In 1929, Ayurveda was again recognized by the State, and after achievement of independence in 1948, was developed and encouraged.

Health care in Sri Lanka today is provided by Western and Ayurvedic practitioners, homeopaths, other traditional practitioners and by over-the counter sales of medications by pharmacies.

The Government provides, free, both Western and Ayurvedic care, largely through the Ministry of Health, local authorities, and some cooperative societies. The organization of the Ministry is shown in Figure 1. As seen, the organization consists of three fairly independent components; medical (curative care), public health, and laboratory services. The largest and most expensive of these is the curative care component, which together with the preventive component, is developed through a regional network of health institutions (Figure 2).

Curative services are provided by a network of institutions as follows (the figures in parentheses indicate the number of such facilities):

Visiting Stations, where out-patient care is given by an officer from the closest hospital (1017);

Central Dispensaries, these are the smallest out-patient units in the health care system and are under the care of either Registered or Assistant Medical Practitioners (336);

Maternity Homes, in charge of government-trained midwives, provides in-patients for maternity patients. Each home has around twelve beds. Medical Officers usually conduct family health clinics in these institutions (93);

Central Dispensaries and Maternity Homes, which give a combination of services of out-patient treatment and in-patient treatment for maternity cases. They have around twelve beds and are in charge of Assistant Medical Practitioners (85);

Peripheral Units, in charge of a Medical Officer or an Assistant or Registered Medical Practitioner, is the smallest hospital unit managed by a doctor and provides a general practitioner type of service. They consist of a general ward (male, female and children), a maternity ward and a central dispensary. The bed strength is around twenty five (116);

Rural Hospitals, similar to Peripheral Units in structure, but managed by a Registered Medical Practitioner or by an Assistant Medical Practitioner (2749);

District Hospitals, broadly classified as large or small, depending on whether their bed strength is above 100 or below, provide a general practitioner service, but unlike Peripheral Units, are staffed with qualified nursing personnel and a laboratory. The large district hospital is manned by one Medical Officer who is often called upon to assist in the maternal and child health and school health work in the area (112);

MINISTRY OF HEALTH, SRI LANKA

ORGANISATION CHART

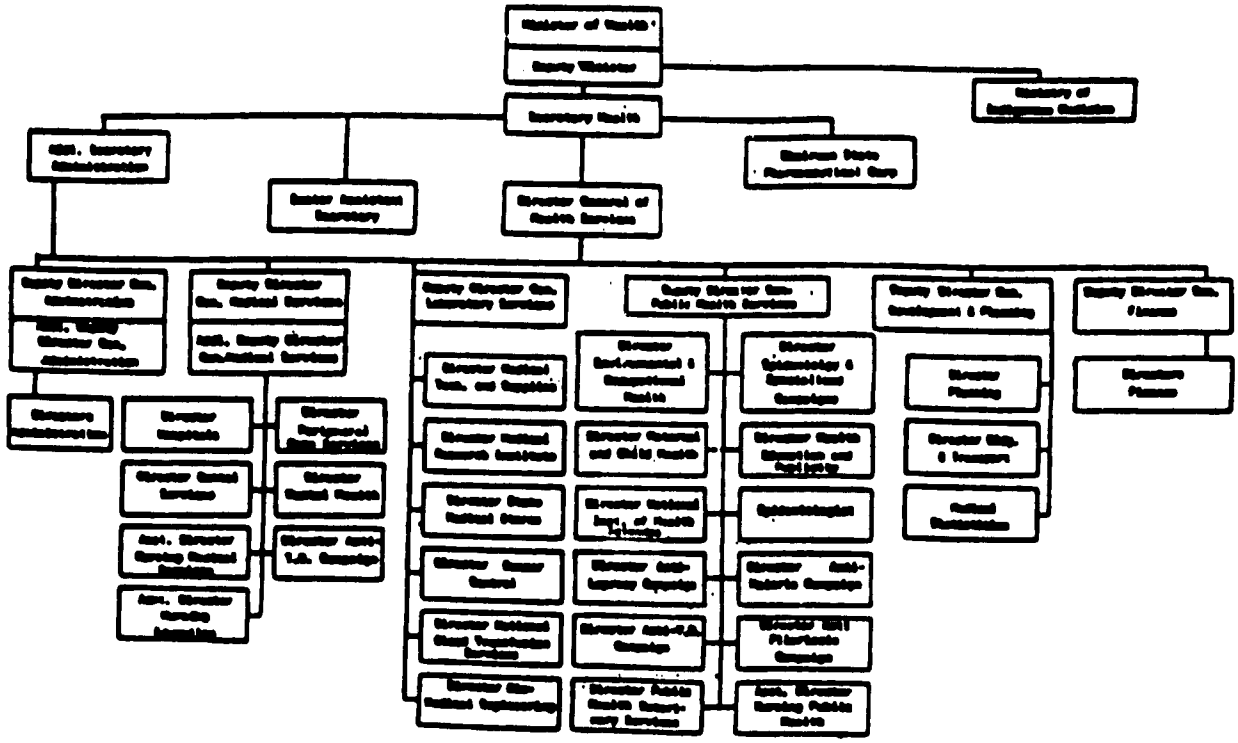


Figure 1

MINISTRY OF HEALTH, SRI LANKA

ORGANISATION OF REGIONAL HEALTH SERVICES

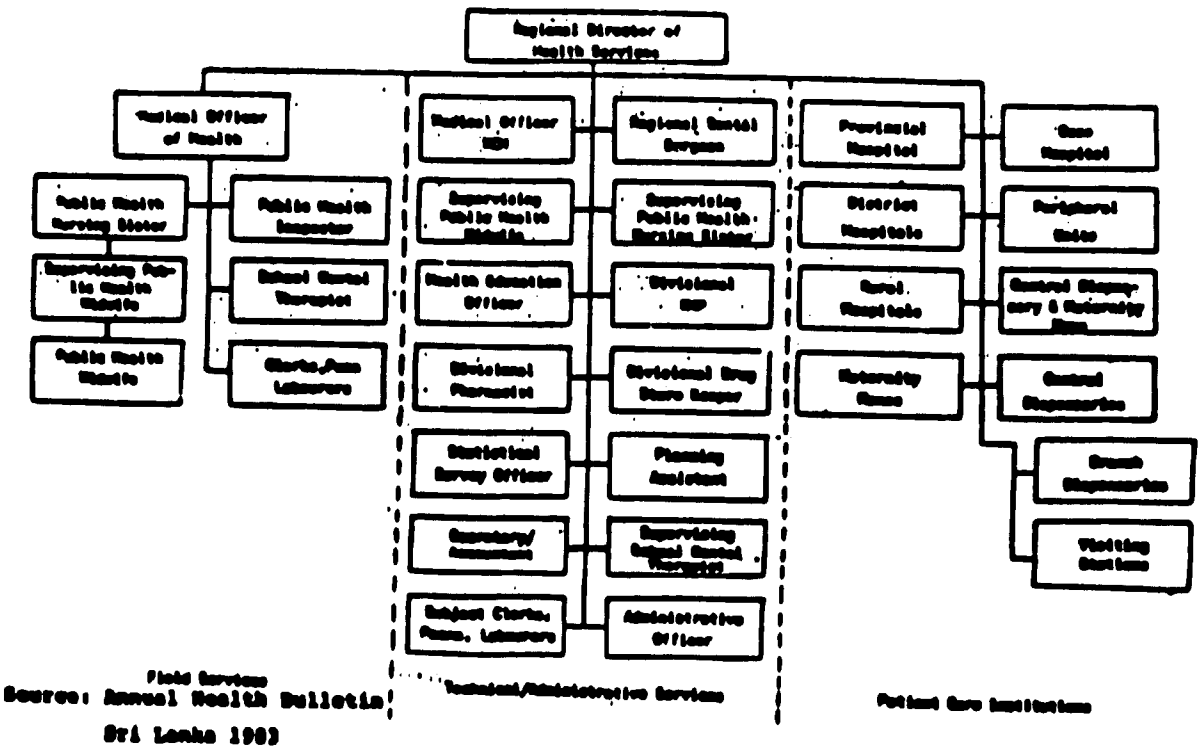


Figure 2

Source: Annual Health Bulletin
Sri Lanka 1983

Base Hospitals, situated in large towns, usually have over 250 beds. They provide the four basic specialist services - medicine, surgery, obstetrics and gynaecology and paediatrics. Some may provide eye and ENT services, a clinical pathology laboratory and X-ray facilities (18);

Provincial Hospitals, an expansion of the base hospitals which provides additional specialist services, including psychiatry. They have a well-equipped laboratory and other ancillary services such as ambulance services (14);

Teaching Hospitals, further developments of the provincial hospitals, providing a wide range of sophisticated curative care and obliged to provide teaching facilities for under-graduate and post-graduate medical students;

Specialized Hospitals, institutions which give special care in paediatrics, obstetrics and gynaecology, tuberculosis, leprosy, mental health, cancer, eye, etc. Adjunct to these hospitals are convalescent homes and rehabilitation centers.

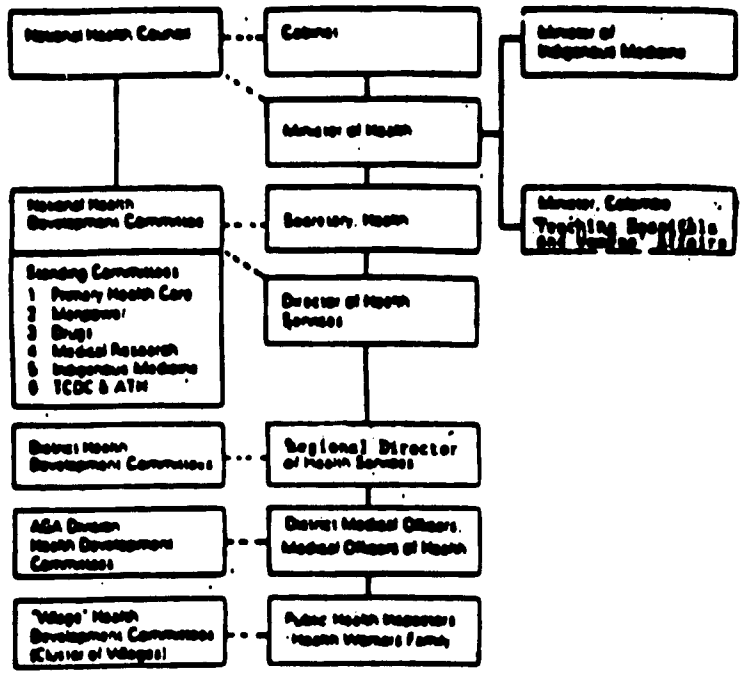
These institutions, providing out-patient and in-patient treatment, are organized regionally, so that each region consists of a central provincial hospital, surrounded by a number of base and district hospitals, and each of the latter in turn serving a number of peripheral units. There is a linkage through referral and an ambulance service between the large provincial and base hospitals and between the district hospitals and peripheral units in each region.

Community Health Services:

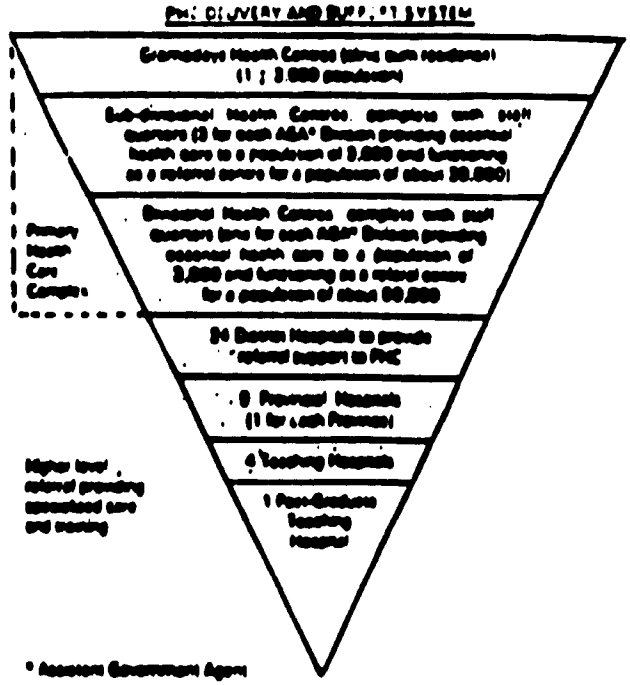
For providing community health services, Sri Lanka is subdivided into 109 Health Units, each in charge of a Medical Officer of Health (MOH). The services given are in the areas of primary and secondary prevention, mainly directed towards the mother and child. The official functions of the Medical Officer of Health include administration, collection of vital statistics, maternal and child health services (with family planning), school health, environmental sanitation, control of communicable diseases and health education. Neither the MOH nor any member of his staff is expected to provide curative care, although the MOH at the clinic and the Public Health Midwife in her home-visits often see mothers and children who have illness they can manage, such as upper respiratory tract infections, gastrointestinal infections, fevers, skin infections, etc. Drugs available to health unit personnel are mainly preventive, such as vitamins and iron tablets.

The MOH's staff consists of Public Health Nurses, Public Health Inspectors, Supervising Public Health Midwives, and Public Health Midwives. When the health unit system was inaugurated in 1926, each unit gave coverage to about 40,000 persons; today, the populations of the units range from 50,000 to over 200,000.

In 1984, of the recurrent and capital expenditure budget for the Ministry of Health, 30.1 percent of the recurrent and 32.0 percent of the capital expenditures were spent on community health services. Of the 30.1 percent of the recurrent expenditure, 27.2 percent was spent on malathion. The AMC uses 44.2 percent of the total Community Health expenditure.



Source: Annual Health Bulletin Sri Lanka 1983



Source: Annual Health Bulletin Sri Lanka 1983

Appendix B.

PERSONS MET DURING ITINERARY
MARCH 10-28, 1986

DATE	PERSON MET	DESIGNATION	PLACE
10 MAR	Ms. Eilene Oldvine	Chief, Health, Population, Human Resources	USAID
	Ms. Paula Bryan	Asst., Health Development Officer	"
	Ms. Anne Dammarell	Acting Program Officer	"
	Mr. William Binns	Project Development and Special Projects Officer	"
	Dr. K. Subramaniam	Director Anti-Malaria Campaign (AMC)	AMC/HQ
	Dr. M. Wickramasinghe	Entomologist, AMC	AMC/HQ
	Dr. M.U.L.P Samarasinghe	Deputy Director, AMC	"
	Dr. P.B.R. Dias	Medical Officer, Training, AMC	AMC/Training Center
11 MAR	Dr. Pushpa R.J. Herath	Sr. Entomologist, AMC	AMC/Entomology Lab
	Dr. Lakshme Telisinghe	Sr. Epidemiologist, AMC	AMC/HQ
	Dr. Chandi Senaratna	Epidemiologist, AMC	"
	Dr. F.A. Wickremasinghe	Chief, ISTI	ISTI Office/AMC
	Mr. John Stivers	Vector Control Specialist, ISTI	"
12 MAR	Dr. Malinga Fernando	Secretery, Ministry of Health	Ministry of Health
	Dr. Mohan Rodrigo	Deputy Director-General, Public Health Services	"
	Mr. R. Subramaniam	Accountant, AMC	AMC/HQ
	Dr. R.E. Han	WHO Malariologist	AMC/HQ
	Mr. G.P. Joshi	WHO Entomologist	
	Mr. Frank Correl	Director, USAID	USAID
	Mr. William P. Schoux	Deputy Director, USAID	"
14 MAR	Ms. R. Ratnapala	Parasitologist, AMC	AMC/HQ
	Mr. D.M. Dharmatilake	Deputy Director, Administration, AMC	AMC/HQ

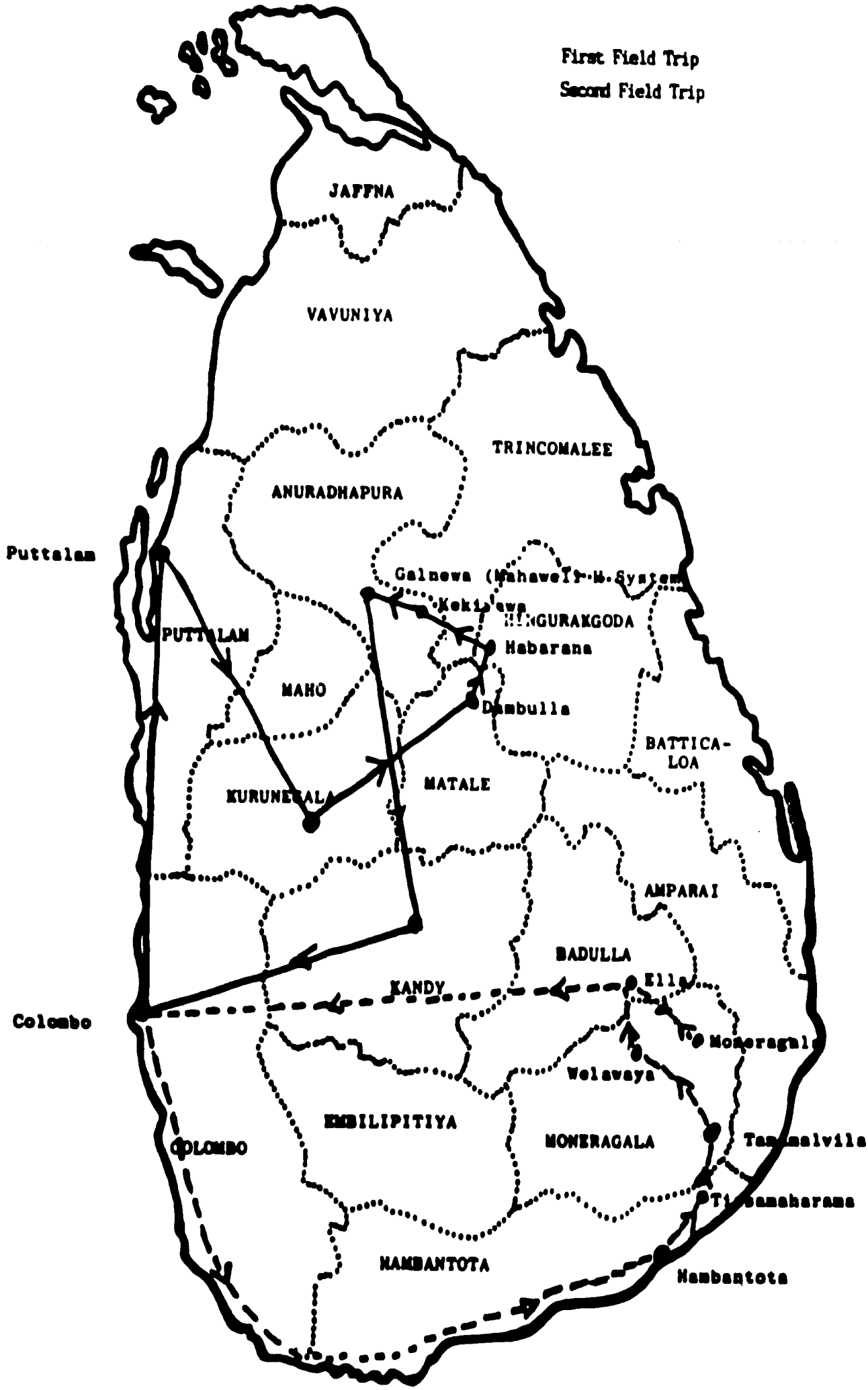
PERSONS MET DURING ITINERARY
MARCH 10-28, 1986

DATE	PERSON MET	DESIGNATION	PLACE
17 MAR	Dr. Puvaneswary Shanmuganathan	RMO, Puttalam	Puttalam Regional Office
	Mr. S.N.W. Dayaratne	PHI/AMC, Puttalam	
	Mr. M.I.M. Wadood	FA, Puttalam District Hospital	District Hospital
	Mr. A.M.S.B. Adikari	Research Assistant	Puttalam Experimental Station
	Mr. K.A.N. Chandraratne	PHI	
18 MAR	Mr. J. Everart	RMO, Kurunegala	Kurunegala Regional Office
	Mr. Bandula Banda	FA, Peripheral Unit, Narammala	
	Mr. Sunil Premasiri	EA, Regional Entomology Team	Narammala village
19 MAR	Mr. Ranjit Alwis	RMO, Anuradhapura	Sub-Regional Office, Kekirawa
	Mr. A.M. Ananda	OIC/SRO	
	Mr. D.A.D. Weerasinghe	PHI/VU, Kekirawa	
	Mr. Sarath Liyanage	PHI/VU, Eppawela	
	Mr. S.A. Samarasekera	CDO, System H, Mahaweli	Mahaweli Authority Office, Kaliwewa
	Mr. D.P.M. Kerthi Rajaratna	FA, Galnewa Peripheral Unit	Galnewa Peripheral Unit
	Mr. U.B. Heenbanda	Health Volunteer, Galnewa	Galnewa Peripheral Unit
	Dr. S.L. Deniyage	MO, Peripheral Unit, Galnewa	Galnewa Peripheral Unit
	Mr. E.M. Asela Banda	FA, AMC Walking Unit	in village
20 MAR	Ms. A.M.G.M. Yapa Bandara	RMO, Matale	Regional Office
	Mr. Sarath Dassenayake	PHI/VU, Wewela Malaria Treatment Centre	Wewela Centre
21 MAR	Ms. P.H.D. Kusumawathie	RMO, Kandy	Kandy Regional Office
	Mr. P.H.D. Williams	PHI/AMC1, Kandy	"
	Mr. S. Amarsena	PHI/SRO, Kegalle	"
	Mr. C.A. Pamunuwa	Engineer, Headworks Operation, Maintenance Division, Polgolla, Mahaweli Authority of Sri Lanka	

PERSONS MET DURING ITINERARY
MARCH 10-28, 1986

DATE	PERSON MET	DESIGNATION	PLACE
26 MAR	Ms. B.S.N. Peiris	RMO, Hambantota	Hambantota Regional Office
	Mr. C. Weerasooriya	PHI/VU, Hambantota	"
	Mr. G.S. Wimalaratna	PHI/AMC2, Hambantota	"
	Mr. S.P. Dayaratna	PHI/AMC, Hambantota	"
	Mr. W.H. Siripala	FA in charge, Pannegamuwa Walking Unit	
	Mr. Dharmadasa Liyanage	PHI/VU, Baddagiriya	
27 MAR	Mr. H.T. Karunaratne	PHI/AMC, Embilipitiya (acting RMO)	Embilipitiya Regional Office
	Mr. B.H. Wijesinghe	PHI/VU, Tanamalwila	"
	Mr. R.G. Weerasinghe	FA, Wellawaya District Hospital	Wellawaya DH/OPD
	Mr. R.M. Ratnayake	PHI/VU, Wellawaya	Wellawaya Regional Office
28 MAR	Mrs. S.P.R. Perera	Nurse in charge, Pelwatte Health Centre	Pelwatte Sugar Co.
	Mr. N.C. Harvie	Personnel Manager, Pelwatte Sugar Co. Ltd.	"
	Mr. D.M. Goonewardena	RMO, Moneragala	Moneragala Regional Office
	Mr. K.A.D.W. Wilson	PHI/AMC, Moneragala	"
	Mr. T.W. Somasiri	Malaria Control Supervisor	"
	Mr. N.W.G.S. Narangammana	PHI/VU, Moneragala	"

Appendix C. Map of the Team's Itinerary



Appendix D.

ACRONYMS

ABER	- Annual Blood Examination Rate (blood films examined per 100 population)
AID/W	- Agency for International Development, Washington DC
AMC	- Anti-Malaria Campaign
ANE	- Asia-Near East (AID/W)
ACD	- Active Case Detection
APCD	- Activated Passive Case Detection
API	- Annual Parasite Incidence (positive blood films per 1000 population)
BMICH	- Bandaranaike Memorial International Conference Hall
CAMC	- Community Participation in Anti-Malaria Control
CP	- Conditions Precedent
CVU	- Community Vigilance Unit
EOP	- End of Project
ERD	- Department of External Resources
ERT	- External Review Team
FAA	- Field Assistants (AMC)
FHW	- Family Health Worker
GHC	- Gramodaya Health Center
GSL	- Government of Sri Lanka
HE	- Health Education
ISTI	- International Science and Technology Institute, Inc.
KAP	- Knowledge, Attitudes, and Practices
KKS	- Laborer (AMC)
LMRB	- Lanka Marketing Research Board

LOP - Life of Project

MCS - Malaria Control Supervisor

MASL - Mahaweli Authority of Sri Lanka

MLT - Medical/Midlevel Laboratory Technician

MSCI - Medical Service Consultants, Inc

MU - Mobile Unit (AMC)

MEA - Mahaweli Economic Agency

MET - Mid-term Evaluation Team

MLT - Mid-level Laboratory Technician

MOH - Medical Officer of Health

MOH - Ministry of Health

NMTC - National Malaria Training Center

OIC/SRO - Officer-in-Charge/Sub-regional Office (AMC)

PACD - Project Activity Completion Date

PCD - Passive Case Detection

PHI - Public Health Inspector

PHI/AMC - Public Health Inspector/Anti-Malaria Campaign

PHI/MOH - Public Health Inspector/Ministry of Health

PHI/VU - Public Health Inspector/Vigilance Unit

PIP - Project Implementation Plan

PHC - Primary Health Care

RDHS - Regional Director of Health Services

RMO - Regional Malaria Officer

RMO - Regional Medical Officer

SEARO - Southeast Asia Regional Office (WHO, Delhi)

SMO - Spray Machine Operator (AMC)

SPR - Slide Positivity Rate (positive blood films per 100 examined)

SRO - Sub-Regional Officer

STC - Short-Term Consultant

TA - Technical Assistance

TOT - Training of Trainers

ULV - Ultra Low Volume (fogging)

USAID - country mission of US Agency for International Development

VBCP - Vector Biology and Control Project (MSCI associate)

VCO/SR - Vector Control Operator/Source Reduction

VCO/SS - Vector Control Operator/Space Spray

VTC - Volunteer Treatment Center

WU - Walking Unit

Appendix E.

BACKGROUND DOCUMENTS

USAID Mid-term Evaluation Team
March 10-April 11, 1986

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2) USAID Malaria Control Project Paper Supplement, Amendment 1, August 1979.

3) USAID Malaria Control Project Paper Supplement, Amendment 2, August 1983.

4) USAID Malaria Control Project Loan Agreement, Amendment 4, April 1984.

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10) First Independent Assessment of the Intensive Malaria Control Programme Anti-Malaria Campaign, Sri Lanka, June 15-30, 1983.

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13) Plan of Action for Entomology, Anti-Malaria Campaign, Sri Lanka, 1986, PRJ Herath, Sr. Entomologist.

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24) Karam JL (1980), AID Assistance in Malaria Control/Eradication: Past, Present, & Future in Asia, August 7, 1980.

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26) Le Clere MN (1984), Report on Training Needs Assessment and Technical Assistant Visit, October 8-19, 1984, report prepared by Training Coordinator, International Science and Technology Institute, Inc. for Anti-Malaria Campaign, Sri Lanka.

27) Patrick WK (1983), Primary Health Care in the Mahaweli, Health Education Bureau Publication, Anna C Printers: Colombo, Sri Lanka, 1983.

28) Ratnapala R, Subramaniam K, Yapabandara MGM, Fernando WP (1984), Chloroquine resistant Plasmodium falciparum in Sri Lanka, Ceylon Medical Journal 29:135-145.

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- August 1984
- September 1984
- October 1984
- November 1984
- January 1985
- February 1985
- April 1985
- May 1985
- July 1985
- August 1985
- October 1985
- November 1985

60) ISTI Quarterly Progress Reports:
- Third Quarter 1984
- Fourth Quarter 1984
- First Quarter 1985
- Second Quarter 1985
- Third Quarter 1985
- Fourth Quarter 1985
- First Quarter 1986

61) Minutes of Technical Conference meetings
- 2 January 1985
- 10 January 1985
- 17 January 1985
- 24 January 1985
- 2 February 1985
- 14 February 1985
- 26 February 1985
- 25 March 1985
- 8 October 1985
- 13 November 1985
- 12 December 1985

62) Minutes of the ISTI Conference meetings
23 January 1985
13 February 1985
2 May 1985

63) Minutes of Entomology Meetings
16 April 1985

64) ISTI Memo on Study Tours and Training Abroad
7 October 1985

65) Minutes of Meetings on Operational Research and Pilot Projects
-GSL/USAID Malaria Control Project Follow Up on PIPW
10 September 1984
18 September 1984
14 December 1984
10 January 1985
11 February 1985
17 April 1985
8 August 1985
21 October 1985
19 November 1985

66) Minutes of Meetings on Training Needs
24 September 1984
October 1984
3 December 1984
11 January 1985
12 February 1985
27 March 1985
10 April 1985
3 May 1985
8 July 1985
15 July 1985

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6- 9 February 1985
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8- 9 November 1985
22 January 1986

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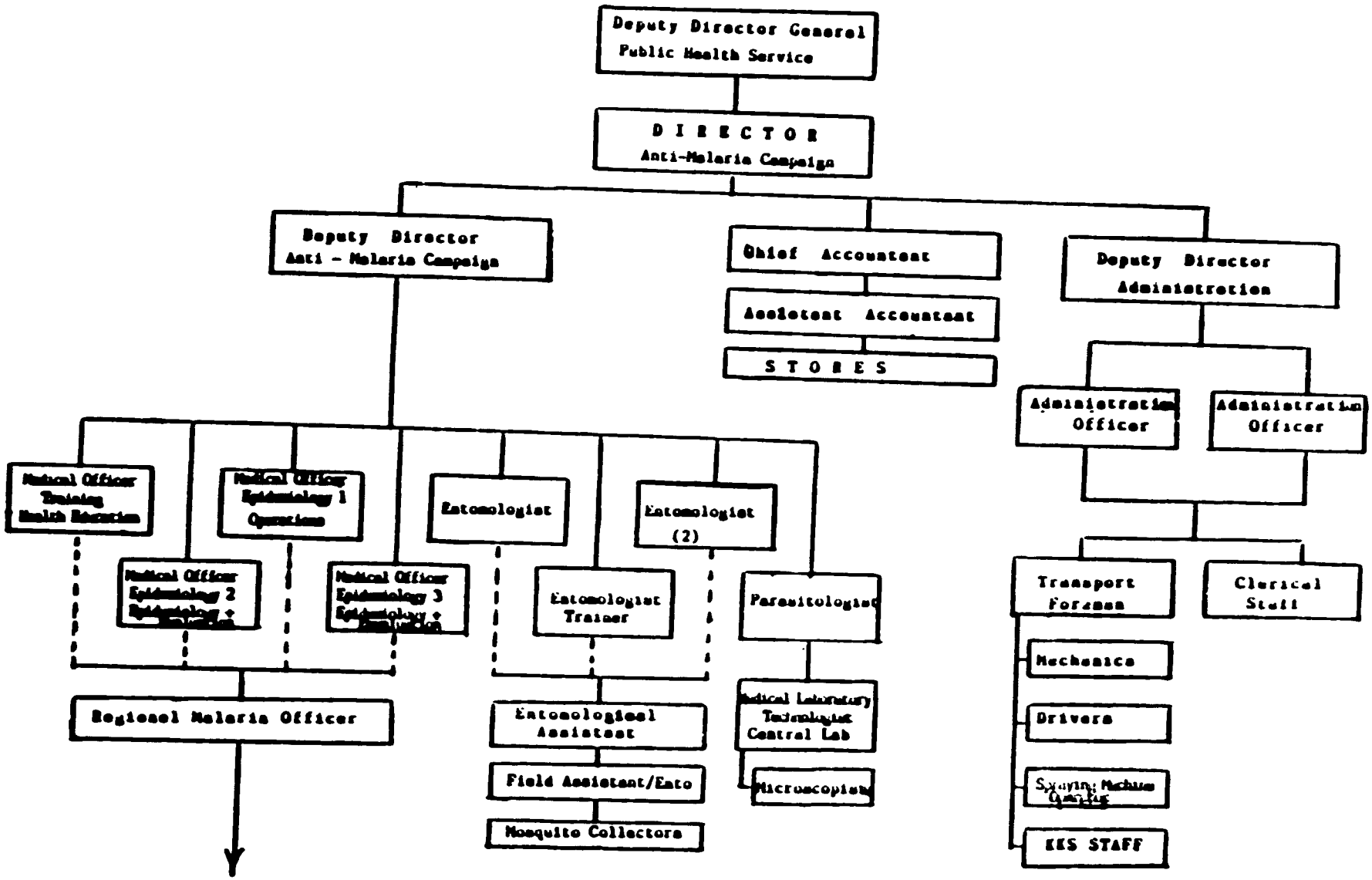
Staff Positions - 1985 Anti-Malaria Campaign, Sri Lanka
AMC Epidemiological Data-1985
Morbidity and Mortality Data - 1931-1974
Malaria Chemotherapy Recommendations-1986

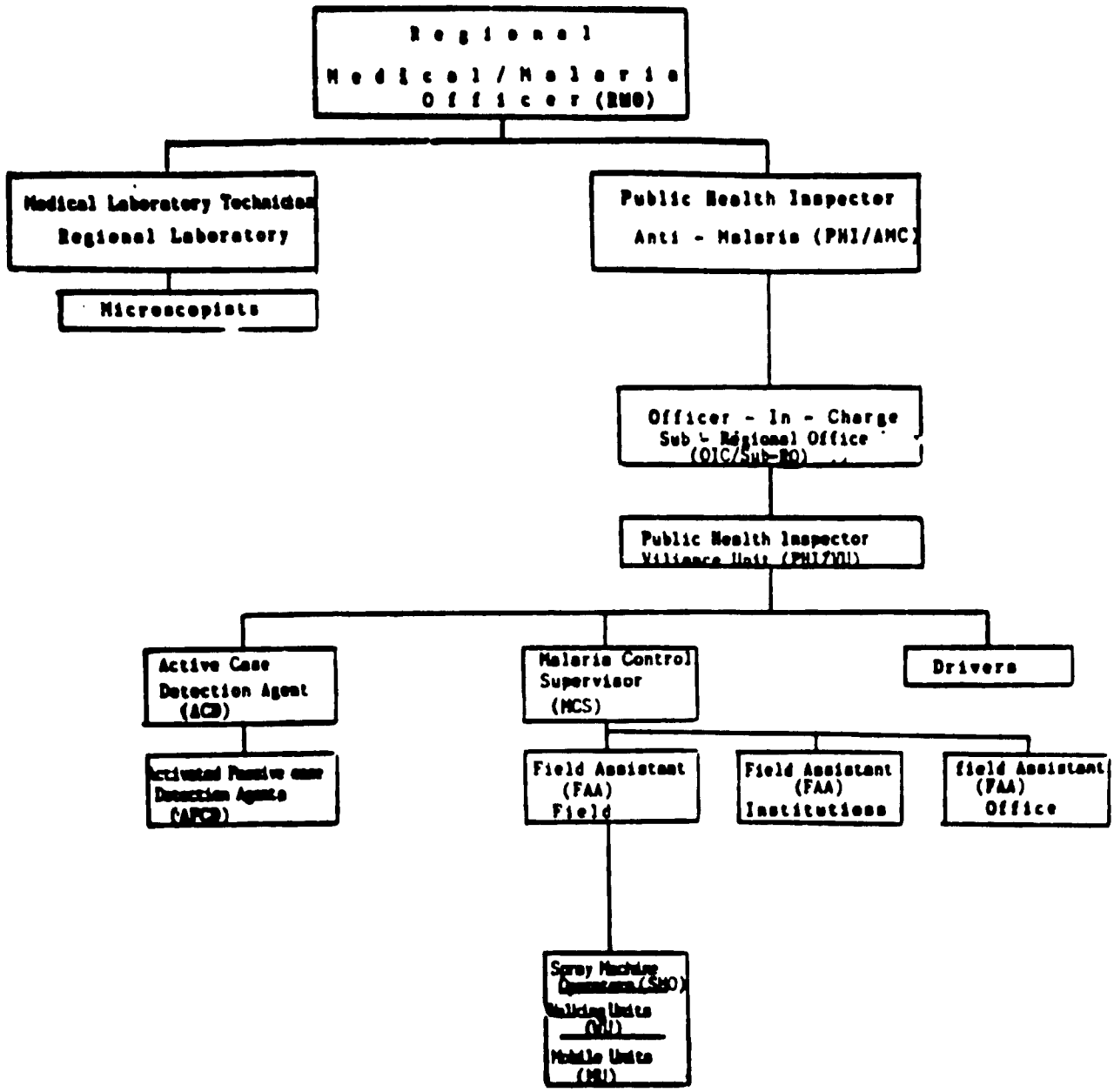
APPENDIX F AMC ORGANIZATIONAL CHART



(See Appendix F/2)
AMC REGIONAL ORGANIZATION

NOTE: This Organizational Chart is reproduced from an organizational chart furnished by the AMC

APPENDIX F/2 AMC REGIONAL ORGANIZATIONAL CHART



APPENDIX G

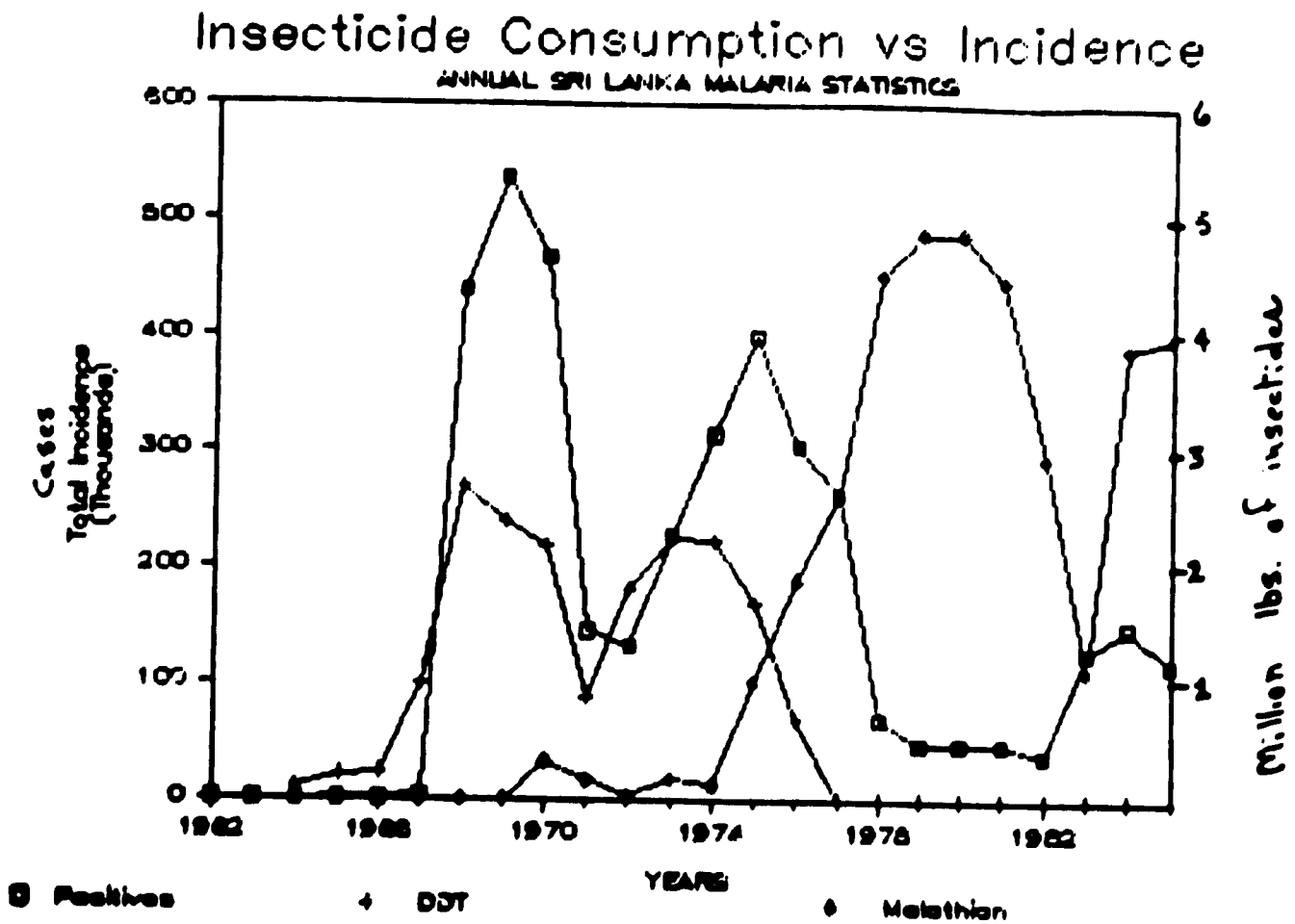
STAFF POSITION - 1985 ANTI-MALARIA CAMPAIGN, SRI LANKA

		Sanctioned Cadre	Present strength	Vacancies
01.	Director	01	01	-
02.	Deputy Director	01	01	-
03.	REgional Malaria Officers	20	14	06
04.	Entomologists	03	03	-
05.	Parasitologiats	01	01	-
06.	Accountant	01	01	-
07.	Acting Accountant	01	01	-
08.	Clerks H.C.S.	59	58	01
09.	Stenographers	01	01	-
10.	Typists - English - Permanent) English - Casual) Sinhalese-Permanent)	04	04	-
11.	Transport Foreman	01	01	-
	Assistant Transport Foreman	02	-	02
12.	Store-Keepers	03	03	-
13.	Book-keepers	02	01	01
14	Malaria Laboratory Technician	15	06	09
15.	Entomological Assistants	15	08	07
16.	P.P.A	30	14	16
17.	P.H.I.	68	83	-
18.	Driver Overseers	20	15	05
19.	Malaria Supervisors	58	47	11
20.	Field Assistants			
	F.A. - Permanent)	1053	289	-
	Casual)		764	

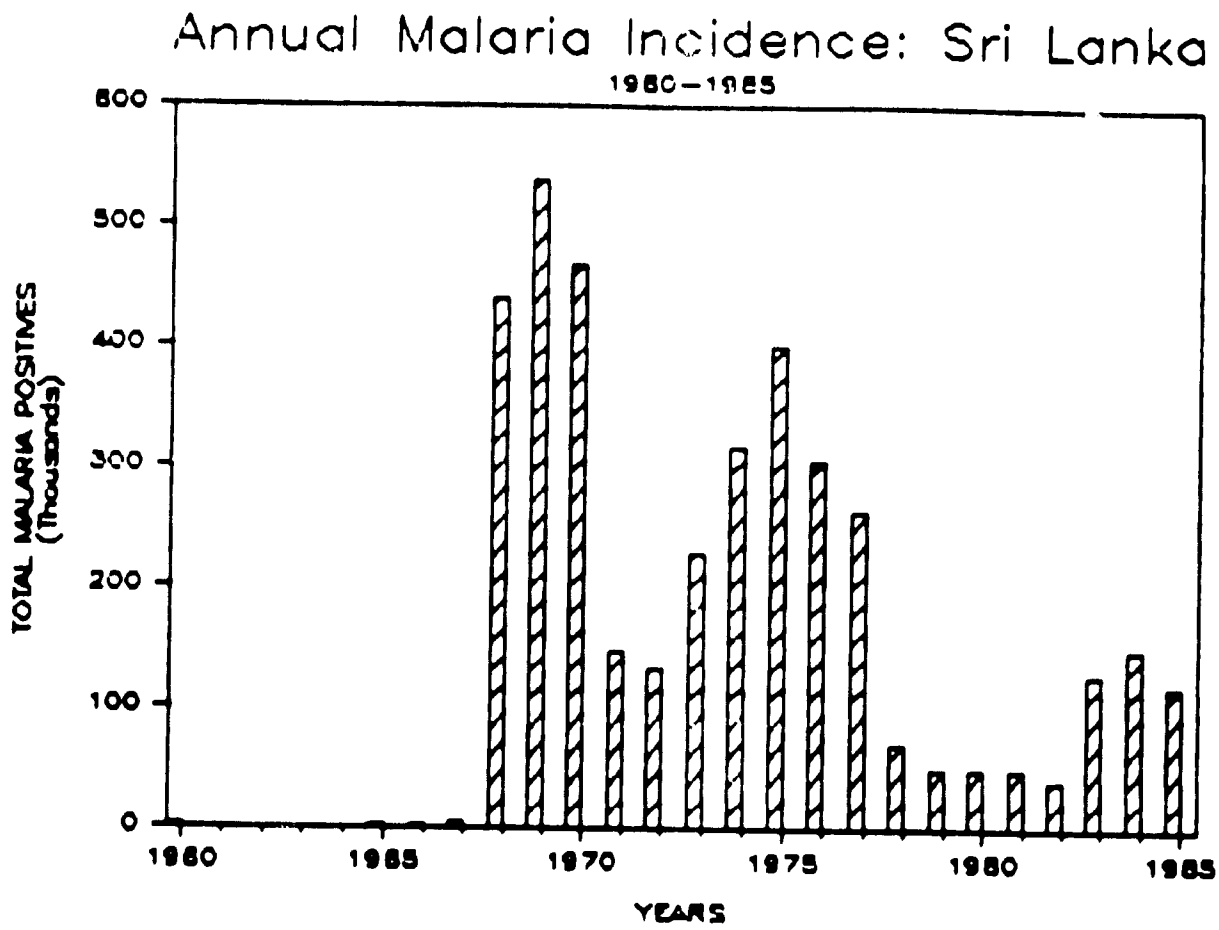
		Sanctioned Cadre	Present strength	Vacancies
21.	Microscopists	233	240	-
22.	Telephone Operator	01	01	-
23.	K.K.S	05	03	02
24.	Watchers - permanent	05	05	-
	casual	-	-	-
25.	Drivers - permanent	59	85)	92
	casual	167	49)	
26.	Book Binders	01	-	01
27.	Motor Mechanics -			
	Grade I seg. A)	05	04)	04
	Grade ISeg. B)	12	09)	
	Assistant Motor Mechanics Grade III) Casual)	02	01	01
28.	Hood Makers - Grade II	02	01	01
29.	Blacksmith - Grade II	01	01	-
30.	Welder	01	01	-
31.	Carpenters	05	05	-
32.	Painter	02	02	-
33.	Cinema Operator	01	01	-
34.	Electricians (Grade 1)	03	04	-
35.	Lab orderly	05	04	01
36.	Spray Machine Operators			
	Permanent	1788	1436	352
	Casual	538	537	01
37.	Ordinary Labourers (Office)	08	08	-
38.	Tinker (Grade 1)	03	03	-
39	Lathemen	01	-	01
40	Sanitary Labourers	03	03	-

	Sanction Cadre	Present Strength	Vacancies
41. Roneo Machine Operator	01	01	-
TOTAL :	4211	3720	514

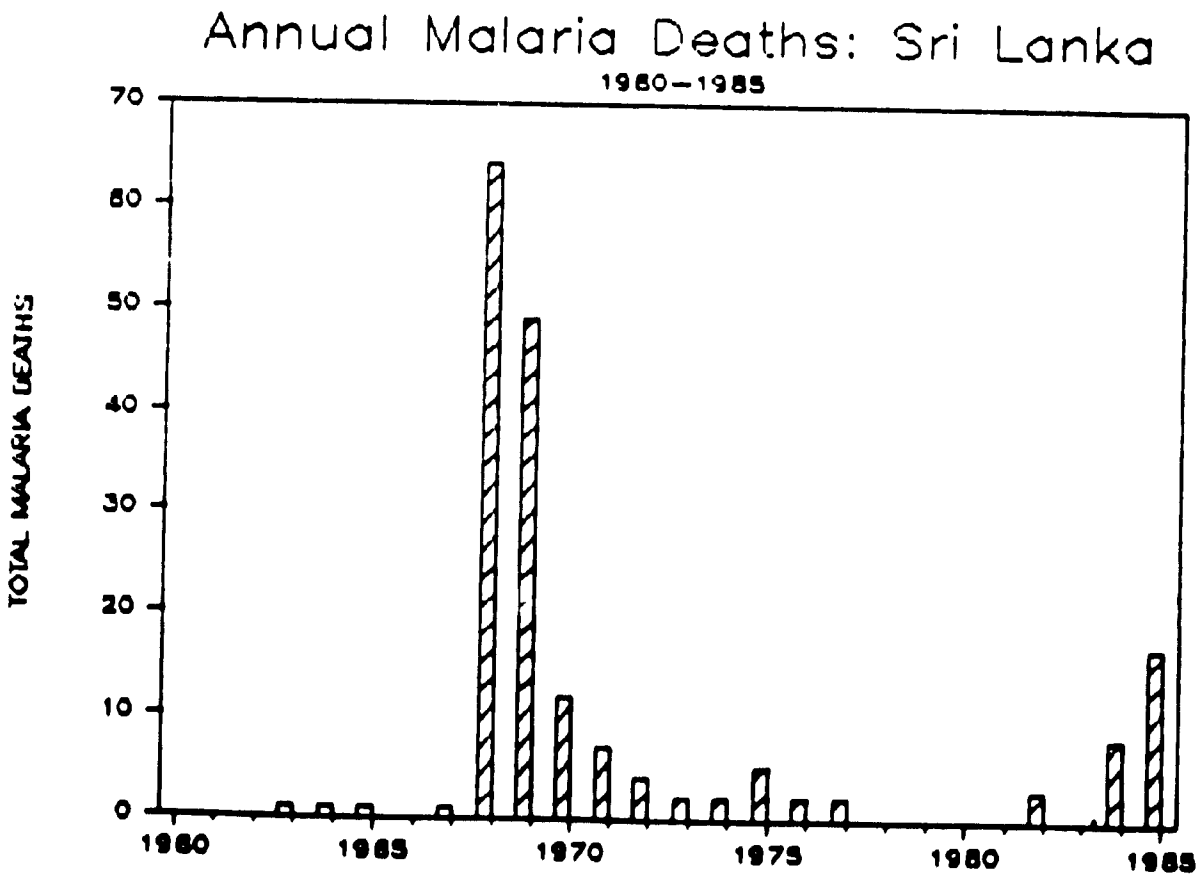
APPENDIX H - GRAPH 1



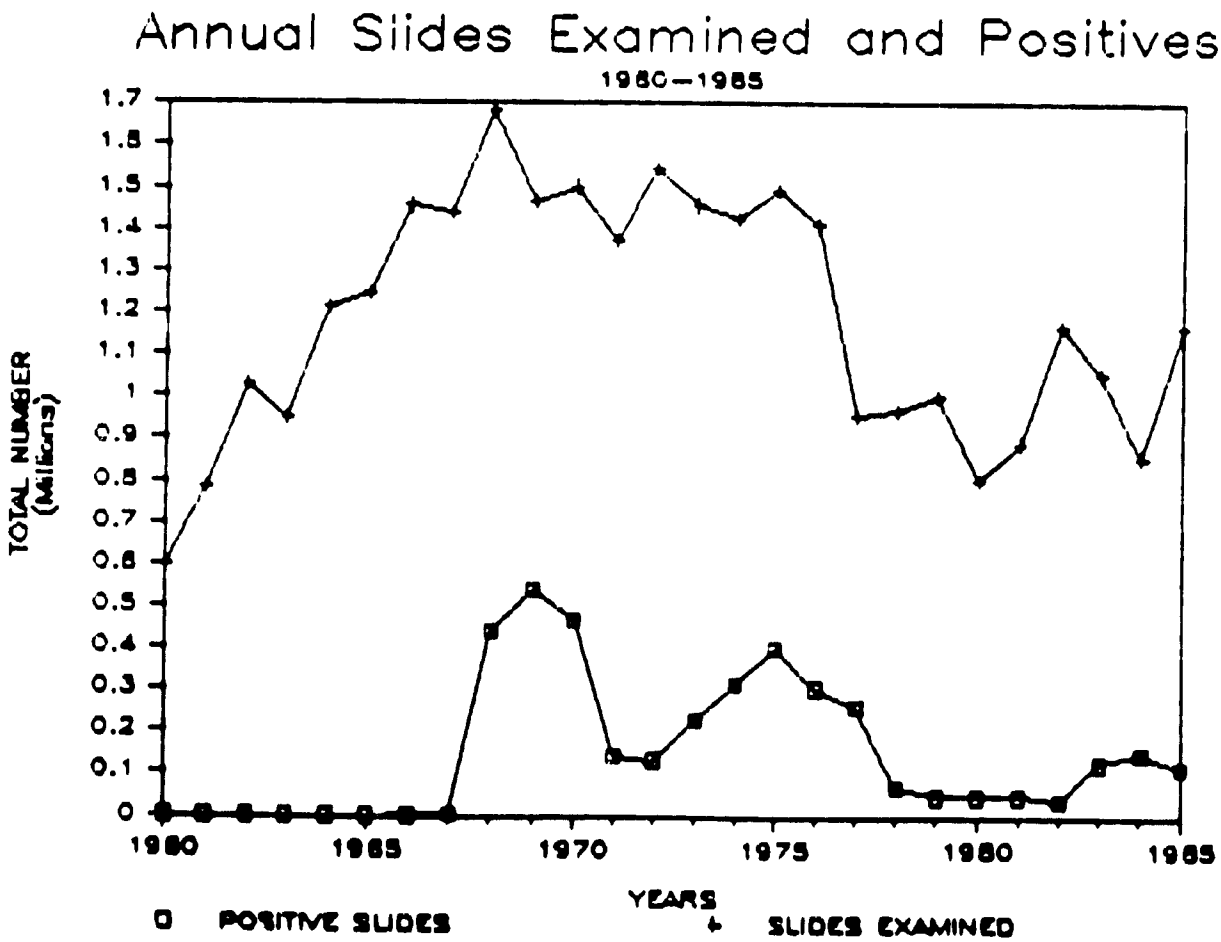
APPENDIX H - GRAPH 2



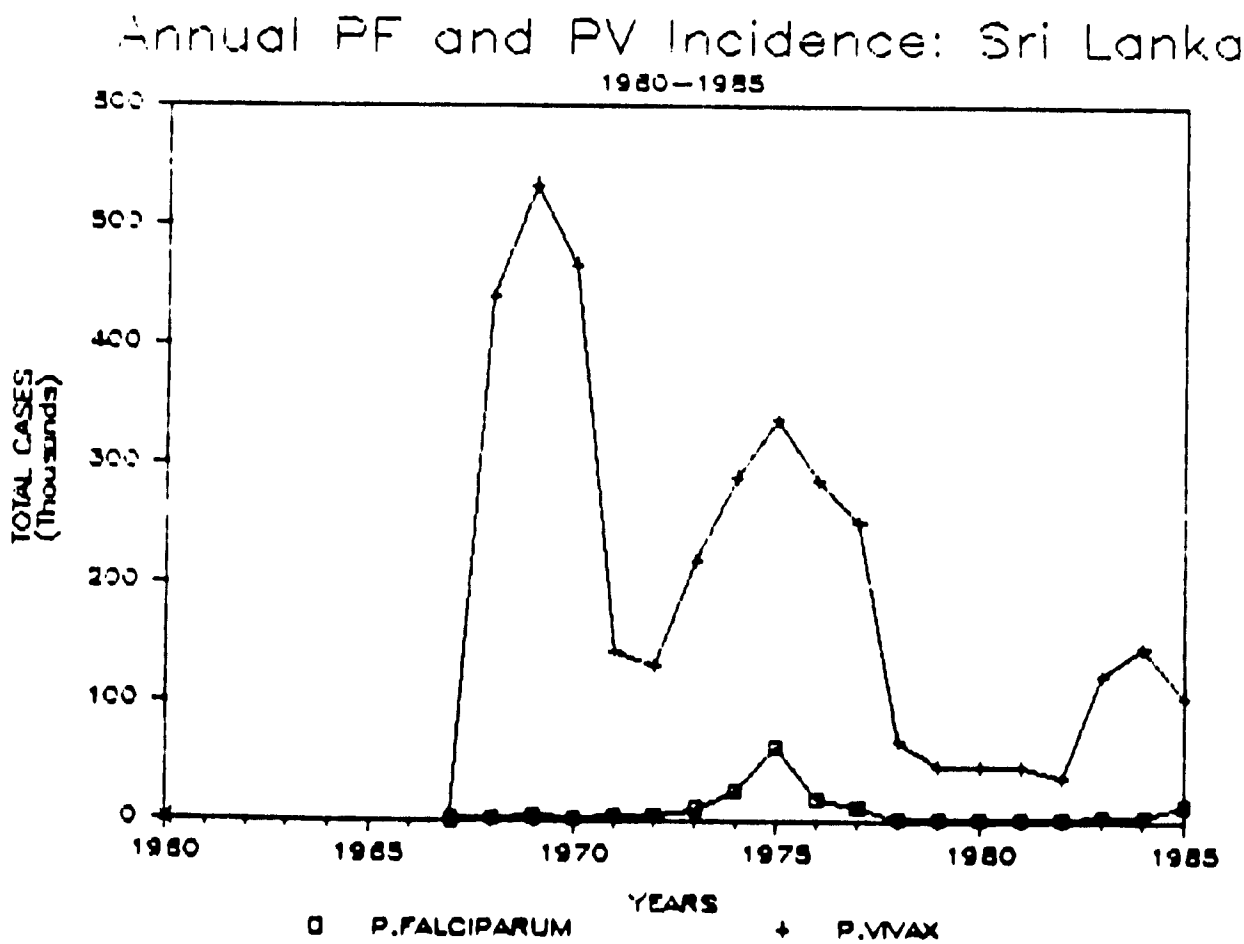
APPENDIX H - GRAPH 3



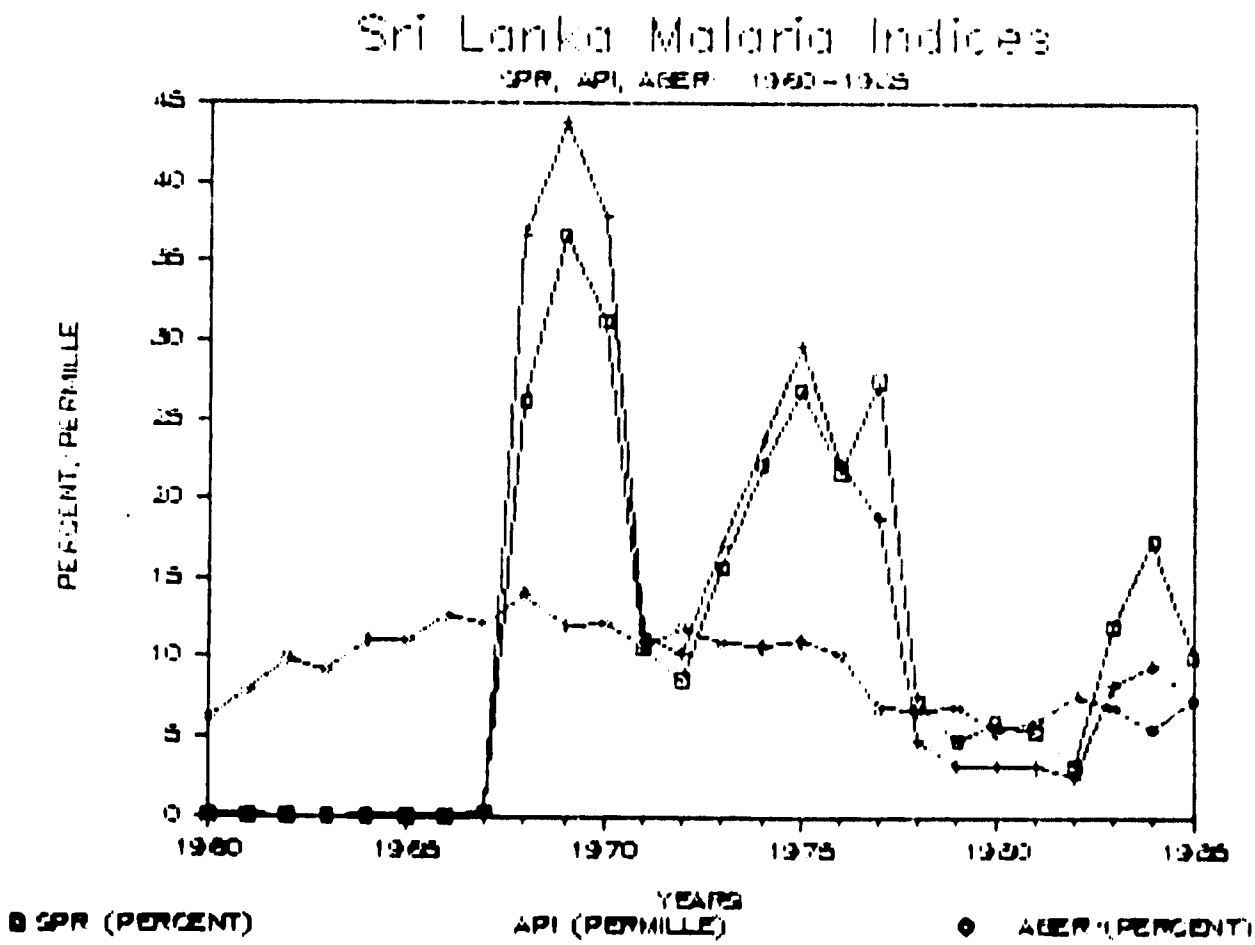
APPENDIX H - GRAPH 4



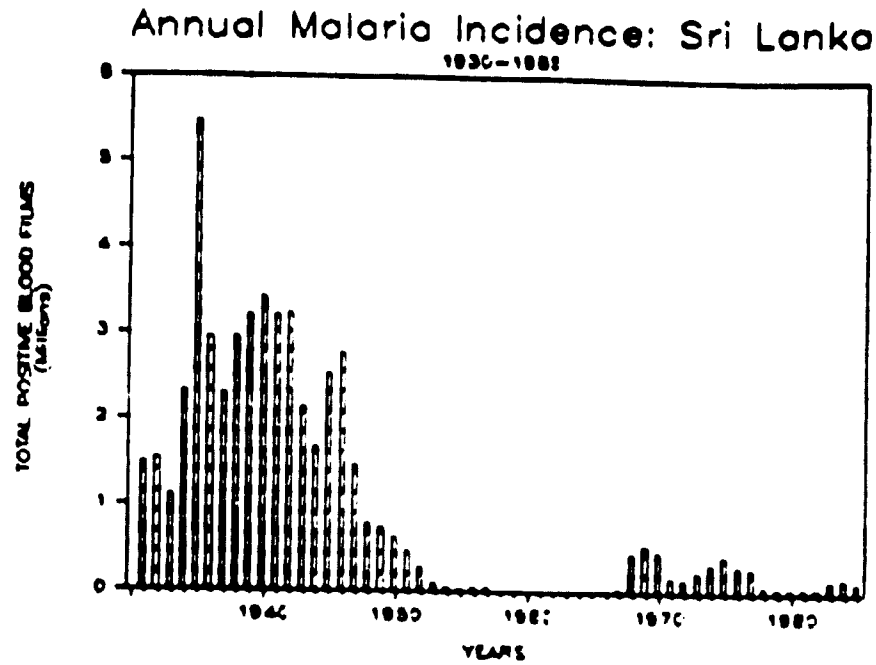
APPENDIX H - GRAPH 5



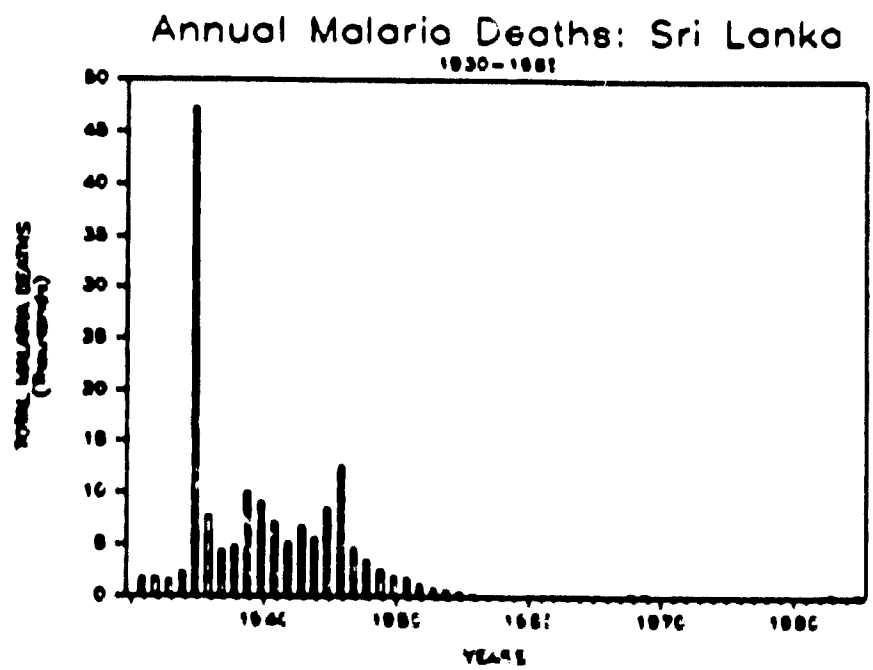
APPENDIX H - GRAPH 6



APPENDIX H - GRAPH 7



APPENDIX H - GRAPH 8



APPENDIX I

I1

FOREIGN TECHNICAL ASSISTANCE - ISTI PROJECT, JULY 1984 - MARCH 1984

	NAME OF CONSULTANT	SPECIALITY	PURPOSE OF CONSULTANCY & DURATION	PERIOD
1.	David Levine	Planning/Management Expert	Conduct of Project Planning workshop - implementation start up - 2 weeks	10-24 August 1984
2.	Ms.Maria Le Clere	Training specialist	Training Needs Survey - 2 weeks	6-19 October 1984
3.	John Davies	Public opinion measurement specialist	To recommend ways of determining reasons for lack of public cooperation with AMC and correcting these public attitudes - 3 weeks	15 January - 2 February 1985
4.	Bo Razak	Adult education expert	Design and conduct of Training of Trainers Workshop - 4 weeks	6-31 May 1985
5.	Richard Huntington	ISTI Management Expert	To have discussions with USAID and ISTI/Colombo regarding Project Implementation Progress.	25 June - 5 July 1985
6.	Robert Emery	Data Management Expert	To examine data collection systems in AMC and to recommend optimum microcomputer, software & hardware for AMC - 1 month	4-29 October 1985
7.	Dr.Samuel Breeland	Vector Control Specialist	To advise on reduction of vector production in Mahaweli river system - 1 month	31 October - 26 November 1985
8.	James Carney	Adult education expert	To plan and design TOT for RMOs - 2 weeks	4-13 December 1985
9.	James Carney	- do -	To conduct TOT for RMOs - 3 weeks	12 February - 2 March 1986.

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APPENDIX I - I2

LIST OF AMC STAFF TRAINED ABROAD UNDER ISTI CONTRACT
JULY 1984 - MARCH 1986

	NAME	DESIGNATION	STATION	NATURE & LENGTH OF TRAINING	PERIOD
1.	Dr.N.U.L.P.Samarasinghe	Deputy Director	AMC Hqrs.Colombo	Integrated Vector Control 6 weeks	Feb.- Apr.1985
2.	Dr.M.B.Wickramasinghe	Entomologist	" " "	-do-	-do-
3.	Dr.A.A.C.Senaratne	Medical Officer, Epidemiology	" " "	Basic Malariology. National Institute of Communicable Diseases - 8 weeks	Oct.- Nov.1985
4.	Sanath Dassanayake	Public Health Inspector	Dambulla	Study tour in Thailand & Malaysia - 4 weeks	December 1985
5.	S. Puvanendran	-do-	Batticaloa	-do-	-do-
6.	S. Rajeswaran	-do-	Valachenai	-do-	-do-
7.	K. Renganathan	-do-	Mullaitivu	-do-	-do-
8.	S. Wignarajah	-do-	Mullaitivu	-do-	-do-
9.	H.M.Somasekera	-do-	Wariyapola	-do-	-do-
10.	W. B. Fernando	-do-	Puttalam	-do-	-do-
11.	Mrs.R.Ratnapala	Parasitologist	AMC Hqrs.Colombo	Drug Sensitivity Testing, cryo-preservation, reviving of malaria culture. Immunological techniques. continuous cultivation of P. falciparum	January - March 1986
12.	M. Rajathurai	Entomological Asst.	Batticaloa	Study tour, Thailand, Malaysia, & Singapore - 4 weeks	March 1986
13.	G.Chandratilleke	-do-	Badulla	-do-	-do-
14.	W.M.Weerasinghe Banda	-do-	AMC Hqrs.Colombo	-do-	-do-
15.	S.L.Alavudeen	-do-	-do-	-do-	-do-
16.	M.I.A.Jiffri	-do-	-do-	-do-	-do-
17.	T.Shanmugarajah	-do-	Jaffna	-do-	-do-
18.	I.B.Nandasena	-do-	Anuradhapura	-do-	-do-

APPENDIX I I 3

LIST OF OFFICERS TRAINED IN THE COUNTRY UNDER ISTI SPONSORSHIP

	NAME	DESIGNATION	STATION	NATURE OF TRAINING & DURATION	PERIOD
1.	Dr.M.U.L.P.Samarasinghe	Deputy Director	AMC Mqrs. Colombo	Training of Trainers Programme 3 weeks	8-28 May 1985
2.	Dr.P.B.R.Dias	Medical Officer, Training & M.E.	-do-	-do-	-do-
3.	Dr.W.P.Fernando	M.O.(Epidemiology 1)	-do-	-do-	-do-
4.	Dr.L.D.Yaliwinghe	M.O.(Epid.2)	-do-	-do-	-do-
5.	Dr.P.R.J.Herath	Senior Entomologist	-do-	-do-	-do-
6.	Dr.M.B.Wickramasinghe	Entomologist	-do-	-do-	-do-
7.	Ms.R,Ratnapala	Parasitologist	-do-	-do-	-do-
8.	*Mr.P.M.D.R.Alwis	Regional Malaria Officer	Anuradhapura	-do-	-do-
9.	*Ms.B.S.L.Pieris *	-do-	Hambantota	-do-	-do-
10.	*Ms.P.M.D.Kusumawathie*	-do-	Kandy	-do-	-do-
11.	Dr.S.K.Sivaguru	-do-	Jaffna	TOT - 2 weeks	16-28 Feb.1986
12.	Dr.Miss S.Puvaneswarie*	-do-	Puttalam	-do-	-do-
13.	Mr.S.P.M.Kodituwakku	-do-	Ninguruhgoda	-do-	-do-
14.	Mr.J.Everart*	-do-	Kurunegala	-do-	-do-
15.	Mrs.Yapa Bandara	-do-	Matale	-do-	-do-
16.	Ms.M.D.B.Perera	-do-	Maho	-do-	-do-
17.	Ms.P.M.D.Kusumawathie*	-do-	Kandy	-do-	-do-
18.	Ms.B.S.L.Pieris*	-do-	Hambantota	-do-	-do-
19.	Mr.P.M.D.R.Alwis	-do-	Anuradhapura	-do-	-do-
20.	Mr. Wimalasinghe	Public Health Inspector	Trincomalee	-do-	-do-
21.	Mr. Selvaratnam	-do-	Batticaloa	-do-	-do-
22.	Mr. Karunaratne	-do-	Embilipitiya	-do-	-do-
23.	Mr. Gunawardena	Regional Malaria Officer	Monaragala	-do-	-do-
24.	Ms.B.S.L.Pieris	-do-	Hambantota	Integrated Vector Control Course Hambantota, 4 days	26-29 Nov.85
25.	Mr.G.Wimalaratne	P.H.I.	-do-	-do-	-do-
26.	M.T.Dayananda	"	Tissamaharama	-do-	-do-
27.	C.Veerasooriya	"	Hambantota	-do-	-do-
28.	G.Gunadasa	"	Matara	-do-	-do-
29.	R.P.Jayatissa	"	Walasmulla	-do-	-do-
30.	R.M.Chandrasena	Malaria Supervisor,	Hambantota	-do-	-do-
31.	K.D.Piyadasa	-do-	Hambantota	-do-	-do-
32.	K.Jayawardena	-do-	Weerakatiya	-do-	-do-
33.	A.J.S.P.Wilfred	P.H.I.	Chandrikaweva	-do-	-do-
34.	M.Dassapala	"	Udawalawe	-do-	-do-
35.	B.M.Wijesinghe	"	Thanamalwila	-do-	-do-
36.	L.M.Lahu Banda	"	Balangoda	-do-	-do-
37.	M.L.T.Dias	Malaria Supervisor,	Thanamalvila	-do-	-do-
38.	G.B.P.Nandis	-do-	Udawalawe	-do-	-do-
39.	P.S.K.de Silva	-do-	Embilipitiya	-do-	-do-
40.	M.W.G.Narangama	P.H.I.	Monaragala	-do-	-do-
41.	R.M.Ratnayake	"	Wellawaya	-do-	-do-
42.	T.W.Somasiri	Malaria Supervisor,	Monaragala	-do-	-do-

APPENDIX I 14

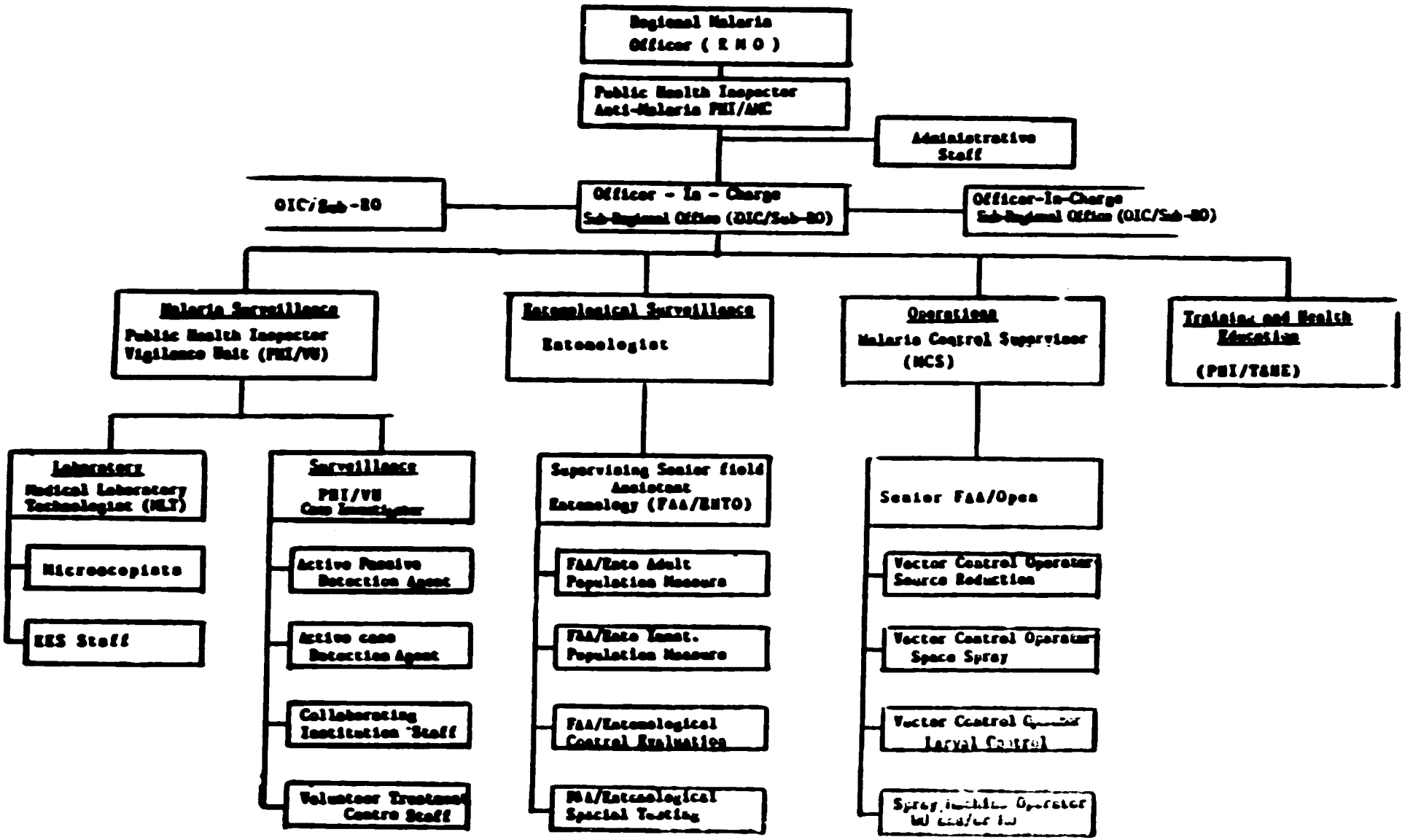
	NAME	DESIGNATION	STATION	NATURE OF TRAINING & DURATION	PERIOD
43.	Mr.J.Everart &	Regional Malaria Officer	Kurunegala	Integrated Vector Control Course Kurunegala, 4 days	4-7 March 198
44.	Mr.D.M.M.A.Dasapala &	P.M.I.	Kurunegala	-do-	-do-
45.	Mr.W.D.Senanayake *	P.M.I.	Kurunegala	-do-	-do-
46.	Mr.A.M.Rambanda	P.M.I.	Kurunegala	-do-	-do-
47.	Mr.K.M.Punchimilame	P.M.I.	Gokarella	-do-	-do-
48.	Mr.W.M.Ariyasinghe	P.M.I.	Gokarella	-do-	-do-
49.	Mr.M.M.A.Somasekera *	P.M.I.	Wariyapola	-do-	-do-
50.	Mr.D.B.Samarakone	P.M.I.	Wariyapola	-do-	-do-
51.	Mr.L.A.D.Pragnasena	P.M.I.	Bingiriya	-do-	-do-
52.	Mr.M.P.Somaratna	Malaria Supervisor	Kumbukwewa	-do-	-do-
53.	Mr. M.S.Fernando	-do-	Malsiripura	-do-	-do-
54.	Mr.K.D.P.Siriwardena	-do-	Polpithigama	-do-	-do-
55.	Mr.M.B.Jayasena	-do-	Hettipola	-do-	-do-
56.	Mr.K.M.Susiripala	-do-	Wariyapola	-do-	-do-
57.	Mr.S.P.A.Aloysius	-do-	Bingiriya	-do-	-do-
58.	Dr.Miss S.Puvaneswarie *	Regional Malaria Officer	Puttalam	-do-	-do-
59.	Mr.S.M.Dayaratna	P.M.I.	Puttalam	-do-	-do-
60.	Mr.M.Ponnamperuma	P.M.I.	Chilaw	-do-	-do-
61.	Mr.D.Dissanayake	Malaria Supervisor	Puttalam	-do-	-do-
62.	Mr.J.M.Rambanda	-do-	Anamaduwa	-do-	-do-
63.	Miss M.D.B.Perera	Regional Malaria Officer	Maho	-do-	-do-
64.	Mr.D.B.Senanayake	P.M.I.	Maho	-do-	-do-
65.	Mr.S.Ramachandra	P.M.I.	Galgamuwa	-do-	-do-
66.	Mr.D.M.Jayaboby	Malaria Supervisor	Nikaweratiya	-do-	-do-
67.	Mr.M.M.Adikaram	-do-	Nikaweratiya	-do-	-do-
68.	Mr.M.R.Weerasinghe	-do-	Galgamuwa	-do-	-do-
69.	Mr.K.A.Wilson *	P.M.I.	Moneragala	-do-	-do-
70.	Mr.S.P.Dayaratne	P.M.I.	Hambantota	-do-	-do-
71.	Mr.T.M.Karunaratne	P.M.I.	Kebillipitiya	-do-	-do-

* Called for Second TOT as it was not field oriented

* Would meet on field trip

APPENDIX J ORGANIZATIONAL CHART

REGIONAL TEST AND DEMONSTRATION PROJECT



Appendix K.

Portable Microcomputers: The Toshiba T1100

The Toshiba T1100 Personal Computer is the first successful example of a truly portable, full-featured computer. Other manufacturers are sure to respond quickly, and therefore this appendix should not be read as an exclusive endorsement. Any equivalent computer that may become available with all the features described here should also be considered.

Features:

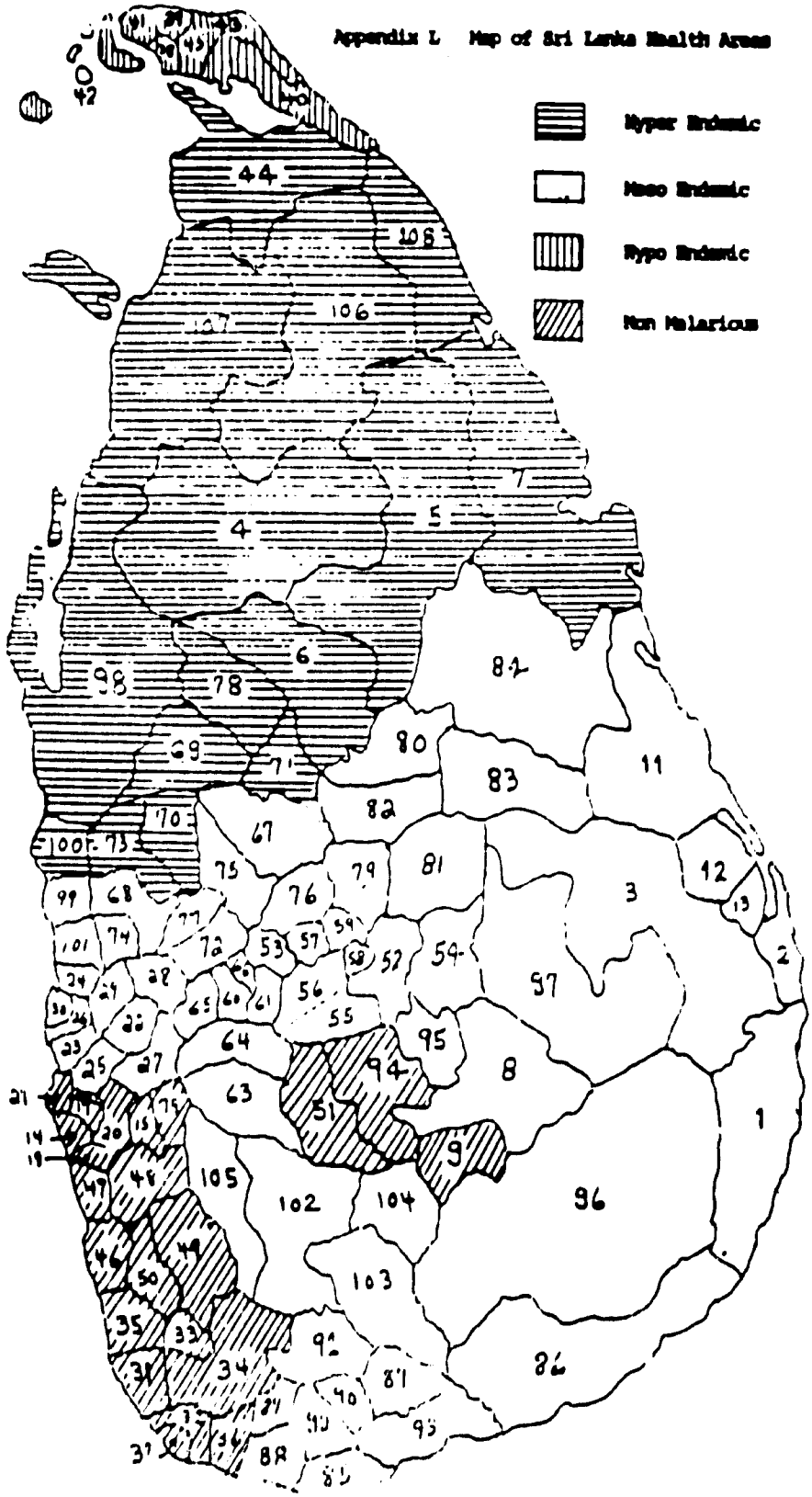
- as compact as a portable typewriter (9lbs/4kgs; 30cm x 30cm x 6cm).
- completely IBM-compatible, and runs all programs and software available for the IBM.
- 512K of RAM.
- one built-in 3-1/2" disk drive.
- uses 3-1/2" floppy disks with 720K storage capacity.
- can be connected to an IBM computer to copy data and programs between 3-1/2" and 5-1/4" floppy disks.
- runs on a nickel-cadmium battery that is rechargeable while the computer is in use. This means the computer has a de facto uninterruptible power supply.
- CMOS circuitry with low power requirements, little heat, and no fan.
- built-in, fully-adjustable, full-size (80x25) LCD screen that is very readable.
- runs on a color/graphics adaptor, so graphics can be displayed, while resolution is very good for text editing.
- any IBM-compatible color monitor can be plugged into the built-in RGB port to substitute for the LCD screen (or composite monitor in the composite port).
- built-in plug ports for connection of a parallel printer and an external disk drive.

Options:

- a combination modem/serial port/clock/calendar.
- external 5-1/4" floppy disk drive
- external 3-1/2" floppy disk drive.

- List price in the U.S. is about $2000.

The team carried one unit on all field trips and used it in preparation of this report, both for word processing and spreadsheet analysis. (Printers were available at the base office.) It performed without any complaints or anomalies. The keyboard is pleasant to use, though some practice is required to adjust to the placement of function keys and cursor keys at the top of the keyboard. It would be very feasible to consider this computer as the single primary computer for many users, and it complements perfectly a stationary IBM microcomputer at the base office. At present it cannot meet the needs of those requiring RAM greater than 512K, nor programs requiring an 8087 math coprocessor, nor a harddisk.


Appendix I Map of Sri Lanka Health Areas
Hyper Endemic
Meso Endemic
Hypo Endemic
Non Malarious

Appendix L. (cont)

HEALTH AREAS

Jaffna Peninsula

38 Jaffna
39 Telippalai
40 Chayakachcheri
41 Manipay
42 Kayts
43 Pt. Pedro
45 Kopay

Northern Dry Belt

4 Anuradhapura
5 Kahatagasdigiliya
6 Kekirawa
7 Trincomalee
44 Kilinochchi
69 Maho
70 Wariyapola
71 Gokarella
73 Bingiriya
78 Galgamuwa
98 Puttalam
100 Chilaw
106 Vavuniya
107 Mannar
108 Mullativu

South Eastern Foot Hills

8 Badulla
11 Valachchena
80 Dambulla
81 Mattota
82 Naula
83 Polonnaruwa
84 Hinguraksoda
86 Hambantota
96 Monaragala
97 Bibile
103 Atakalanpanna
104 Balangoda

Intermediate Zone

10 Welimada
22 Gampaha
23 Taela
24 Kichchikade
25 Kelaniya
27 Kirindiwela
28 Mirigama
29 Minuwangoda
30 Negambo MC
52 Wattegama
53 Galagedera
54 Meda Mahanuwara
55 Gampola
56 Kadugannawa
57 Werellaga a
58 Talatuoya
59 Kandy
60 Kegalle
61 Mawanella
62 Ruwanwella
63 Dehiowita
64 Galigamuwa
65 Warakapola

Non Malarious

9 Bandarawela
14 Dehiwala
15 Homagama
16 Kolonnawa
17 Kotte
18 Moratuwa
19 Dedukka
20 Nugegoda
21 Colombo MC
31 Ambalangoda
32 Galle PG
94 Nuwara Eliya
66 Rambukkana
67 Jurunegala
68 Kuliyapitiya
72 Polgahawela
74 Kandanegedara
75 Moonamaldeniya
76 Mawatagama
77 Narammala
79 Matale
85 Matara
87 Walasmulla
88 Weligama
89 Akuressa
90 Hakmana
91 Kotapola
92 Kamburupitiya
93 Tangalle
95 Maturata
99 Marawila
101 Dankotuwa
102 Ratnadura
105 Cheliyagoda
33 Elpitiya
34 Baddegama
35 Anduruwa
36 Uruwatuna
37 Galle MC
46 Kalytara
47 Panadura
48 Horana
49 Agalawatta
50 Matugama
51 Nawalapitiya
59 Kandy MC

Eastern Coastal Belt

1 Thirukovil
2 Kalmunai
3 Amparai
12 Batticaloa
13 Kaluwanchikudy

SUSTAINABILITY

Current anti-malaria strategy in Sri Lanka relies on two interventions: 1) quarterly or biannual residual house-spraying in most rural areas, and 2) presumptive treatment of all fever/suspected malaria patients, using either 3-day chloroquine cum 5-day primaquine (defined as radical treatment), or single-dose chloroquine cum primaquine (defined as presumptive treatment). The house-spraying is carried out on a rigid schedule designed to maintain a near-continuous coating of malathion on all indoor domiciliary surfaces. Chemotherapy is prescribed to all suspected malaria patients, the great majority presenting with fever at government medical institutions. Retrospectively over 80% of all radically treated patients prove to be malaria negative by blood film. The wide availability of self-medicated chloroquine may mask many infections, but still a great proportion of the chloroquine distributed is apparently prophylactic, not therapeutic.

Sustainability is a primary issue. Although eradication of malaria is an ultimate longterm objective in Sri Lanka, attainment is not on the horizon. There is unanimous agreement that intensive malathion residual house spraying as presently practiced is not sustainable until eradication is attained. This is based on the previous experience in Sri Lanka with selection for DDT-resistance, and the current indication of incipient malathion resistance. The cost in foreign exchange is largely met by external donors which probably is not sustainable. The support of the population for longterm residual spraying is also not sustainable.

Sustainability of chloroquine use is also a concern, because foci of chloroquine-resistant Plasmodium falciparum (CRPF) have been identified. Although 95% of malaria infections in Sri Lanka are P. vivax, with no indication of less response to chloroquine, the loss of chloroquine as a P. falciparum therapy would raise new problems. For example, if radical treatment were desired to remain as a program strategy, rapid species diagnosis to implement appropriate therapy would become essential, and supply of alternative anti-malarials would have to come from foreign sources.

There is wide agreement that a modified approach to malaria control in Sri Lanka must be developed that reduces the reliance on residual insecticiding and on wide-scale drug distribution. In recent years, many documents and reports have stated this (for example, the Administration Report of the AMC, 1983). The USAID Malaria Project Paper, Amendment Number 2, programmed technical assistance to promote and facilitate such a modified approach. In 1986, there is in the Sri Lanka AMC a desire to implement such a modified strategy of malaria control, good progress in training of staff has taken place, and some trial testing of alternate vector measures has taken place. A plan to go ahead with an operational demonstration project in a Region is needed now.

If Sri Lanka achieves an integrated malaria control program, it will be an example to the rest of the malaria endemic world where malaria control strategy has proved easier to theorize than to actually implement.

Appendix M. Cross-Cutting Issues and 1986 Project: State 073097

Women and Development:

Of 3720 persons working for the Sri Lankan Anti-Malaria Campaign (AMC) 175 are women (5%). However, some 1973 positions are listed as Spray Machine Operators positions not recommended for women leaving 175 out of 1747 or 10%.

Half of the 10 Regional Malaria Officers within the AMC are women of high caliber and qualifications.

At AMC headquarters there are 4 highly qualified and capable women scientists which represents half of the senior technical staff.

Environment:

There are no changes since the environmental assessment made for the project.