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REPORT ON MALARIA CONTROL FOR THE HEALTH SYSTEMS MANAGEMENT PROJECT OF EL SALVADOR

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by

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SITUATION ANALYSIS

Background and Present Situation

Although El Salvador's malaria problems have had much in common with those of other middle American areas from southern Mexico through Nicaragua, the country's efforts in combating the disease have included pioneering and innovative features not observed in programs of many countries. A brief sketch of El Salvador's antimalarial efforts is in order.

In the first trimester of 1903, El Salvador's Health Council reported that "paludismo" was responsible for 72 (17 percent) of the 425 deaths registered in the republic. Malaria has defended its notorious reputation ever since, and in 1985 remained in fourth place among the top ten transmissible diseases reported by El Salvador's health services.[1]

For many years (through the 1930's), antimalarial measures were limited to urban areas. They consisted of draining or filling anopheline breeding places, and burning sulfur indoors as a fumigant against adult mosquitoes. The people living in both urban and rural areas depended on quinine to relieve their fevers.

In 1932, the Department of Sanitary Engineering, in collaboration with the Rockefeller Foundation, carried out extensive drainage projects in the San Miguel and Usulutan areas. Many of the concrete-lined ditches, when manually cleared of debris and vegetation, still alleviate the malaria problem in those areas.

Beginning in 1942, the antimalarial efforts promoted by the Institute of Inter-American Affairs encouraged malaria fighters in El Salvador and other countries of Latin America.

When DDT became available at the end of World War II, El Salvador pioneered, along with Venezuela and British Guiana, in trials of the "wonder insecticide." Intradomiciliary spraying was carried out in Ilopango, Asino, Colombia, and Acajutla.

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[1]Diez primeras causas de enfermedades transmisibles notificadas por los servicios de salud: El Salvador, 1985.
División de Epidemiología, Ministerio de Salud Pública y Asistencia Social: Enero, 1986.

In 1950 the Second National Sanitary Congress studied the serious repercussions of malaria on the social and economic development of the country. Participants decided to convert the malaria control program to an eradication program. This was not feasible until 1956, when the Eighth World Health Assembly endorsed a global eradication program, and El Salvador signed a tripartite agreement with the Pan American Health Organization (PAHO) and UNICEF.

In the same year, the El Salvador program took another pioneering stride. It established a network of Voluntary Collaborators - individuals in often-remote communities who dispensed antimalarial drugs and took blood samples for microscopic examination by the malaria service. Undoubtedly inspired by El Salvador's example, the use of voluntary collaborators was soon developed by malaria services in many other Latin American countries, and became an outstanding feature of this hemisphere's antimalarial efforts.

By 1958 Anopheles albimanus in El Salvador was showing some resistance to DDT, and there was even more resistance to another chlorinated hydrocarbon insecticide - dieldrin. Use of the latter insecticide was suspended.

By 1965 it was evident that chances of early eradication of malaria were slipping away, even when applications of insecticide were complemented by mass drug distribution. Irregular funding resulted in irregular attack measures. No spraying was done in 1965, and resurgence of malaria affected some areas considered free of the disease since 1962. Intradomiciliary spraying with DDT was resumed in 1966, but anopheline resistance increased. By 1969, use of DDT was suspended in most parts of the country's malarious areas.

Development of the voluntary collaborator network (see Annex V) was accelerated to insure the distribution of antimalarial drugs and to obtain the blood samples needed in order to monitor the levels of malaria throughout the country.

In 1970 the program was thoroughly reviewed by a commission of specialists from the Government of El Salvador (GOES), PAHO/WHO, UNICEF, and the U.S. Public Health Service (USPHS) and the U.S. Agency for International Development (USAID). They concluded that although eradication might be retained as a long-range goal, highest priority was a malaria control program within the national health plans and within the programs for economic and social development of the country.

Spraying with a carbamate insecticide - propoxur - was initiated. Its use was extended year by year, even though limited, focal evidence of anopheline resistance was noted in 1971. Rising insecticide costs, confirmation of increasing mosquito resistance, and increasing awareness of the need for environmental protection dictated much greater selectivity in the use of insecticides and a more intensive search for alternative measures.

The malaria eradication strategies launched in 1956 recognized that malaria transmission potential was not homogeneous throughout any given region. However, antimalarial measures were often applied with uniform - even rigid - total coverage intensity. In the late 1970's, the El Salvador program became a leader in the development of a "stratification" strategy, based on analysis of malaria transmission characteristics in individual "caseríos" or localities. Such analysis was particularly effective in El Salvador because of the records of malaria cases accumulated by more than 2,000 Voluntary Collaborator Posts (VCP's). At these posts, "passive case detection" (PCD) occurred when citizens with chills and fever came to the VCP's.

By 1983 the "stratification" process, based principally on VCP data and topographic characteristics, permitted the preliminary establishment of priority areas (see Table I) and the selective application of control measures using available resources.

TABLE I

Malaria Stratification by Area
El Salvador

(January 1983)

AREA CHARACTERISTICS	MALARIA CASES (PERCENTAGE)	SIZE Km2	NATIONAL AREA (PERCENTAGE)	POPULATION
First priority Hyperendemic More than 60 cases Annually per Voluntary Collaborator Post (0 to 300 meters altitude)	85	4,819.00	22.9	1,407,620
Second priority Moderately endemic 30 to 60 cases annually per Voluntary Collaborator Post (301 to 600 meters)	10	3,215.79	15.3	928,780
Third priority* Hypoendemic 0 to 29 cases per Voluntary Collaborator Post (more than 601 meters)	5	13,006.00	61.8	2,962,686
Totals	100	21,040.79	100	5,299,086

Inasmuch as the "first priority" calculation showed that 85 percent of the malaria cases came from only 22.9 percent of the country's total area, the 1984 and 1985 malaria plans included major efforts in the most highly affected areas, emphasizing the cross-hatched portions of the map shown in Annex 1.

*Includes non-malarious area estimated at 1,118 Km2.

Intradomiciliary residual spraying was carried out in 1984 and 1985 in areas where Anopheles albimanus still showed susceptibility to propoxur. The latest completed cycles (1985) gave the following figures for "houses programmed" and "houses sprayed" in each of two cycles (also see Annex Ia).

	Houses Programmed	Houses Sprayed	Percentage Sprayed
1st cycle	38,113	36,970	96.9
2nd cycle	39,164	36,470	93.1
1985 Total	77,277	73,440	95.0

Case finding and drug distribution in 1984 and 1985 continued to be made by three types of surveillance mechanism: a) Voluntary Collaborator Posts; b) official health services; and c) active case detection by malaria program personnel.

Annex II permits a comparison of slides examined and positive cases derived from 1981 to 1985 using each system.[2] In all five years, the greatest numbers of slides (72.4 percent in 1982 and 91.5 percent in 1985) have come from Voluntary Collaborator Posts (VCP). The passive case detection by those posts, although sometimes subject to considerable variations (drug and microscope slide availability, intensity of supervision, and the entomologic and human factors affecting transmission of malaria), has remained the barometer of malaria in the country. For this reason, the VCPs have been maintained in high, intermediate, and low priority areas, but with significant differences in frequency of supervisory visits (see below).

[2]Informe de la Evolución de la malaria en el año 1985. Departamento de Malaria, Ministerio de Salud Pública y Asistencia Social, El Salvador, 1986 - 8 páginas. (Presented at PAHO/A.I.D.-sponsored meeting in New Orleans, LA, February, 1986).

TABLE II

Numbers of Voluntary Collaborator Posts According to Periodicity of Supervisory Visits

Supervisory Visit Schedule	No. of Posts	Percentage
Once each week	734	28.6
Once each two weeks	179	7.0
Once each month	366	14.3
Once each three months	717	28.0
Occasional	567	22.1
Total	2,563	100.0

Active Case Detection requiring direct input by malaria division personnel has been virtually abandoned. Blood samples from that system have declined numerically from 13.7 percent in 1981 to 0.5 percent in 1985.

The Annual Parasite Incidence (API), which is "the proportion of cases of malaria detected on an annual basis in relation to the unit of population in which malaria occurs," declined in 1985 (see Annex III). Analysis of the 1985 data on proportions of the malaria parasite species *Plasmodium vivax* and *P. falciparum* also gave favorable results. As shown in Annex IV, the proportions of *P. falciparum* had risen consistently during 1981, 1982, 1983, and 1984, which is contrary to expectations in programs in which both *P. vivax* and *P. falciparum* are occurring. The percentage of *P. falciparum* infections dropped sharply in 1985 - a very favorable sign.

Despite the encouraging trends noted above, malaria is still considered to represent "... a serious problem of public health which affects a great majority of the Salvadoran population, and the control of malaria continues to be one of the priorities in the health area."[3]

[3]Estado Actual y Avances Observados en los Proyectos del País en las siete Areas contempladas en el Plan de Necesidades Prioritarias de Salud de Centro América y Panamá. El Salvador. RESSCAP/1/85 (página 29) Documento de Trabajo.
I Reunión de Sector Salud y I de Directores Generales de Salud y Jefes del Area Médica de los Institutos de Seguridad Social de Centroamérica y Panamá. San Salvador, El Salvador, 26 al 30 de Agosto de 1985.

Present Policies

Further refinement of the epidemiological "stratification" strategy initiated in 1983 is further reducing malaria morbidity. Use of chemical control measures is still required in the more highly endemic areas while improvements are being made in the identification of source reduction sites - small and large - for coordinated community action. Local malaria service involvement in the all-Central American program of innovative projects, promoted by PAHO/A.I.D., will be of mutual benefit to all participating malaria organizations.

Current Resources and Activities

Programs

The Malaria Division of the Ministry of Public Health and Social Welfare is currently engaged in the following tasks:

Detection. A network of Voluntary Collaborators (see Annex V) presently detects 95 percent of the confirmed malaria cases; official health facilities another 4.2 percent; and the intentionally reduced active case detection system accounts for less than one percent of all cases.

Treatment. Presumptive treatment of cases is accomplished by Voluntary Collaborator Posts; presumptive and radical cure treatment is made using chloroquine and/or primaquine.

The passive case detection system of Voluntary Collaborator Posts (VCP's) is proving itself an increasingly important asset within the program. Some 45 percent of its 2,563 collaborators are within the more highly endemic zones. Inasmuch as the VCP's are responsible for delivering presumptive treatment to febriles and for obtaining blood samples for epidemiologic purposes, consideration is being given to still further increasing the number of VCP's. However, until the present system shows maximum consistency in providing presumptive treatment and collection of blood samples, emphasis will be given to qualitative as well as quantitative development of this important program component.

Two types of source reduction measures are receiving attention. One is a very modest but practical effort to identify small water management problems which may be producing vector mosquitoes within flight range of rural communities. Actual filling or drainage work is generally done by laborers employed from displaced persons localities. Some 40 source reduction efforts have been completed, reducing malaria transmission

threats affecting 31,000 persons.

Preliminary steps have been taken for much larger source reduction projects. These involve brackish estuaries and lagoons which have long been recognized as significant seasonal sources of high anopheline mosquito densities and associated malaria transmission along El Salvador's Pacific coastline.

During the period of heavy rains, the rivers and smaller streams discharge water onto the coastal low lands in such volumes that the water reaches the sea; at high tide, sea water invades the estuaries and the salinity of those estuaries remains higher than the limits tolerated by anopheline larvae. As the rainy season ends, the reduced volume of run-off from the rivers cannot break through the dunes along the beaches. Sand bars are formed, impounding water in estuaries and lagoons. The impounded water, which has high salinity, is gradually diluted by the limited but continuing effluent from the rivers.

The larvae of El Salvador's malaria vector can tolerate reasonable salinity levels. The estuaries become virtual "factories" of anopheline adults until the sand bar is broken by the next heavy rains, or by man's efforts. Unless the anopheline-favorable conditions of the estuaries are altered, El Salvador's attractive beach areas near estuaries and lagoons pose a threat to people in nearby settlements, and to vacationers from Guatemala, Honduras, and all parts of the Republic, who stay in local accommodations (or who, during Holy Week holidays, arrive in tremendous numbers and often sleep on the beach). The Malaria Division has begun to explore designs of innovative engineering works to break the above mentioned cycles of massive anopheline production and associated malaria transmission. If appropriate methodology is found, its application may permit the long-range elimination of insecticide use now necessary in houses and hotels in affected areas.

Methods include:

- Promotion and education of community groups with emphasis on those receiving agrarian reform orientation;

- Application of larvicide, mainly during the dry season when reduced accumulations of water are still highly productive of adult mosquitoes;

- Ultra low volume (ULV) spraying (with synthetic pyrethroid insecticide) in areas of high vector density; and

- Intradomiciliary spraying of the residual adulticide propoxur in priority areas where anophelines still show susceptibility to that insecticide. Annex VI indicates the areas where propoxur applications are being made.

Active Case Detection has been carried out in the past and has played a useful role, but it has been the responsibility of Malaria Division employees whose long-range efforts are needed for more innovative aspects of the program. Field personnel continue to take blood samples opportunistically and to provide presumptive treatment in the field. Their time-consuming, house-to-house search for febriles, however, has been abandoned in favor of even more efficient passive case detection by VCP's.

Organization and Manpower

Within the Ministry of Public Health and Social Welfare (MSPAS) the malaria service is one of three "Departamentos" under a "Division de Atención al Medio" (or environmental matters). It has virtually exclusive control over all malaria-related matters. All data on malaria cases, including associated blood slides, are sent directly to the Malaria Division. The slides are examined or re-checked by Malaria Division microscopists. All antimalarial drugs are controlled by the Malaria Division.

At the executive level, the Malaria Division has a program director (M.D.), a chief of field operations, an administrative officer, and an entomology chief (see Annex VII). Although sorely needed, there is no chief of the Epidemiology Section, nor an engineer to plan and execute source reduction activities. PAHO currently assigns one technical officer (sanitary engineer) to the malaria service.

In total there are 517 positions in the malaria service, a significant reduction from the 614 positions authorized in 1983 (see Annex VIII for details of authorized positions for 1983, 1984, 1985 and 1986). Personnel vacating positions through attrition are not replaced.

Field operations are carried out from five zone headquarters among which are distributed the 14 "departamentos" into which El Salvador is politically and administratively divided.

According to the program director, the authorized personnel can scarcely cover one-fourth of the first priority area.

Budget

In 1985 the Malaria Division expended ¢4,151,900 and requested ¢4,440,260 for 1986. An adjusted budget of ¢4,846,210 for 1986 was authorized. This represented 2.59 percent of the 1986 budget of ¢186,888,180 for the Ministry of Public Health and Social Welfare, which in turn amounted to 7.12 percent of the total national budget of ¢2,631,317,940.

The break-down of the malaria service budget (colones exchange rate: US$1.00 = ¢5.00) by categories is as follows:

Personnel services (permanent employees)	1,350,060
Other personnel services (contract personnel)	3,096,160
Non-personnel services (utilities, etc.)	41,540
Materials and supplies (office, etc.)	356,450
Miscellaneous transfers (emergency aid to employee)	2,000
Grand total	4,846,210 colones

The first two categories above (payments for personnel) totaled ¢4,446,220, or 91.75 percent of the entire budget.

The above categories include no expenditures for equipment, because MSPAS issued instructions in July 1980 cancelling purchases of new equipment.

Operational Management Policies and Procedures

The operational epidemiological unit of the program continues to be the "caserío" (the smallest viable base concerning grouping of houses), inasmuch as this unit better reflects the variety of epidemiologic factors than the larger "canton" unit which was used until the "stratification" concept was applied. Transmission problems are often based on local conditions and thus are identified and individualized more effectively. The operational "Polos" which were established earlier as national points of local development for health and other socio-economic objectives are still recognized as malaria program priority areas, but are incorporated more routinely among operational management goals.

In general terms there are two major types of program activities. These are based on conditions during the rainy season (May - October) and the dry season (November - April).

Vector control aspects during the rainy season emphasize control of adult mosquitoes. Ultra-low volume (ULV) chemical applications and intradomiciliary residual spraying, in conjunction with drug distribution, make up the major seasonal activities. During the dry season, emphasis is given to source reduction efforts and to larvicidal applications. Each annual operational plan (see Annex IX for the 1986 work schedule) is based on the anticipated epidemiologic/ecologic conditions. Weekly analyses are based on incoming parasitologic (and on limited entomologic) information to permit adjustments according to local vector and disease situations.

Basic and refresher training of employees is considered essential by the Malaria Division, but is complicated by the shortage of personnel. A study of the 1986 work calendar (Annex VII) shows few gaps in the intensive schedules when personnel can even be spared for refresher training. For residual spraying operators working from March to December, on-the-job training under tight supervision gives the best guarantee of satisfactory performance. High-level job performance by the microscopists in the five zones is monitored by re-checking, in the central laboratory, all positive slides and 10 percent of the negative slides. Re-training in the central laboratory is required when any microscopist's errors exceed a basic level. Sporadic courses are given to employees in other disciplines. Two physicians are currently enrolled in the malaria course in Maracay, Venezuela. The chief of field operations, the entomology chief, and one auxiliary entomologist obviously benefited from training in the vector control course completed at the University of South Carolina's field station.

Supplies and Materials

The critical situation in this area may be attributed to the following:

- Limited financial resources;
- Deterioration and/or insufficiency of critical equipment. Examples include transport equipment, boxes needed by the voluntary collaborators for their slides, and antimalarial drugs and report forms; and
- Occasional failure of the central administration to obtain and distribute materials and supplies on time and in appropriate quantities.

Major Constraints or Problems

Budget

The fixed budget allocated to the Malaria Division for 1986 represented 2.59 percent of the total budget of the MSPAS, compared to 2.6 percent proportion in 1983.

The Director of the Malaria Division believes this budget level is insufficient because it scarcely covers one-fourth of the activities in the top-priority areas. Voluntary Collaborator Posts are maintained to gather information about the malarious area. Due to lack of funds, supervisors visit many of the lesser priority areas (717 posts) once every three months. For another 567 posts, no visits are scheduled.

Management: Policies and Philosophy

- The most critical problem is the resistance of *Anopheles albimanus* in the greater part of the coastal areas to almost all available insecticides. In the case of propoxur - the insecticide now considered useful in some areas - tests have indicated a very rapid loss of effectiveness when it is used on most house construction materials. Its residual effect on wood appears to be acceptable, but wood is used in very limited amounts in many malarious areas.

- Funding restrictions have made it impossible to cover even high-priority areas. In the hopes of gleaning some useful epidemiologic information from the otherwise unworked areas, Voluntary Collaborator Posts in those areas have been maintained. Visits to supply them with drugs and slides have been virtually impossible, however, as has the collection of blood slides.

- Areas of relatively low endemicity are threatened by increased movement of the population, in many cases from highly endemic areas to relatively clean areas.

- Malaria Division resources (manpower, equipment, and insecticides) are sometimes diverted to other technical divisions of the MSPAS. The diversions are most often requested by those responsible for environmental sanitation.

Commodities, Supplies, and Materials

Program development and morale are sometimes severely damaged by a lack of commodities, supplies and materials, often caused by one of the following factors.

- Delivery of products contracted by MSPAS frequently are delayed because of private enterprise difficulties caused by the country's foreign exchange problems.

- Instructions issued by MSPAS in July 1980 cancelled the purchase of new equipment.

MSPAS Response to Problems and Constraints

Resources, Policies, and Programs

MSPAS' published statements continue to emphasize the priority status of the malaria control program. In the "MEMORIAL" of 1984-1985[4] of MSPAS, the Minister and Vice Minister announced the health policies for the period 1985 to 1989 with the stated purpose of improving health of the people of El Salvador. Point 5 listed basic programs to be carried out in 1985 - 1989 by the National Health Systems:

5.1 Attention to the Environment
5.2 Integral Medical Attention
5.3 Development of Resources

The stated objective for Point 5.2 was "Reduction of Indices of Morbidity and Mortality" under:

5.2.1 Infant Care
5.2.2 Maternal Care
5.2.3 Integral Medical Attention for Adults

"Integral Medical Attention" emphasizes:

- Malaria
- Tuberculosis
- Venereal Diseases
- Infectious and Parasitic Diseases

[4]Valdez h., Benjamín y Beltrán-Castro, G. 1985. Memoria Ministerio de Salud Pública y Asistencia Social. 1984 - 1985 134 páginas. San Salvador, El Salvador

- Mental Health
- Cardiovascular Diseases
- Degenerative Diseases

The official published statement is very clear: Efforts to reduce morbidity and mortality will emphasize maternal and child health, and integral medical attention for adults with emphasis on six other diseases. It may be unrealistic in view of the economic situation in San Salvador to expect favored MSPAS treatment.

Malaria Control among Displaced Populations

There are many displaced persons in El Salvador whom the GOES is attempting to assist -- directly or through appropriate agencies. Any population in new settlements may be subject to risks of malaria infections, and the Malaria Division is collaborating with other agencies to ensure protection. In addition, where displaced persons may be available for community improvement projects, the Malaria Division identifies areas where vector source reduction may prove beneficial through water management construction efforts, especially where manual labor can be used to solve the problem (see Annex X). Where displaced populations are receiving antimalarial drugs, and where blood smears are being taken, the Malaria Division responsibilities include the distribution of the appropriate drugs, lancets and microscope slides for blood samples, training of involved persons, and examination of blood samples. When the responsible agencies organize larviciding operations, the Malaria Division furnishes the larvicide (Abate) and trains personnel to apply it properly.

Donor Assistance

The Pan American Health Organization (PAHO) has continued the assignment of one full-time malaria advisor. His assistance in the Malaria Division has been fully utilized and much appreciated.

The USAID loan-grant input through the Health Systems Vitalization Project No. 519-0291 has been invaluable during 1985 and 1986, but will end in December 1986. The Malaria Specialist of that project's team enabled the Malaria Division to achieve its very considerable accomplishment.

The preliminary steps taken in the innovative source reduction project described above could not have been taken without the $10,000 from United Nations Development funds. That

contribution financed an engineering design for slight modification of the salinity of Estero Ticuiziapa, ESE of La Libertad, by a fixed installation stabilizing the river effluent into the estuary during the dry season. This control method historically has been inefficiently and irregularly handled by manual input. The innovative design has been completed; the construction effort, which well justifies PL 480 input, may offer a pattern for long-range source reduction efforts along the malaria-plagued coasts of El Salvador and adjoining countries. The Malaria Division entomologists have already initiated some of the anopheline-related studies needed for gathering base line data to evaluate the project's effectiveness.

PROPOSED ASSISTANCE STRATEGY - MALARIA CONTROL COMPONENT

The Government of El Salvador has impressively strengthened its antimalarial activities under the Malaria Division. Operational rigidity so characteristic of malaria eradication programs has disappeared, and malaria control options are being considered without the impetuosity that sometimes resulted from frustrations when earlier efforts failed. Maintenance of, or further reductions of, the current levels of malaria incidence appear feasible if a number of serious constraints can be overcome.

Constraints

1. Currently malaria is not epidemic in El Salvador. This does not guarantee that extraordinary human mobility and funding limitations for antimalarial measures will not trigger resurgence of the disease. Along with the national and regional zeal to improve primary health care, there is concern about malaria's high risk status.

2. Vector resistance to dieldrin and DDT (chlorinated hydrocarbons) made an early appearance in El Salvador, followed by resistance to malathion and other organophosphorus compounds. At least partial resistance has been confirmed to the carbamate propoxur, but it is being used in some high priority areas. Tests of additional insecticides are in need should further loss of effectiveness of propoxur occur.

3. Bioassay tests to confirm the duration of effectiveness of residual insecticide deposits on sprayed surfaces have given highly variable results. They suggest that many rural housing materials - with the exception of

wood, which is not a common construction material - do not remain lethal to anophelines very long after spraying. Further extensive testing is clearly indicated, beginning with test anophelines from a colony of anophelines of unquestioned susceptibility.

4. The remarkable network of Voluntary Collaborator Posts understandably receives more attention in the highly endemic areas, but the number of such posts has been static at 2,563 for more than three years. Inasmuch as 567 posts receive no regular visits, and 717 posts are on a one-visit-per-three-months schedule, a post-by-post review of productivity may provide clues to possible revitalization of dormant posts.

5. Without questioning the value of the passive case detection done by the Voluntary Collaborator Posts, periodic mass blood survey results in reasonably representative areas are needed to provide better base lines for specific population universes.

6. Economic restrictions have required equipment purchases to be cancelled and personnel levels to be frozen. This has hampered the coverage of malaria problems.

Malaria Program Accomplishments

1. The "stratification" concept has resulted in selective and imaginative use of often limited resources. Malaria endemicity is still a recognized public health problem, but epidemics and mortality have been avoided, and morbidity has been reduced.

2. The Ministry and the Malaria Division have centralized responsibility for malaria problems; uniformity and distribution control of drugs; collaborative action with other agencies which have interest in, or resources for, source reduction; treatment and blood-sampling of patients; and direct-line flow of malaria data.

3. Workers were used for passive case detection through the Voluntary Collaborator Posts, while active case detection by malaria field workers was eliminated when such personnel were more urgently needed for higher priority tasks.

4. Reliable endemicity figures are difficult to derive from passive case detection reports, but the reduced proportion of Plasmodium falciparum cases signals a probable decline in all cases, and lessens the treatment and recovery risks associated with that virulent species.

5. Experienced staff members are present in most levels of the malaria service and represent a nucleus for further development of the program. It is expected that two ministry officers now in the malariology course in Maracay, Venezuela will return to positions in the Malaria Division. One will become chief of the Epidemiology Section and the other will occupy a senior position involving operations. There is no national senior entomologist; technical assistance in entomology is being requested (short-term consultant) to help upgrade the program input by the chief of entomology and auxiliary entomologists.

6. The most recent training at a senior level includes two candidate officers now in the malariology course in Venezuela. The chief of field operations, the chief entomologist, and one auxiliary entomologist successfully completed the six-week Vector Control Course at the Center for Public Health Research field station of the University of South Carolina. One shop specialist received special training in maintenance of ultra low volume spray equipment in a course sponsored by the manufacturer. Planning continues for upgrading the frequency and practicability of courses for field personnel.

7. Unusual investigative interest made possible the early "stratification" concept development, with its lucrative 'spin-off' of program-saving methodology. Field-testing of 'bendiocarb' - a "fall-back" alternative to propoxur should the latter adulticide no longer be usable - is scheduled for September 1986. Operational entomological research is underway at the site of the estuary source reduction project near La Libertad. Despite problems in investigating the duration of effectiveness of several presumably residual adulticides on rural building materials, Entomology Section personnel have persisted in their efforts. Entomology investigations have been particularly hampered by lack of equipment.

Project Purpose and Sub-Purpose of the Malaria Control Component

The purpose of the malaria control component is to help raise existing levels of primary health care by meeting short-term needs of the MSPAS for essential goods and support services, especially malaria control.

The sub-purpose of the project is to help the Government of El Salvador contain or further reduce the incidence of malaria. The malaria component hopes to achieve the following goals by the end of the project:

1. An annual parasite incidence which does not exceed that of the 1983 - 1985 period;

2. Plasmodium falciparum will represent less than 10 percent of all cases of malaria and show progressive further reduction;

3. The number of blood smear slides collected through passive case detection in the Voluntary Collaboratory Posts will show a progressive increase during the 1987 - 1989 period;

4. House spraying coverage will exceed 90 percent of the planned number of houses to be sprayed during each cycle;

5. Estuary source reduction trials, if executed, will have longitudinal epidemiologic monitoring data that include results of periodic mass blood surveys, and longitudinal entomologic monitoring data covering adult and larval anopheline densities.

Important assumptions for achieving the goals and purposes of the malaria control component are that the GOES will accord priority to malaria control activities by providing adequate budgetary support to the program, and that parasite resistance to chloroquine and anopheline resistance to available insecticides does not develop during the life of the project.

End-of-Project Status

Specified output indicators for the End-of-Project Status (EOPS) are presented below, by Fiscal Year:

Spray Operations	1987	1988	1989
Residual spraying operations should cover at least 90 percent of the number of houses programmed for spraying in each cycle.	90%	90%	90%
Surveillance			
Passive Case Detection			
PCD blood slide collection from health institutions should reach 10 percent of the total number of slides collected by 1989.	5%	8%	10%
Surveillance Case Detection			
(a) Blood slide collection should exceed 10 percent of the number of inhabitants in the area being covered.	10%	10%	10%
(b) The average time lag from slide collection to radical treatment of a positive case should be 7 days or less.	7 days	7 days	7 days
Laboratory Service			
The error rate in laboratory examination should not exceed 0.1%.	0.1%	0.1%	0.1%
Transport			
The percentage of the total vehicular fleet (including condemned, non-repairable units) which is off-the-road at any time should not exceed 15 percent by end of the project if support services and condemnation actions of the MSPAS Maintenance Dept. are properly carried out.	10%	12%	15%

Planning	1987	1988	1989
Annual plan of action prepared and submitted	1	1	1
Annual plan prepared and submitted covering insecticide safety measures	1	1	1
Evaluation			
Program-wide evaluation conducted with GOES/A.I.D./PAHO and any donor participant			1

Technical Analysis

Spraying Operations

Application of residual insecticides will be required throughout the life of the project, inasmuch as any reductions in endemicity in current priority areas will permit extension of operations to areas of slightly lower priority. The broad annual plans for such things as numbers of spray cycles are based on accumulated data from field operations. Modifications may be made in field operational areas as local weekly reports are reviewed in group meetings with decentralized delegation of authority for local adjustments.

Insecticide applications will be made in one, two or three cycles. Propoxur will be used during the project period unless the vector becomes totally refractory as shown by entomologic studies. In anticipation, a trial of bendiocarb is scheduled for September 1986. The Malaria Division has estimated that approximately 40 percent of the malaria area still requires some application of insecticide. Focal spraying will be carried out based on local conditions. Epidemiological analyses support estimates that 85 percent of El Salvador's malaria cases come from between 20 percent to 25 percent of the area, where some 26 percent of the country's inhabitants live. Concentrated efforts against that situation thus are justified

The continuing receipt of information from the field on a caserio (locality) basis should permit even more selective use of insecticides. This prospect emphasizes the urgency of filling the epidemiology slot on the headquarter's staff and the benefits from input by a short- term epidemiologist as soon thereafter as possible.

Surveillance

Surveillance of malaria incidence, upon which efficient residual insecticide spraying, larviciding, focal applications and drug treatment rely, depends on passive and active case detection and periodic mass blood surveys. In El Salvador, passive case detection is accomplished by the network of Voluntary Collaborator Posts and by official health installations. The more than 2,500 VCP's have been collecting, during the period 1981 - 1985, between 72.4 percent and 91.5 percent of all slides, accounting for 82.8 percent to 95.1 percent of confirmed malaria cases (see Annex II). A fail-safe distribution of drugs, slides, lancets and report forms must be maintained if this volunteer system is to provide its invaluable service. Most of the collaborator posts now lack the simple box needed to hold their critically-needed supplies. Official health services have only been taking between 4.2 percent and 9.7 percent of slides -- figures which indicate much room for improvement. Active case detection plays an important role in a malaria eradication campaign, but is of limited value in a control program. This surveillance mechanism, which had been carried out by ever-declining malaria field personnel, was suspended in 1984 in order to use the field personnel for higher priority operations. Field personnel may still take slides and distribute antimalarial drugs, but the activities occur mostly on a humanitarian basis when febriles cannot be referred to the VCP's. Periodic mass blood surveys are useful for a more precise knowledge of the parasites in a given area. In field research areas they are essential in monitoring the effectiveness of trials involving source reduction or insecticides.

Research

Studies of three problems adversely affecting the malaria program merit the title of "operational research." They are a study of source reduction through salinity control in estuaries and lagoons; the study of early loss of residual insecticides effectiveness on some house construction materials in rural El Salvador; and the practical use of bendiocarb as a residual insecticide if *Anopheles albimanus* becomes completely refractory to propoxur.

Source Reduction in Estuaries by Salinity Control

Anopheles albimanus thrives in mildly brackish estuaries and lagoons from Suchiate in southern Chiapas, Mexico to the coastal areas of Nicaragua. The anopheline larvae cannot tolerate high

salinities (sea water) but do well in fresh and mildly-brackish water. Control of anopheline breeding by installation of tide gates succeeded in controlling Trinidad's coastal malaria vector (An. aquasalis) in the early 1940's but attempts to exploit this weakness of anopheline biology have not been investigated in Central America. Preliminary steps have been taken toward an engineering project in Estero Ticuiziapa near La Libertad which would in effect improve on a practice used for years by ranchers in that area: they avoid the excessive flooding of pastures bordering the estuary and avoid a mixture of fresh and sea water to the point of favoring anopheline development. The Malaria Division is interested in monitoring the densities of A. albimanus larvae and adults and any subsequent effects on malaria in adjacent communities. Anopheline densities are already being studied by dipping for larvae and by the use of light traps for capturing adults. Major equipment required is a reliable salinometer for use by the entomologists. Bi- or trimesteral blood surveys should be made in the adjoining population.

Duration of Residual Effectiveness of Insecticides on Locally Used Construction Materials

When use of intradomiciliary residual spraying is considered in a malaria program, the first concern is the susceptibility of the target vector to the insecticide. Once the insecticide is applied to the house construction materials in common use, the next concern is the period during which the deposit on the wall will continue to kill the vector mosquitoes. This "duration of effectiveness" is determined by exposing susceptible mosquitoes to the on-wall deposits for a given time, and recording the mortality among those mosquitoes. Many tests have been carried out by the Malaria Division, checking mortality after exposure to deposits of various insecticides on various substrates. The results have indicated very limited duration of effectiveness on the more common construction materials, with slightly longer effectiveness on wood, which is a less prevalent construction material in rural houses. More exhaustive studies are needed, starting with anophelines of fully-confirmed susceptibility to the insecticides being tested, deposits of well-determined dosages, and exposure cones and other artifacts absolutely free of contamination. Tests can be executed during the assignment of the short-term entomologist consultant. New, clean test kits should be ordered from WHO well in advance.

Testing of Bendiocarb as a Possible Substitute for Propoxur

The Malaria Division director has already arranged to test this candidate material in September 1986. Such a trial may questionably be labeled "research," although procedures involved must be carried out with great precision.

Health Education

Health education designed to increase the understanding, cooperation and participation in the program at the community level is as important as the technical operations of vector control, case finding and treatment. Because it is relatively difficult to achieve and measure results in this area, health education is ofter neglected in malaria programs. The Malaria Division recognizes the importance of health education and is attempting to strengthen that component of the programs. The Division is handicapped by a shortage of trained health educators assigned to the program. Progress in reducing malaria, maintaining low levels, and finally eliminating malaria as a public health problem will require a greater health education effort than when the disease constituted a greater threat.

Training

Although there is a continuing need for more basic training in malaria control and for refresher training at all levels, this project is not designed to assist in meeting those needs. However, significant input will be made during technical assistance assignments. A major portion of the effort of the short-term consultant in epidemiology will be the orientation of the national officer will fill the post of Chief of the Epidemiology Section of the Malaria Division upon his return from the malariology course in Maracay, Venezuela. Similarly, the short-term consultant in entomology, while upgrading entomology procedures for routine field work and for operational research tasks, will give hands-on training to senior entomology personnel and to entomology aides.

Biological Control

In the past, the national malaria program has explored two aspects of possible biological control methods: larvivorous fish and herbivorous fish that might be useful in keeping drainage ditches, canals, ponds, and lakes clear of vegetation that provides protection for mosquito larvae. No local species of fish offered promise as an herbivorous agent for maintaining clean surfaces of aquatic environments. Of the local fish

disposed to feed significantly on mosquito larvae, all were sought by people who used them as "minnows" for fishing for larger species, or added them as delicacies to sometimes monotonous diets. No attempt was made to import fish from outside the country and to submit them to lengthy trials required before their release in the local environment.

The microbial insecticidal products (based on Bacillus thiringensis, SH-14; or B. sphaericus) have received considerable attention in recent years and have been widely tested. Their consideration for use in this program would depend on demonstrated success against An. albimanus in trials that are being conducted elsewhere in Central America and Mexico.

Insecticide Handling Procedures

Strict safety procedures are required for carbamate compounds (propoxur). Workers must be trained and supervised when using this material. Continuous follow-up and supervision of spraymen are critical. Having passed through stages of applying dieldrin, DDT and fenitrothion, as well as propoxur, malaria personnel have become accustomed to, but not complacent about, handling such materials. Propoxur is received already packaged and in pre-weighed amounts. Protective gear is provided to all spraymen. Emphasis is placed on the procedures used in safely applying insecticides at the village level to insure that spraymen and villagers are not subjected to any undue health hazard.

The Abate (temephos) applied as a larvicide on mosquito breeding sites, and the 'Ponce' (permethrin) used for ultra low volume spraying are among the safest biodegradable pesticides available. However, malaria control personnel are trained in their proper use.

Environmental Analysis

An Initial Environmental Examination (IEE) was submitted with a negative recommendation for the three insecticides currently in use (propoxur, temephos and permethrin). Trials with bendiocarb are scheduled for September 1986 for its possible use as a backstop to propoxur if anopheline susceptibility to propoxur deteriorates. Prior to any field use of bendiocarb, IEE an will be made and submitted.

The Malaria Division will only carry out studies on anopheline biology and malaria incidence reduction associated with the source reduction procedures and will not carry out

engineering procedures for salinity control in estuaries. The presently-designed engineering input is in effect, only a mechanical action to obtain objectives long carried out manually by ranchers and other residents of the area. No adverse environmental effects of this action can be foreseen.

Women in Development

This project has both direct and indirect impact of the status of women. Direct benefits will accrue to female malaria and general health workers, researchers, health educators and volunteer collaborators who will improve their knowledge and skills as a result of the technical assistance and training to be provided under this project. At present, approximately 8-10 percent of the voluntary collaborators in the villages are women. The Division of Malaria reported that women perform very well as volunteer collaborators because they are more available to the public. Indirect benefits resulting from program evaluation findings will permit all service providers to implement an effective malaria control program. Most importantly, the recipients of services of the project will include all females in the population. The increased participation of females in surveillance activities as both recipients and providers of malaria control services is result of this project.

Long-Term Sustainability and Impact

If successfully executed, the project will assist the GOES in changing from a program emphasizing a total coverage house-spraying to an integrated program utilizing a selective mix of vector-control measures and a better balance between active and passive case detection and treatment methods. Progressive reduction of malaria transmission by vector control and radical drug treatment for humans will reduce the geographical area to be actively controlled, thereby reducing the administrative and financial costs of the program. Successful execution will depend on a number of key variables, including vector resistance to the insecticides used, epidemiologically accurate direction of spray operations, cooperation and participation of the general public and general health service staff, continued reduction in the incidence of *P. falciparum* malaria, and expanded use of feasible alternative control measures.

Summary

The malaria control component of this project is judged to be technically feasible and sound. The project design provides appropriate and sufficient technical assistance. The program's operational research participation in the innovative estuary source reduction trial may prove beneficial not only to El Salvador's malaria program, but to other countries where similar problems exist in Pacific coastal areas. The commodity, technical assistance and training components will help implement an effective and technically sound program of malaria control. Without the assistance extended in this project component, the general health and malaria services may be unable to avoid an early resurgence of malaria.

PROJECT SUB-COMPONENT DESCRIPTION - MALARIA CONTROL

Outputs

The project sub-purpose will be achieved by: (A) supporting and increasing the capability of the national and operational areas services to effectively control malaria; and, (b) assisting the Division of Malaria to move more rapidly to an integrated program utilizing a selective mix of vector control methods and a better balance between passive case detection and treatment methods. Successful fulfillment of the project's purpose will be reflected by completion of the following outputs.

1. Annual house-spraying programs are targeted specifically to highly or moderately endemic areas based on sound analysis and careful stratifications.

2. As a regular part of their duties, senior and mid-level health personnel at health institutions undertake surveillance, including taking blood smears and administering appropriate drug treatment.

3. Criteria for selection of appropriate insecticides (propoxur, fenitrothion or other insecticides) are developed and applied in the program.

4. Appropriate and effective biological control methods have been identified from field trials and are implemented where appropriate.

5. The Division of Malaria's training programs meet the priority needs of the GOES's malaria control program.

6. Health education activities expand and increase social acceptance of house spraying and surveillance activities.

7. A detailed plan of action for 1987, 1988 and 1989 (covering the period of the A.I.D. project) for malaria control is prepared and adopted by the GOES and PAHO.

Project Components

The malaria control component of the project consists of three elements: (1) Technical Assistance; (2) Operational Research, and (3) Commodity Supply.

Technical Assistance

In order to effectively control malaria, the GOES malaria control effort will require intensive surveillance and possible modifications in program strategy and activities over the life of the project to respond to a changing vector-human-insecticide environment.

The program plans to provide the following technical assistance:

Malaria Control Officer: Duration of Project (local hire contract)

This officer will be primarily responsible for monitoring the U.S. commodity input in the field to insure that the GOES in its spraying operation, uses proper health safeguards to protect the environment, malaria personnel, and the public. (A scope of work is included in this report.)

Epidemiologist: 1 month (U.S. source)

This officer's principal responsibility will be the orientation and training of the Chief of the Epidemiology Section (scope of work is included in this report).

Entomologist: 3 months (U.S. source)

This specialist will determine the basic entomological procedures for assessment of anopheline aspects of the estuary source reduction effort and will upgrade techniques for bioassay studies of the duration of effectiveness of insecticides deposited on walls constructed of native materials.

Technical assistance will include (1) program monitoring, (2) upgrading control methodologies currently in use or alternatives to same and (3) training personnel in operation and maintenance of U.S. - supplied equipment.

Training

All training will be in-country on an in-service basis, including the orientation and training provided by the epidemiology and entomology specialists during their one and three-month assignments, respectively.

Commodity Support

Insecticides

Antimalarial activities in El Salvador, as in many other countries, depend largely on residual insecticide house-spraying to interrupt malaria transmission. In some rural areas in particular, no other suitable mechanism currently exists which can provide comprehensive protective coverage of the population. Widespread vector resistance has developed to DDT, the internationally recognized insecticide of first choice, as well as to malathion. Resistance to propoxur, the carbamate in use in selected areas, is being monitored.

The amount and type of insecticides required is determined by the Matriz Division/GOES an analysis of extensive field data collected by means of geographical reconnaissance (GR) of operational areas and its relationship to epidemiological findings. This information includes the area of sprayable interior surfaces, the number of houses and occupants, and malaria case rates. Under the present selective spraying approach, only areas in the first priority areas are targeted for spraying. Once the areas are identified and the most effective insecticide is chosen for each area, the amounts of insecticide required are computed in accordance with standard dosages and the extent of sprayable surface.

In addition, there is a requirement for larviciding materials. The compound "Abate" is the one of choice. It is formulated in both 1 percent granules and Emulsifiable Concentrate (EC).

Antimalarial Drugs

The project plans to procure approximately 850,000 360 mg. tabs for the next years. At present, there is no indication of chloroquine resistant parasites in the country.

Equipment

To provide focal relief from malaria, the project will require in each of the years 1987 and 1988 some 5 truck-mounted ULV and pick-ups to carry them to remote areas. One hundred 3-gallon Hudson hand compression-sprayers (50 in 1987, 25 in 1988, and 25 in 1989) with pressure gauges are needed. It is imperative that these be X-Pert sprayers of the same type now in use to prevent serious problems in training and use of spare parts.

PERSONS CONTACTED

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Country Representative
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Engr. Víctor Pou
Malaria Advisor
Pan American Health Organization

ADDITIONAL AUTHOR'S NOTES

PROJECT RATIONALE

Given the nature of malaria and its capacity for resurgence, the ability of vectors to develop resistance and the likelihood of re-infection from neighboring countries, control of malaria is essential for the orderly social and economic development of the country. The tremendous problems, significant cost in human suffering and economic loss related to malaria are sufficient to justify this component of the project. In addition, malaria control is important in all sectors of A.I.D.'s development efforts in El Salvador since such success relies on a healthy, productive labor force.

In addition to meeting the urgent requirements for insecticides, antimalarial drugs, and equipment of which the country is in dire need, the project is designed to support the GOES in its efforts to reduce recurrent and foreign exchange costs by:

A. Using alternative malaria control methodologies such as source reduction to reduce the geographic area that must be actively controlled by insecticides. This in turn will reduce foreign exchange costs; and

B. Supporting a comprehensive study of the epidemiological situation in order that a rational long-term plan can be developed rather than the ad-hoc planning and program operation which is now occurring.

This project component is entirely consistent with the agreed upon strategy and objectives of the present economic assistance program to El Salvador.

EVALUATION PLAN

A mid-term evaluation will take place during the last two weeks of May, 1988. The final evaluation will be scheduled by the USAID mission after the PACD. The evaluation will be made by GOES, A.I.D./W, USAID and PAHO representatives.

In addition to measuring specific progress achieved against the specific yearly output indicators for the project, the mid-term and final evaluations will assess and provide recommendations on the following aspects of the National Malaria Program.

a) Staffing and administrative procedures at Malaria Division Headquarters and in operational areas

b) Quality and quantity of laboratory services

c) Volunteer Collaborator Program

d) Condition and maintenance of vehicles, motorcycles and spray equipment

e) Epidemiological quality in the stratification process including surveillance, passive and active case detection, health institution participation, drug treatment, follow-up, etc.

f) Utilization of insecticides, antimalarial drugs, and related logistic and supply procedures

g) Spray and larviciding operations, including coverage and efficiency

h) Entomological studies and resistance problems

i) Training

j) Health education and community participation

k) Insecticide handling and safety measures

The evaluation will be conducted on the basis of field trips, interviews with personnel at various levels, administrative and technical reports, PAHO reports both within El Salvador and at the WHO Regional Office, and documents in the USAID office.

CONDITIONS PRECEDENT, COVENANTS, SPECIAL CONDITIONS

1. Conditions Precedent

The GOES, through its Division of Malaria MSPAS, shall furnish to A.I.D. in form and substance satisfactory to A.I.D. assurance that the two health officers who are in special training in the malariology course in Maracay, Venezuela shall, upon satisfactory completion of that course, occupy essential posts in the Division of Malaria, MSPAS.

2. Covenants

a) The GOES, through the Division of Malaria, shall prepare an annual plan detailing safety measures and procedures to be followed in the application of all insecticides used in the program. The plan shall be completed by December 4 of FY 1986 and FY 1987, and copies provided to A.I.D.

b) The GOES shall take appropriate safety measures for the use of insecticides furnished under this project, including the provision of safety equipment to insecticide handlers and training of spray personnel engaged in actual application or field supervision. The GOES shall also maintain rigid control over the quality of the insecticides procured for the program to ensure that they meet WHO and A.I.D. technical specifications.

Recommendation

If the A.I.D. is to continue its support to malaria control efforts in the country, that assistance should be based on a Plan of Operation which has been approved by the GOES and PAHO.

ANNEXES

I. Map: Hyperendemic Area, Priority 1

Ia. Houses Sprayed During 1985

II. Comparative Surveillance System Production of Blood Smears

III. Annual Parasite Incidence

IV. *Plasmodium vivax* and *Plasmodium falciparum*: Proportions by Year

V. Map: Distribution of Voluntary Collaborator Posts

VI. Map: Areas Where Propoxur is Used for Intradomiciliary Spraying

VII. Organization Chart of the Malaria Division

VIII. Manpower (Personnel) Employed: 1983 - 1986

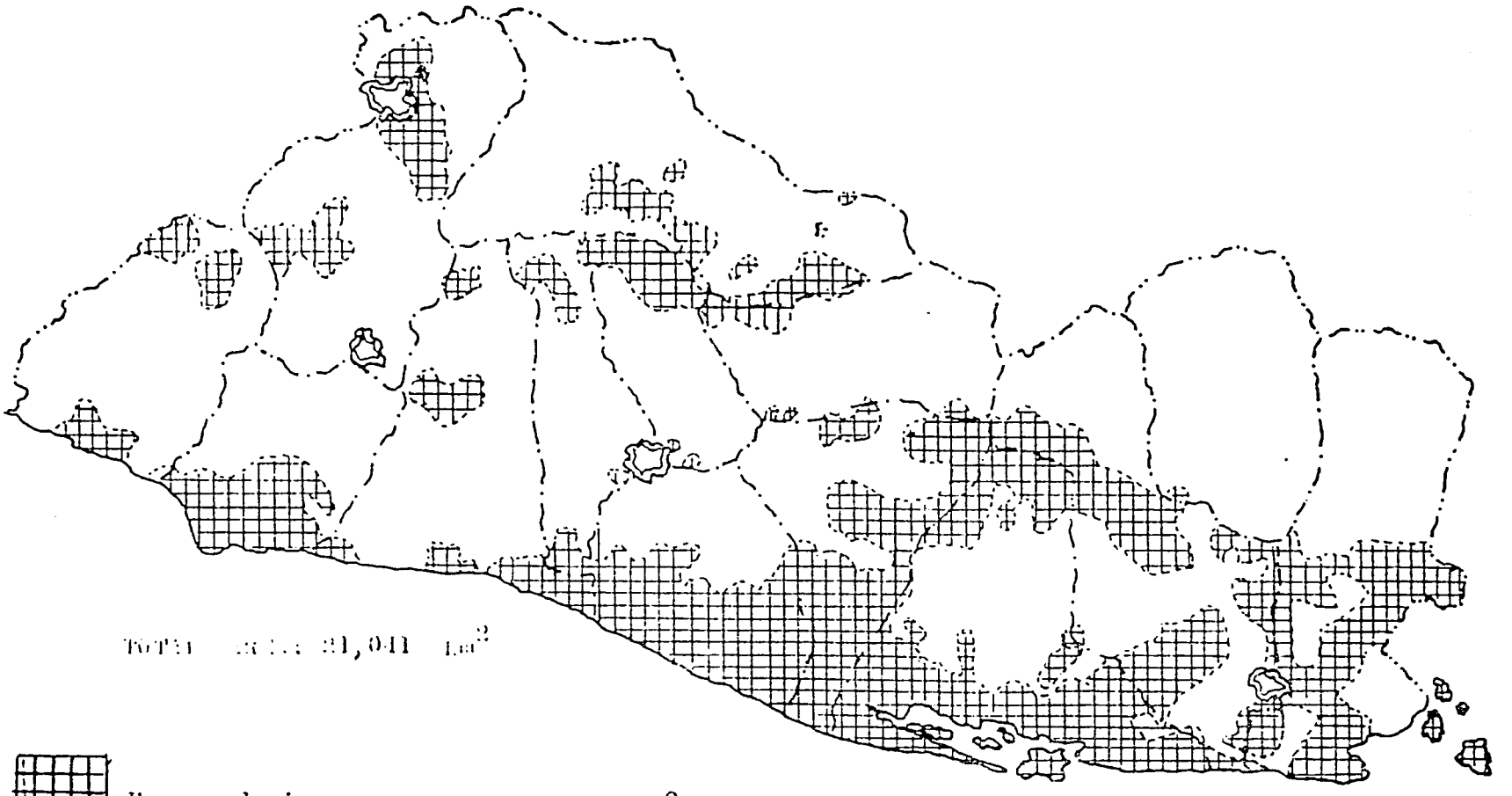
IX. Work Plan for 1986, Division of Malaria

X. Coordination with Agencies Effecting Displaced Persons Projects

XI. Malaria Division Vehicles

XII. Specifications for Commodities for Malaria Control Component

XIII. Scopes of Work for Technical Assistance



TOTAL AREA: 21,041 Km^2

Hyperendemic area
Priority I

4,819 Km^2

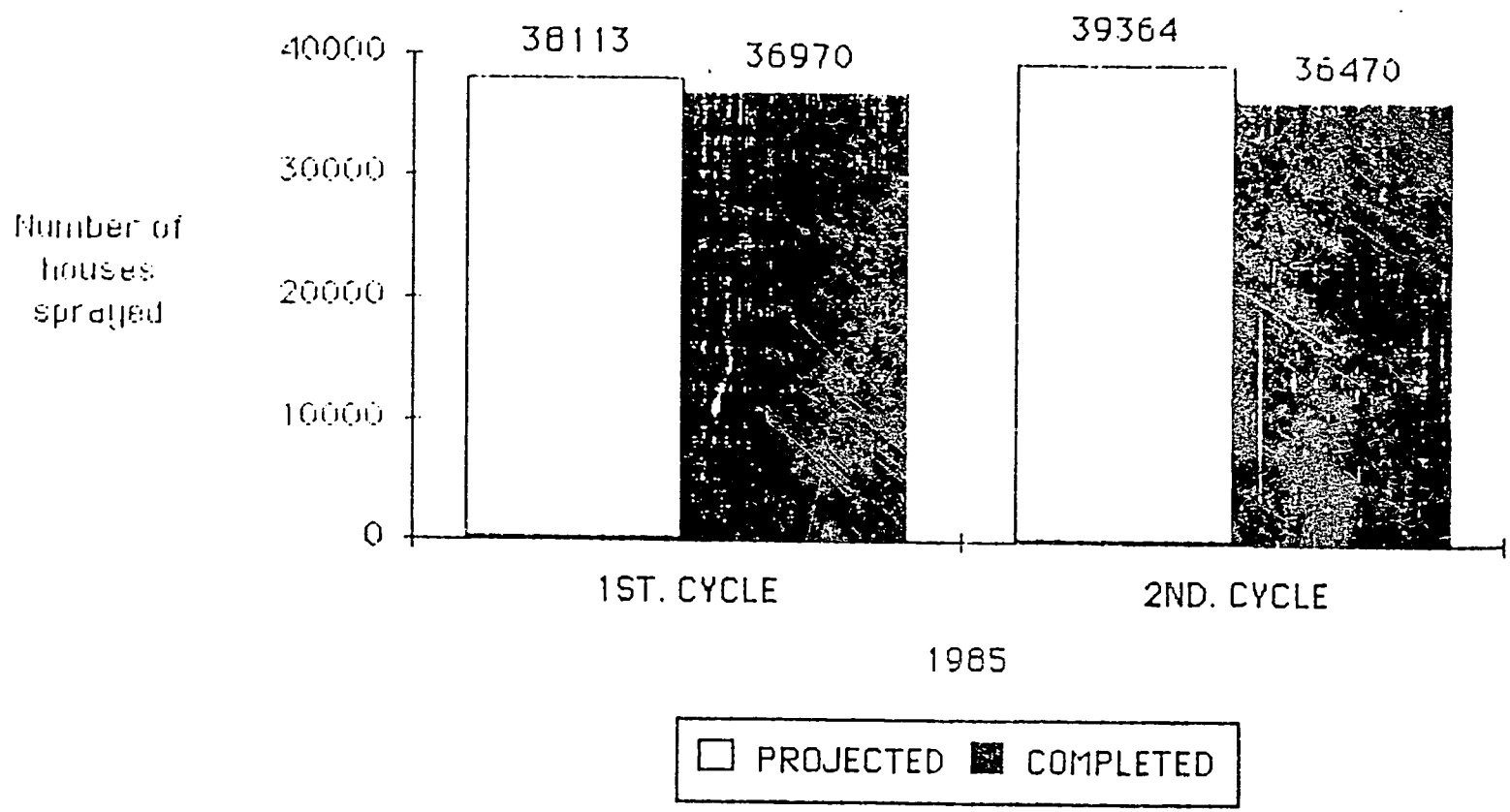
REPUBLIC OF EL SALVADOR

Epidemiologic Definition

Source: Malaria Division

ANNEX 1

NUMBER OF HOUSES SPRAYED DURING 1985



SOURCE: MOH'S MALARIA DIVISION

ANNEX Ia

REPUBLIC OF EL SALVADOR
MINISTRY OF PUBLIC HEALTH AND SOCIAL WELFARE
- MALARIA DIVISION -

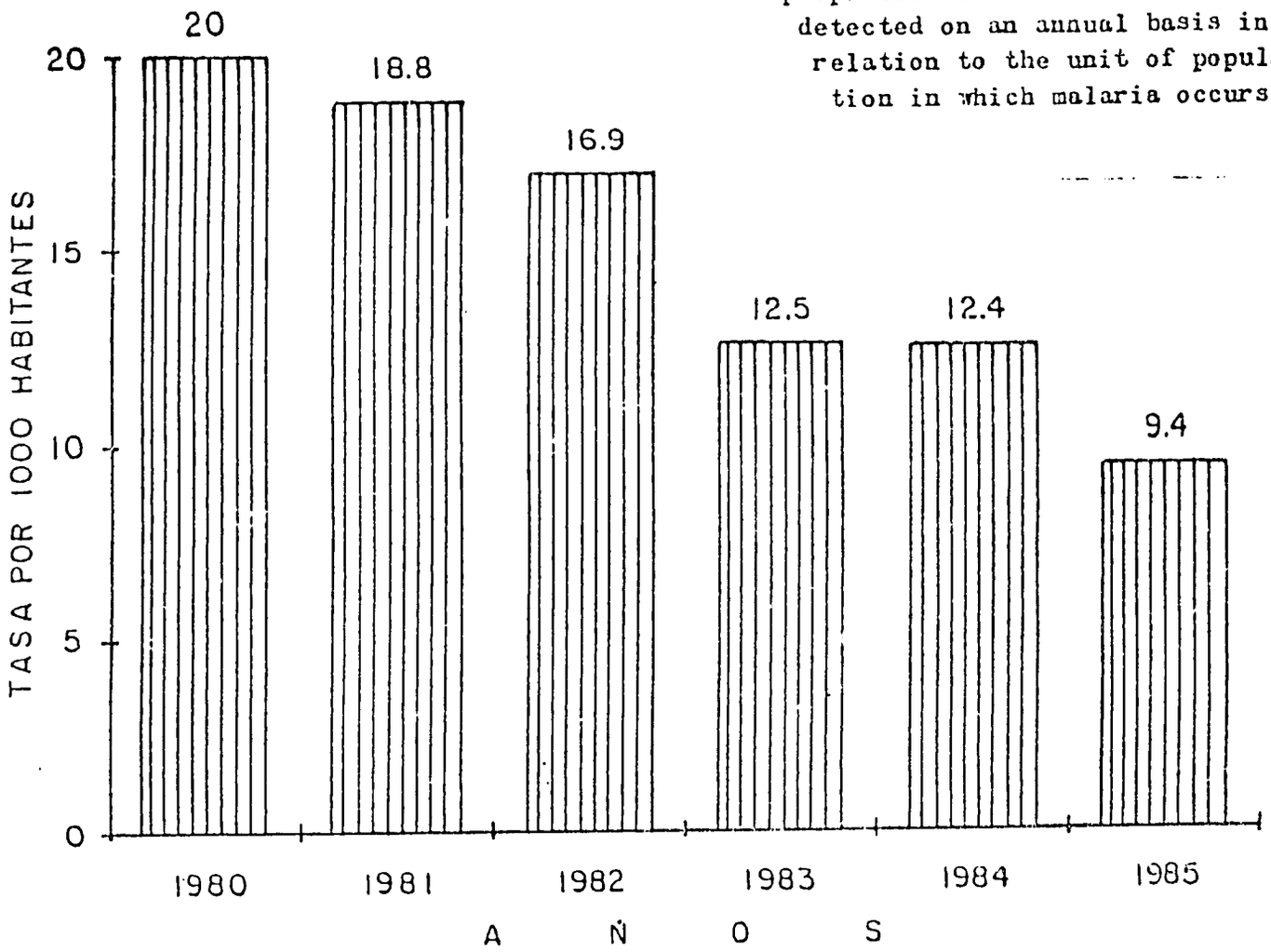
Comparative Surveillance Systems
According to Sources of Blood Slides
Years: 1981 - 1985

YEAR	Voluntary Collaborators				Official Health Services				Active Case Detection				TOTAL	
	Slides	%	Cases	%	Slides	%	Cases	%	Slides	%	Cases	%	Slides	Cases
1981	266,896	72.6	77,718	83.4	49,883	13.5	6,674	7.1	50,668	13.7	8,795	9.4	367,447	93,187
1982	254,434	72.4	71,406	82.8	59,547	16.9	8,391	9.7	37,445	10.6	6,405	7.4	351,426	86,202
1983	224,127	73.1	55,132	84.3	38,338	12.5	4,659	7.1	44,183	14.4	5,586	8.5	306,648	65,377
1984	237,643	87.9	61,626	92.1	29,038	10.7	4,503	6.7	3,470	1.2	745	1.1	270.156	66,874
1985	184,231	91.5	42,320	95.1	15,794	7.8	1,906	4.2	1,152	0.5	247	0.5	201,177	44,473

FUENTE: SECCION DE ESTADISTICA DE MALARIA.

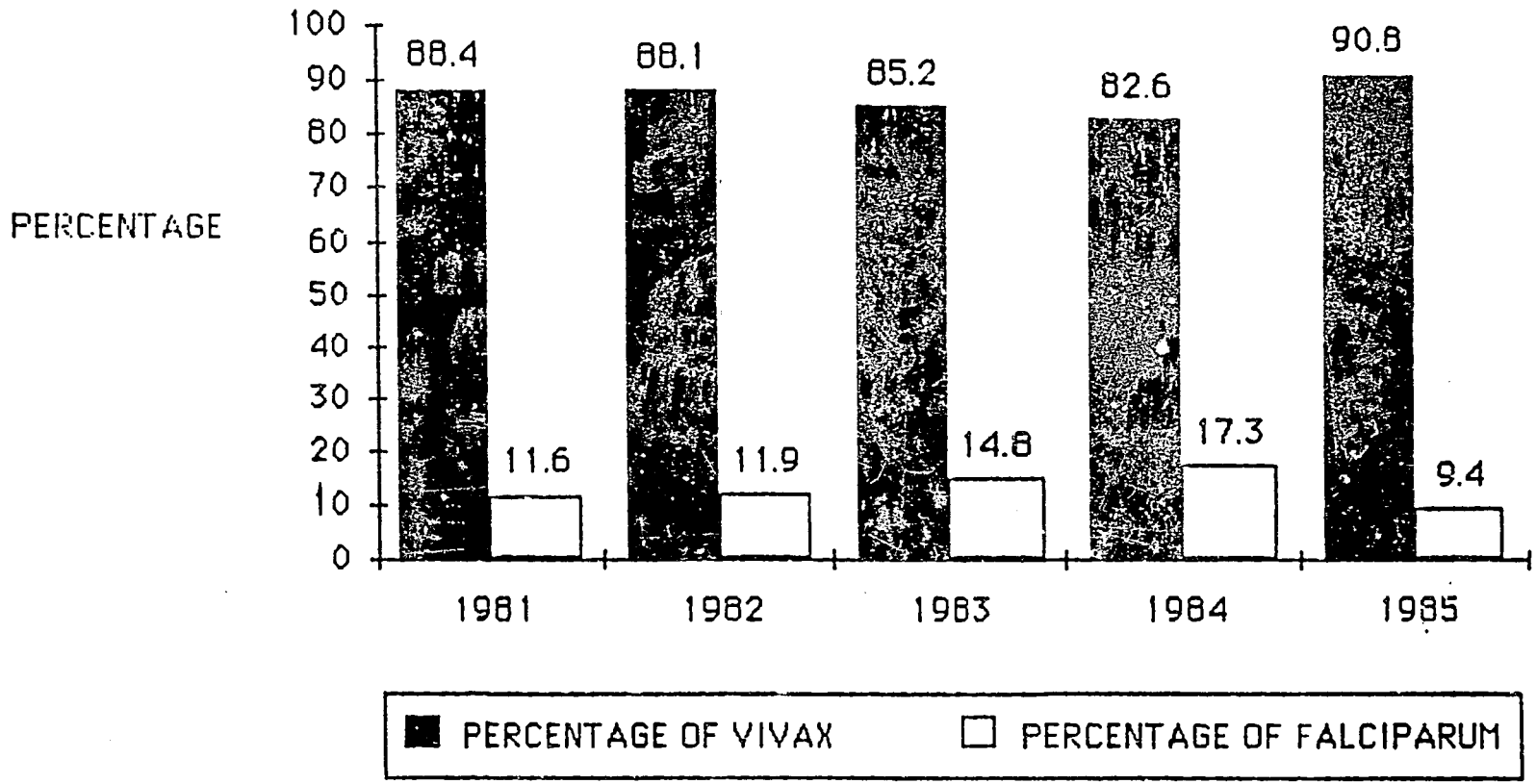
INCIDENCIA PARASITARIA ANUAL POR AÑOS

"Annual Parasite Incidence is the proportion of cases of malaria detected on an annual basis in relation to the unit of population in which malaria occurs".



Fuente: SECCION ESTADISTICA DE MALARIA

P. VIVAX - P. FALCIPARUM
RATIO BY YEAR

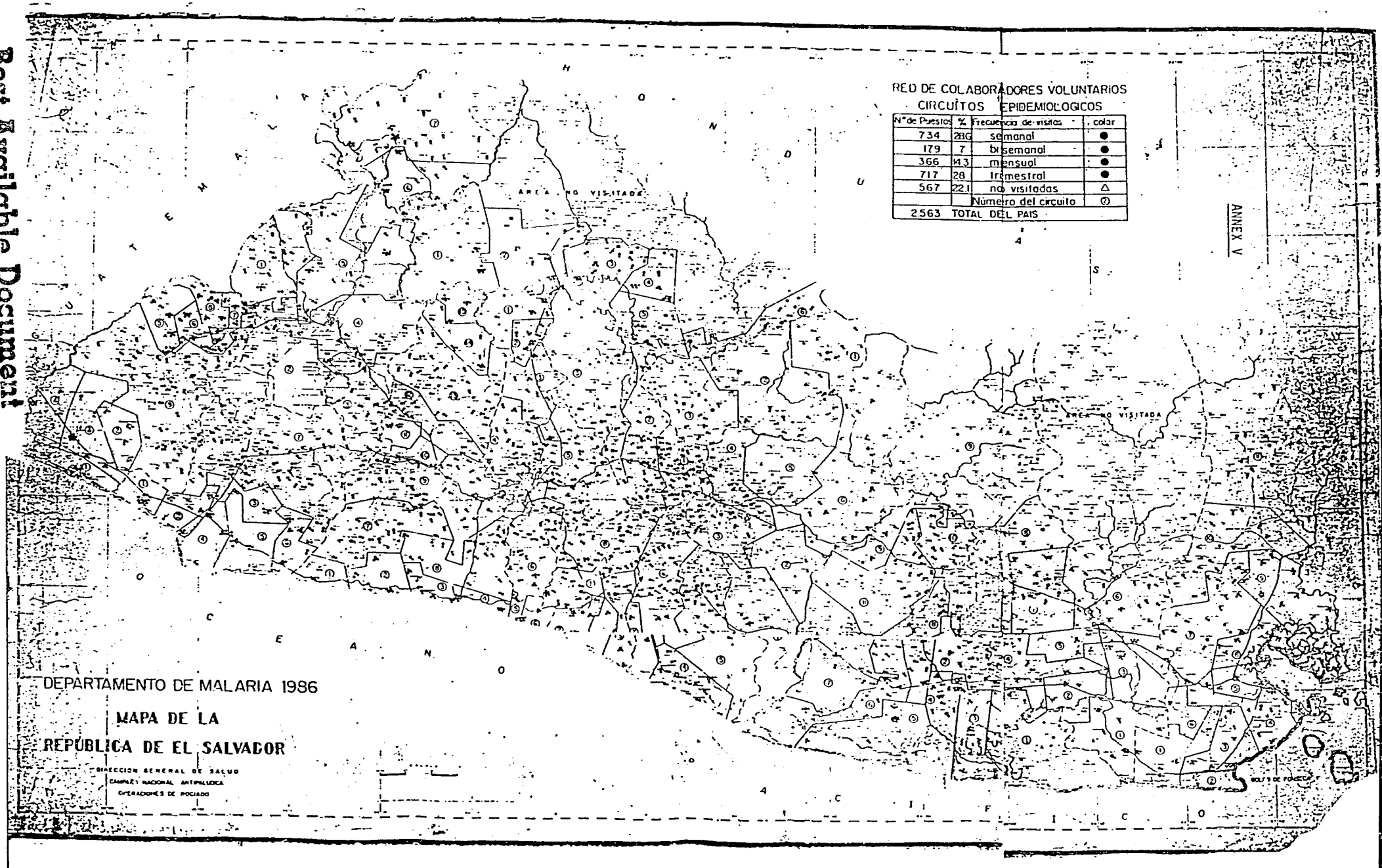


SOURCE: MOH'S MALARIA DIVISION

ANNEX IV

Best Available Document

ANNEX V



Best Available Document

ANNEX VI

DIVISION DE MALARIOLOGIA

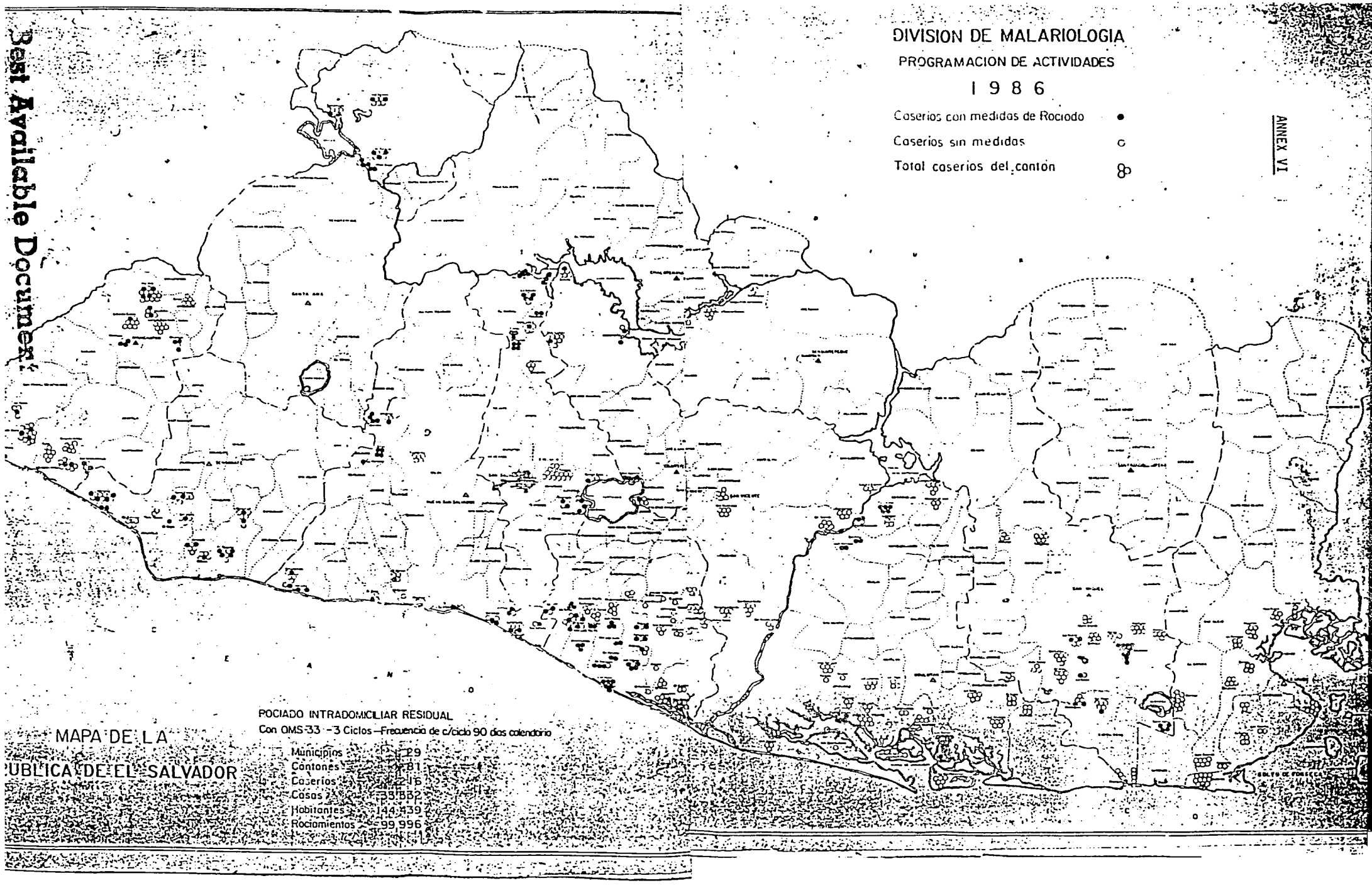
PROGRAMACION DE ACTIVIDADES

1 9 8 6

Caserios con medidas de Rociado ●

Caserios sin medidas ○

Total caserios del canton

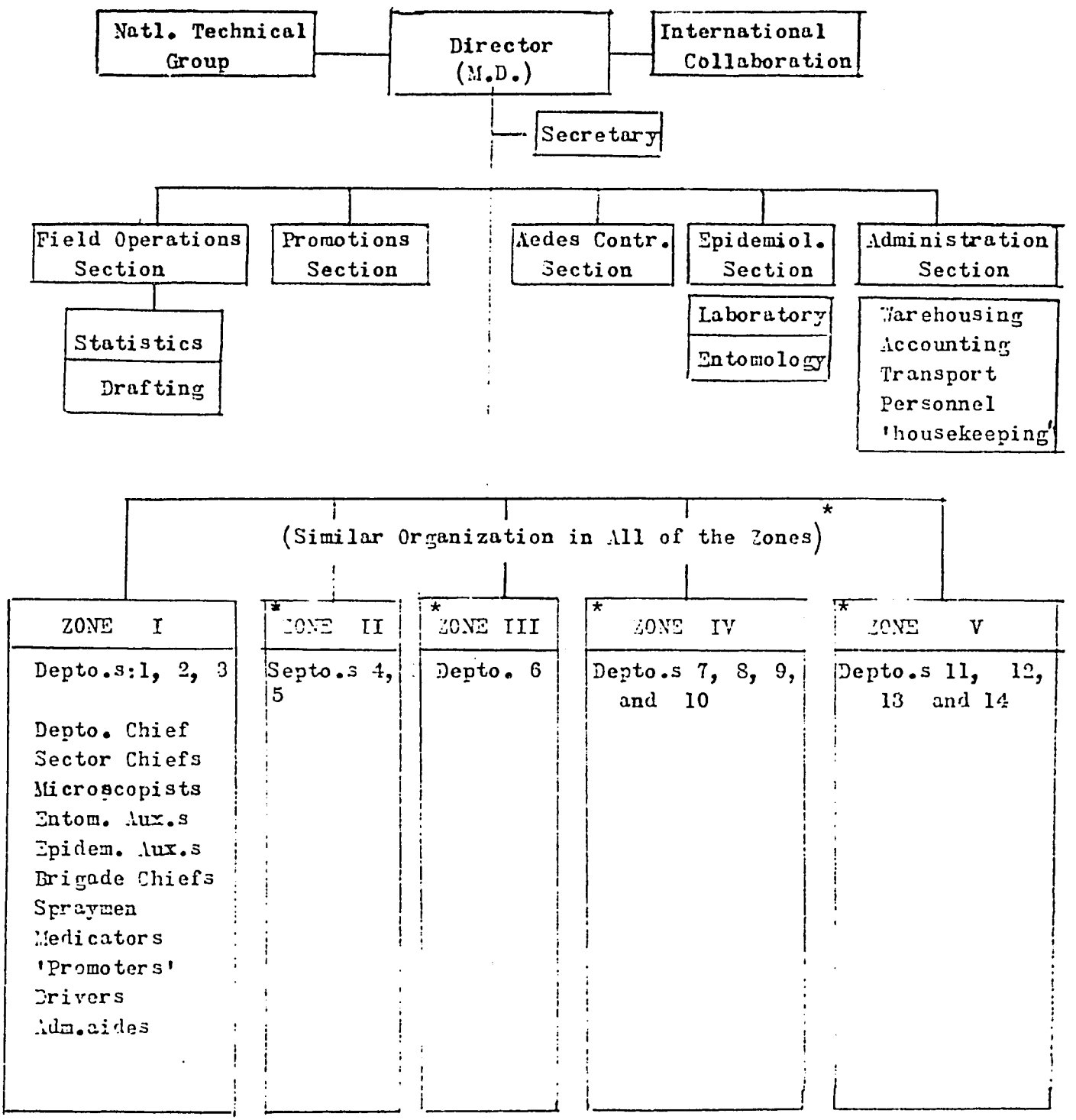


MAPA DE LA
REPUBLICA DE EL SALVADOR

ROCIADO INTRADOMICILIAR RESIDUAL
Con OMS-33 -3 Ciclos—Frecuencia de c/ciclo 90 días calendario

Municipios	229
Cantones	281
Caserios	2 216
Casas	33 832
Habitantes	144 839
Rociamientos	99 996

ORGANIZATION OF THE MALARIA DIVISION (MSPAS)



MALARIA DEPARTMENT MINISTRY OF HEALTH EL SALVADOR

MANPOWER (PERSONNEL) EMPLOYED BY YEAR

Position Title	1983*	1984	1985	1986**
Program Director	1	1	1	1
Technical collaborator	-	-	-	1
Chief for Field Operations	1	1	1	1
Entomologist	1	1	1	1
Administrative officer	1	1	1	1
Chief of Zone	5	5	5	5
Chief of Department	10	10	10	10
Field Supervisor	23	24	24	22
Promoters	5	6	6	9
Spraymen group chief	16	15	19	20
Spraymen and operators	112	109	108	103
Chief of sector	26	25	23	25
Medicators	134	130	115	80
Epidemiology evaluators	81	79	70	101
Entomology evaluators	38	37	39	34
Microscopist	36	35	31	32
Mechanics	4	3	2	2
Secretaries	4	4	3	3
Draftsmen	2	2	2	2
Administrative auxiliaries	5	4	4	4
Warehousemen	3	3	2	2
Tabulators	12	12	12	10
Drivers	39	38	35	35
Laboratory aides	9	9	8	6
Janitors	6	6	6	5
Watchmen	2	2	2	2
Totals	576*	562	530	517

* During 1983, there were 38 additional employees paid under Malaria budget but assigned to other units.

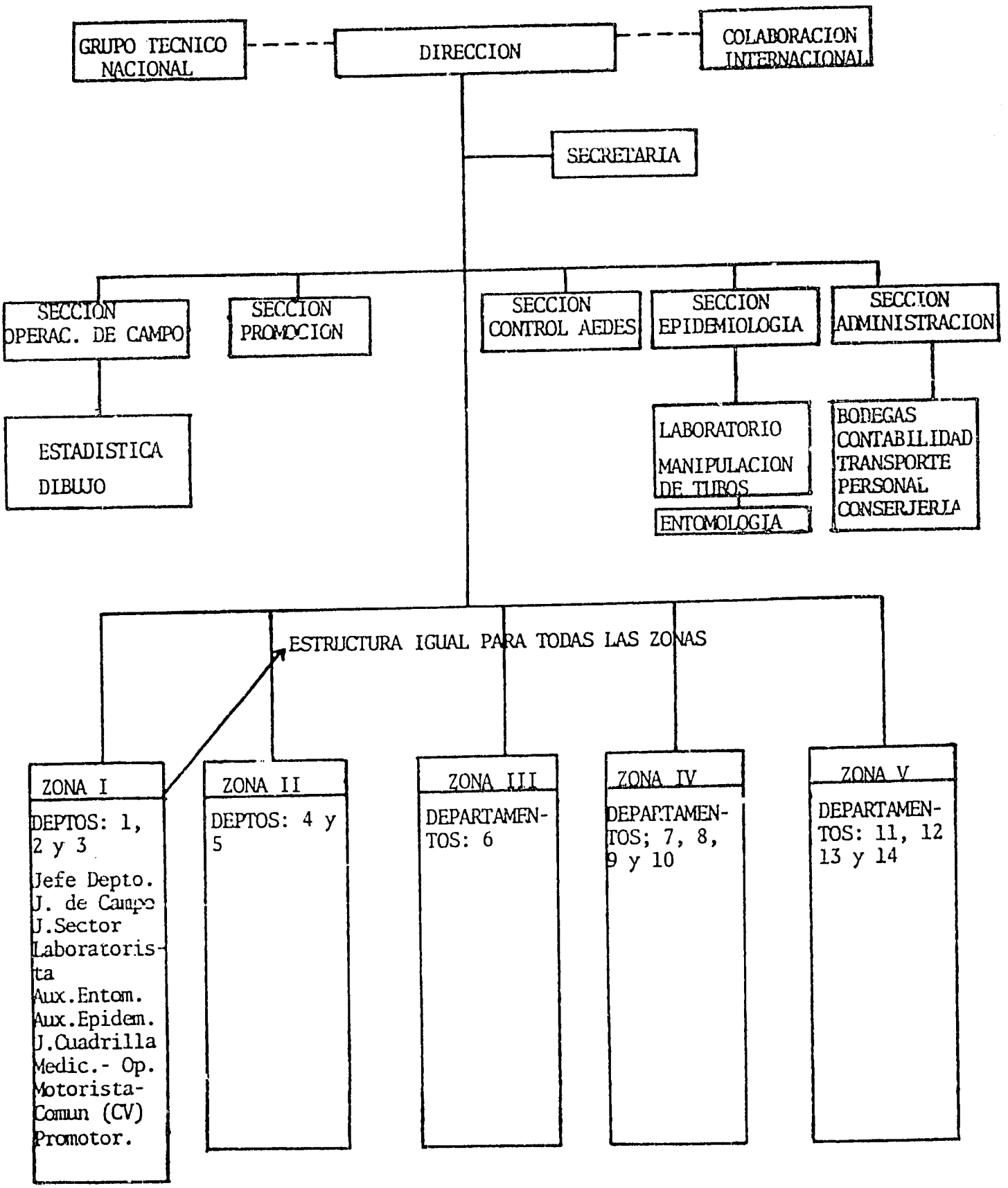
** Employed as of May 31, 1986

Source: Malaria Department MOH.

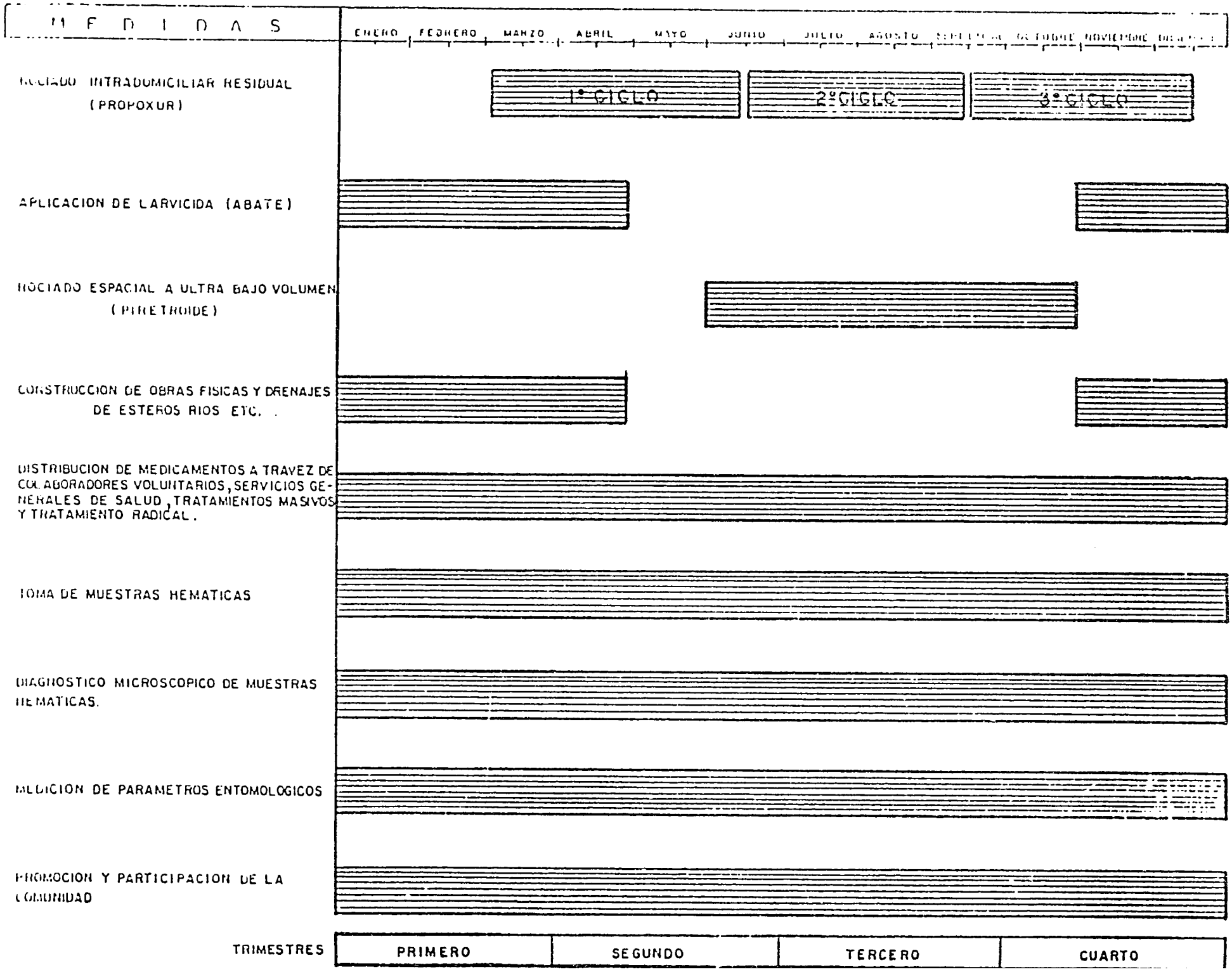
VIII

Spanish Version

ORGANIGRAMA DEL DEPARTAMENTO DE MALARIA



DEPARTAMENTO DE MALARIA
CRONOGRAMA DE ACTIVIDADES 1986



ANEXO IX

MALARIA DEPARTMENT MOH, COORDINATION ACTIVITIES

WITH OTHER ORGANIZATIONS FOR MALARIA CONTROL AMONG DISPLACED POPULATION

Organization	Type of Coordination	Distribution of Responsibilities	
		Malaria Dept.	Organization
Consejo Nacional de Asistencia a la Población Desplazada de El Salvador (CONADES)	Drug Distribution Blood Slide collection Limited larviciding control with ABATE among displaced populations under responsibility of CONADES	Drugs (Antimalaria) Glass Slides Lancets ABATE Training Supervision Blood sample examination	Medical Supervisors (5) Visiting Nurses (15) Collection of samples Drug distribution ABATE Larviciding Data Information
Project HOPE	Drug distribution Blood slide collection among displaced populations under responsibility of Hope	Drugs Blood sample examination Training Supervision	All necessary supplies Resident nurses Auxiliary aids Data Information
Displaced Program USAID (job generation among displaced)	Malaria personnel identifies small water management problems (vector source reduction) to be constructed under displaced labor	Problem identification possible solution and supervision of construction. Promotion of communities involved.	Analyse problem solutions and pays for displaced labor required.
CESAD* Comité Evangélico Salvadoreñ de Ayuda y Desarrollo	Drug distribution Blood slide collection Limited insecticiding and larviciding control Training of new Volunteer Collaborators among displaced populations under responsibility of CESAD	Drugs (Antimalaria) Glass slides Lancets ABATE Training Supervision Blood sample examination	Physician Visiting nurses Collection of samples Drug distribution ABATE larviciding Data information All other supplies required by Volunteer collaboratos.

* Coordination activities with CESAD are under final planning and expected to initiate during end of June.

ANNEX XI

MALARIA DIVISION VEHICLES
(as of June 1986)

Years of Use	No. of Vehicles	Percentage
1	5	
7	8	
8	1	30 (0-9 years)
9	4	
10	25	41.6 (10 years)
12	2	
13	3	
14	1	
15	1	
17	3	28.3 (11-26 years)
18	2	
19	2	
21	1	
23	1	
26	1	
Total	60	

MALARIA VEHICLE STATUS

Status	No.
Functioning	40
Being Repaired	5
Assigned to other units	3
Beyond repair	8
Discarded	4
Total	60

SPECIFICATIONS FOR COMMODITIES FOR MALARIA CONTROL COMPONENT

Subject Area	Unit Description	Quantity 1987	Quantity 1988	Quantity 1989	Suggested Source
1. Insecticide	a. Propoxur (OMS-33), "Baygon" 50% water dispersible powder, prepared in plastic bags of 800 grms.	40,000 Kg.	60,000 Kg.	40,000 Kg.	Mobay Chemical Co. Missouri
	b. ULV Pyrethroid permethrim (Pounce) 5% for ULV spacial applications in 50 gallon metal barrels.	4,000 gal.	4,000 gal.	4,000 gal.	FMC Agricultural Chemical Group. Philadephia.
	c. Abate (Temephos), 1% granules for treating domestic water. 15 Kg. units in cardboard drums.		14,000 lbs.	14,000 lbs.	American Cyanamid New Jersey.
	d. Abate (Themephos), 44% E.C. for use in larviciding in surface water. In 5-gallon metal containers.	1,000 gal.	1,000 gal.	850 gal.	American Cyanamid New Jersey.
2. Anti-Malaria Drugs	a. Chloroquin Diphosphate (150 mg. base) plus Primaquine (15 mg.) tablets. Bottles of 1000 tabs.	4,500,000 tab.	5,500,000 tab.	5,500,000 tab.	Laboratorios Pharmedic San Salvador.
	b. Chloroquin Diphosphate (75 mg. base) plus Primaquin (7.5 mg. base) tablets. Bottle of 1000 tabs. each.	1,000,000 tab.	1,200,000 tab.	1,200,000 tab.	Laboratorios Pharmedic San Salvador.

SPECIFICATIONS FOR COMMODITIES FOR

MALARIA CONTROL COMPONENT

Subject Area		Unit Description	Quantity 1987	Quantity 1988	Quantity 1989	Suggested Source
2. con't.	c.	Chloroquin Disphosphate (300 mg. base) 1000 tabs. per bottle.	50,000 tab.	200,000 tab.	600,000 tab.	General Service Administration (GSA)
	d.	Primaquin (15 mg. base)* Bottles of 1000 (for Malaria treatment).	_____	_____	_____	
	e.	Primaquin (5 mg. base) * Bottles of 1000 tablets (for malaria treatment)	_____	_____	_____	
* Stock enough to cover 3 years.						
3. Spraying Equipment.	a.	ULV Spray Unit (truck mounted) London Air Model HPD with posive drive.	5 ea.	5 ea.	0	London Air
	b.	London Turbo Eliminator, hand portable insecticide fogger light weight, two stage fog generating system.	5 ea.	5 ea.	5 ea.	London Air
	c.	London model 250 Fogger Thermal aerosol fogger two stage turbo-fogger. One cylinder 4 cycle, 12 horse power, gasoline or similar like TIFA model 100E.	3 ea.	0	0	London Air or TIFA square Millington, New Jersey.

SPECIFICATIONS FOR COMMODITIES FOR

MALARIA CONTROL COMPONENT

Subject Area		Unit Description	Quantity 1987	Quantity 1988	Quantity 1989	Suggested Source
3 con't.	d.	Dusting, ULV and larvicid-ing sprayer. Back pack type Birch-mier model micro-niseur sp-71 type N° 308.	20	20	20	
	e.	Spray pumps, 3 gal. capacity with pressure gauge Hudson X-pert N° 67322.	50 ea.	25 ea.	25	H.D. Hudson 500 North Michigan Chicago Ill.
	f.	Nozzle tips for Hudson X-pert 3 gal. sprayer. HSS-8002E-Brass Tee-jet.	2,000 ea.	2,000 ea.	2,000 ea.	Spraying Systems Wheaton Ill.60188
	g.	Nozzle tips for Hudson X-pert Sprayer Cone Jet TX-2-Brass	2,000 ea.	2,000 ea.	2,000 ea.	Spraying Systems Wheaton, Ill.60188
4. Equipment	a.	Table top map white printer 50 inch printing width and 0-30 ft. per minute mecha-nical speed. 110/120 volt, 60 Hz, 4.7 amps. Blu-Ray model 350 or similar.	1	-	-	Blu-Ray Incorporated Essex, Connecticut 06426 U.S.A.
5. Vehicles	a.	Pick-up double cabin (diesel) 3/4 ton.	10	10	10	Ford/American Motors /Toyota
	b.	Jeeps (diesel) 4 WD	5	5	5	American motors
	c.	Motorcycles 125 cc. scrambler 4 cycles.	30	30	30	Honda of America.

SPECIFICATIONS FOR COMMODITIES FOR

MALARIA CONTROL COMPONENT

Subject Area	Unit Description	Quantity 1987	1988	1989	Suggested Source
5. Con't	d. Outboard motor aluminum boat 16 feet long, V shaped bottom for long tail engine use.	2	-	-	CvSA
	b. Outboard motor engine 15 h.p. long tail. Johnson or Evinrude.	2	-	-	CvSA
6. Scientific Equipment	a. Lietz compound microscopes binocular with built-in light source and 10-40 and 100 x objectives and 10 x eyepieces. 110/120 volts AC. and wood carrying case.	20	-	-	LEITZ
	b. Pedometer 25 mile adjustable and belt attachable. Size 1 3/4" diameter. Weight 2 oz. (Catalog N° 1141N).	2	-	-	Bio Quip Products El Segundo Calif.
	c. Altimeter pocket-sized which measures altitude from 0 to 1,000 feet in graduating readings of no more than 25 feet.	10	-	-	Bio Quip Products El Segundo, California 90245.

SPECIFICATIONS FOR COMMODITIES FOR

MALARIA CONTROL COMPONENT

Subject Area	Unit Description	Quantity 1987	1988	1989	Suggested Source
6. Con't	d. Insect aspirator pocket size with cooper intake and exhaust tubes. Mouth-piece 1/4" of latex tubing. Including two 9 dram clear styrene tubes with snap-on caps. as containers. (Catalog N° 1135 A).	50	-	-	Bio Quip Products El Segundo, Calif.
	e. Plastic tubes 9 dram clear styrene with snap-on caps. 1 x 2 3/4" mosquito containers. (Catalog N° 8909).	5 gross	-	-	Bio Quip Products El Segundo, Calif.
	f. Insect vac for collecting mosquitoes from inaccesible spots hand-held portable cordless, 120 volts 60 Hz. 5 watts rechargeable battery operated. (Catalog N° 2820A)	1	-	-	
	g. Portable salinometer for measurement of levels of sea water and dilution of same. Including enough reagents supplies for three years.	1	-	-	Fisher Scientific or Arthur H. Thoms.
	h. WHO Standard Insecticide susceptibility test kit, including impregnated papers for proporxur and permethrin insecticides.	50	50	50	World Health Organization Geneva Switzerland.

SPECIFICATIONS FOR COMMODITIES FOR

MALARIA CONTROL COMPONENT

Subject Area	Unit Description	Quantity 1987	Quantity 1988	Quantity 1989	Suggested Source
6. Con't	i. WHO Bioassay test kit (with cones, etc) to determine duration of effectiveness of insecticide residues.	50	50	50	World Health Organization Geneva, Switzerland.
	j. Dropping pipette with rubber bulb 4 1/2" (Catalog N° 4775)	4 dozen	-	-	Bio Quip Products El Segundo, Calif.
	k. Collapsible cages for mosquito breeding, lightweight aluminum frame and 16x18 mesh. Size 24x24x24 inches. (Catalog N° 1450 D).	10	-	-	Bio Quip Products El Segundo, Calif.
	l. Polypropylene slide box for 25 (3x1") microscope slides with snap on cover numbered 1 thru 25. Size 4 1/2x3 1/4 x 1 1/4". (Catalog N° 6125)	42 dozen	-	-	Bio Quip Products El Segundo, Calif.
	m. Mosquito larvae dipper. Plastic 5 inches in diameter with pour spouts and graduated measurements in metric systems with a 3 foot 5/8 in. wooden handle. (Catalog N° 1132).	50	-	-	Bio Quip Products El Segundo, Calif.
	n. Extendable handle for mosquito larvae dipper. Telescopic, light weight aluminum 37" long when collapsed and 67" when fully extended. Diater 3/4" (Catalog N° 1131H).	25	-	-	Bio Quip Products El Segundo, Calif.

SPECIFICATIONS FOR COMMODITIES FOR

MALARIA CONTROL COMPONENT

Subject Area	Unit Description	Quantity 1987	Quantity 1988	Quantity 1989	Suggested Source
6. Con't	o. Mosquito breeder, clear styrene quart-sized containers 8 3/4" and 4 7/8" in diameter. (Catalog N° 1425).	24	-	-	Bio Quip Products El Segundo, Calif.
7. Other Supplies	a. Medicine cabinets made of plywood 39.30 x 26.60 x 17.10 cm. with metal handle and painted with MOH caption.	2500			Made under contract in El Salvador.

BASIC ENTOMOLOGICAL EQUIPMENT AND SUPPLIES NEEDED BY MALARIA DEPARTMENT MOH

Unit Description	$ Cost/Unit	Quantity	$ Total Cost	Catalog No.	Suggested Source
Equipment					
Microscope stereozoom 5 power, continously variable magnification (zoom) with 10x wide field eyepieces giving magnification of 8x to 40x.	1,216.00	5	6,080.00	BL 31-26-30 84	Fisher Scientific
Nicholas Illuminator to be used with stereozoom microscope to backlight transparent specimes with 3 step transformer and tungsten lamp 120V. 50/60 Hz.	106.00	5	530.00	BL 31-33-05 28	Fisher Scientific
Tungstene lamp 120V. 50/60 Hz replacement for Nicholas Illuminator type	10.00	24	240.00	?	Fisher Scientific
Starlite tungsten illuminator to use with stereostar/zoom with 6,5V 20W tungsten lamp.	104.00	2	208.00	AO-363	Fisher Scientific
Replacement lamps for starlite illuminator 6,5V 20W tungsten	9.50	12	114.00	AO-1033	Fisher Scientific
Linear micrometer for wide field eyepieces divided into 0.03mm.	30.00	2	60.00	BL-31-16-69	Fisher Scientific
Sling Psychrometers Model SAC with built-in slide rule. Telescoped instrument 2.5 cm. dia. x 19 cm. long.	39.18	6	235.08	11-664	Fisher Scientific
Wicks for SAC Sling Psychrometer	4.77/pack of 4	25 packs	119.25	11-664-4	Fisher Scientific
Mercury thermometer 30° to 110°F replacement for wet or dry bulb	10.37	1	10.37	11-664-2	Fisher Scientific

Unit Description	$ Cost/Unit	Quantity	$ Total Cost	Catalog No.	Suggested Source
Thermometer in wooden case for immersing or floating horizontally in liquids 20° to 220°F range.	19.50	2	39.00	15-115-A	Fisher Scientific
Indoor/Outdoor wall thermometer - 60° to + 55°C.	65.00/ Pack of 12	1 Pack	65.00	15-127	Fisher Scientific
Glass tubing cutter. Griffin-type. Steel wheel with zinc alloy body.	9.25	2	18.50	11-340	Fisher Scientific
Steel cutting wheels for Griffin-Type glass tubing cutter	12.50/ Pack of 10	1 Pack	12.50	11-345	Fisher Scientific
Forceps Medium-pointed curved, serrated tips, chromed 115 mm. long	40.50/ Case of 10	3 Cases	121.50	08-882	Fisher Scientific
Supplies					
Disposable Seal Tight Petri Dishes 50 x 9 mm. Polystyrene	101.10/ Case of 500	2 Cases	202.20	08-757-105	Fisher Scientific
Glass sample vials with rubber lined caps. 16 x 50 mm. capacity 7,4 ml. Borosilicated glass vial with screw cap	107.22/ Case of 576	2 Cases	214.44	03-340-1C	Fisher Scientific
Glass tubing pyrex brand OD 10 mm.	120.25/ Case of 150 pieces	1 Case	120.25	11-365H	Fisher Scientific
Plastic slide boxes for 25 microscope slides	248.40 Pack of 72 boxes	1 Pack	248.40	03-450-5	Fisher Scientific

Unit Description	$ Cost/Unit	Quantity	$ Total Cost	Catalog No.	Suggested Source
Tubing tygon clear ID. 9.5 mm. wall thickness 1.6 mm.	45.45/ Pack of 50 feet.	5 Packs	227.25	14-16910	Fisher Scientific
Deepers plastic clarke capacity 350 ml.	?	50	?	312-894-200	Mosquito Control Service and Supplies P.O.Box 288 Roselle Ill. 60172

TOTAL AMOUNT $8,865.74

* Most of items descriptions and prices were selected from the Fisher Scientific Catalog for 1986.

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SCOPES OF WORK FOR TECHNICAL ASSISTANCE

1. Title of Position/Consultant

   A. Level of Consultant Grade - Malaria Control Officer
   B. Source of Consultant - Local Hire, senior grade
      - San Salvador

2. Education, Experience and Previous Work Activity

   A. Education

This officer must possess at least a master's level degree in the biological or engineering sciences with a degree in medical entomology or parasitology preferred. Completion of a special course in Malaria Eradication or Malaria Control is mandatory. A specialized course in vector control techniques would be desirable. Must be fluent in both Spanish and English at the FSI S/3-R/3 level.

   B. Experience

It is required that this specialist have no less than five years experience in mosquito control or malaria control work. It is also required that this specialist be familiar with the proper application and use of pesticides in a malaria control or mosquito control operation and be able to train personnel in these subjects with special emphasis on health safeguards.

   C. Previous Work Activities

The officer should have worked at least three years in an international organization, U.S. Agency or a country program which has as its main activity the control of malaria or other vector-borne diseases.

3. Duties and Tasks

This officer acts as the part-time USAID/San Salvador specialist in the malaria control activities for the Health Systems Management Project. The duties of this position are as follows:

A. Assists the USAID/San Salvador in all matters relating to the malaria control component of U.S. assistance including planning, operation, monitoring and evaluation. Maintains close contact with Malaria operations at the National Division of Malaria to identify and assist GOES and USAID authorities in solving any potential or existing technical or management problems connected to U.S. assistance efforts in malaria control. Prepares report on these contracts and problems to A.I.D.

B. Monitors field operations where U.S. supplied commodities are being used to ensure that these commodities are (1) being used in a technically sound fashion; (2) in accord with US-GOES agreements; (3) properly stored and controlled; and (4) in a safe manner which protects the health of malaria program personnel as well as village populations. Makes actual site visits to spray operations and prepares a report on the findings of these visits.

C. Assists the GOES in the establishment of a viable training program for the safe use and application of U.S. supplied insecticides and participates in this training if requested by the GOES. Evaluation of the GOES training procedures for pesticide management and use will be expected at the completion of this assignment.

D. Assists the Office of Human Resources/Humanitarian Affairs of A.I.D. (HR/HA) in the development, preparation and follow-up of USAID procurement for the malaria control program. Assists in the end use audits of U.S. supplied commodities.