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Executive Board

COOPERATIVE INSECT CONTROL PROGRAMMES IN CENTRAL AMERICA

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(60p.)+ b.

COOPERATIVE INSECT CONTROL PROGRAMS IN CENTRAL AMERICA

Prepared by the WHO Regional Office for the Americas

1. The present Report covers the operation of cooperative Insect Control Programs in Central America. These Programs have been carried out by the Governments of Central America, with the assistance of materials and equipment furnished by UNICEF, and with technical advice of the World Health Organization and Pan American Sanitary Bureau. The Report describes the Programs from their inception to June 30, 1952.

A. Early Discussions Between WHO/PASB and UNICEF Regarding Cooperative Health Programs in the Americas.

2. On February 22, 1949 the Director of the Pan American Sanitary Bureau, the Regional Office of the World Health Organization for the Americas, was invited to attend a meeting with members of the United Nations Children's Emergency Fund and to discuss programs in Public Health which might be developed in the Americas with the assistance of UNICEF funds. At that time the Director proposed programs which could develop rapidly, without need for highly trained personnel, and from which immediate benefits might be expected. Included in the programs presented for discussion was one of Insect Control.

3. At meetings of the Executive Board of UNICEF on March 9 and 10, 1949, an overall initial allocation of $2,000,000 was made for UNICEF-assisted programs for Latin America.

4. On March 18, 1949, in a meeting in Washington, D. C., attended by representatives of UNICEF, the U.S. State Department, the Institute of Inter-American Affairs, the Pan American Union, the American International Institute for the Protection of Childhood, the Food and Agriculture Organization of the United

/Nations....

Nations, and the WHO/PASB, the recommendation was made to use the greater part of the initial allocation of UNICEF for Public Health programs. The other part of the allocation was to be destined for feeding demonstrations and a social welfare program.

5. At the Seventh Meeting of the Executive Committee of the Pan American Sanitary Organization, the parent Organization of the Pan American Sanitary Bureau, the Director of the PASB was authorized to continue discussions with UNICEF regarding cooperative health programs in the Americas, with due consideration to be given to the desires of the individual Governments as to the types of programs to be developed.

B. Discussions with the Governments of Central America Regarding the Insect Control Programs

6. Among the first proposals of WHO/PASB for cooperative health programs in the Americas was one for Insect Control in Central America. Following the initial allocation of UNICEF funds, an exchange of correspondence was carried out between the organizations and the Governments of Central America regarding the possibilities for program development. All Governments concurred in the establishment of an Insect Control Program. At a later meeting, the Executive Board of UNICEF resolved to include British Honduras in the Central American Program.

7. In September and October 1949, representatives of both organizations visited the Governments of Central America to discuss at greater length the establishment of the Programs in each country, and to assist the Governments in drawing up official requests to UNICEF for assistance. Later in 1949 and early in 1950, the countries were again visited to discuss and prepare specific plans of operations for the Programs, establish ports of entry for supplies, and outline schedules for shipments of materials.

/These....

8. These early discussions with Governments and subsequent visits by members of both organizations have been facilitated by the existence of offices of both agencies in Central America. The PASB Zone Office has been located in Guatemala City since 1943, and at the time of the initial discussions with UNICEF was already assisting the Governments of Central America in a number of health programs. With the establishment of the UNICEF Area Office in Guatemala City in 1949, closer coordination at the field level became possible.

C. The Status of Insect-Borne Diseases in Central America Prior to the Cooperative Program

9. Insect-borne diseases have had a long history of endemicity in Central America. There is apparently nc convincing evidence that malaria existed in Central America prior to the visits of Columbus. It is said, however, to have appeared among the armies of Cortez and Alvarado during the conquests of Mexico and Guatemala, and since that time has become firmly established throughout the Isthmus. Most historians of yellow fever agree that its first description occurred in 1648 in the Yucatan Peninsula of Mexico, and epidemics of the disease have been written into the histories of all Central American countries. Exanthematic typhus is believed by some historians to have existed during the Mayan civilization, since descriptions of a disease believed to be typhus have been found among the hieroglyphics of the Mayas.

10. While these diseases are most important in the category of insect-borne diseases, a number of other diseases transmitted by insects have been discovered in Central America. Onchocerciasis exists in the coffee-growing regions of Guatemala. Chagas' disease has been found throughout Central America. Filariasis has been reported from the Atlantic Coast regions of Costa Rica and Nicaragua.

/Among...

Among the most common causes of morbidity and mortality, particularly among children, are the diarrheas, which may be transmitted by the common house fly.

11. At the time of first discussions of the insect control programs, yellow fever had not been reported in Central America for some 25 years. However, the vector of urban yellow fever, Aedes aegypti, was widespread throughout all the countries and, following a resolution of the Directing Council of the Pan American Sanitary Organization, was the subject of coordinated attack, with eradication of aegypti as a goal. The appearance of cases of yellow fever in Panama in 1948 emphasized the importance of the eradication campaign to the Central American countries, and with the cooperation of the PASB anti-aegypti services were established in the several Health Departments.

12. Typhus existed in the highlands region of Guatemala, at elevations above 5,000 feet. In 1946, a cooperative program for its control was begun by the Guatemalan Health Department and the PASB, employing vaccine and insecticide. The effectiveness of the program has been well established, and results are summarized in the section of this Report dealing with Guatemala.

/Malaria...

13. Malaria, historically the most widespread and persistent of the insect-borne diseases in Central America, was, curiously enough, one of the least studied. Its endemicity seems to have been taken for granted. Outside of scattered surveys of individual localities, the only systematic studies of malaria in Central America readily available are those of Costa Rica 1/, El Salvador 2/, and Guatemala 3/.

14. For a rapid survey of the incidence of malaria in Central America, prior to the present programs, the reader is referred to the work of Faust 4/. He lists average mortality rates for the region as follows:

Country	Period	Death Rate per 100,000
British Honduras	1929 - 1939	14
Guatemala	1931 - 1939	414
El Salvador	1934 - 1943	250
Honduras	1942 - 1943	356.9
Nicaragua	1942 - 1943	432
Costa Rica	1929 - 1939	152

15. The coastal regions in Central America are regions of high endemicity, and spleen and parasite rates often indicate that 75% of the population is infected at the time of survey.

1/ Kumm, H.W. and Horacio Ruiz S.: A Malaria Survey of the Republic of Costa Rica, Central America. Am. J. Trop. Med. 19: 425 (1939).

2/ Sutter, V.A., and H. Zuniga: A Malaria Survey of El Salvador, Central America. Am. J. Trop. Med. 22: 387 (1942).

3/ Herrera, Julio Roberto: Estudio del Paludismo en la Republica de Guatemala. Bol. San de Guatemala 11: 142 (1940).

4/ Faust, E. C.: Malaria Incidence in North America. Chap. 30. Malariology, Edited by M. F. Boyd. W. B. Saunders Company, Philadelphia. (1949).

/In ....

16. In El Salvador and in British Honduras, Plasmodium falciparum was the most common type of infection, prior to 1949. In the other countries, P. vivax dominated. P. malariae infection rates vary from zero to 10 per cent of all positive examinations.

17. Central America is rich in Anopheline fauna. Komp 5/ in a study of species occurring in the Caribbean lowlands, lists 6 species found in Nicaragua, 10 in British Honduras, Guatemala, and Honduras, and 16 in Costa Rica. Zepeda 6/ lists 12 species which occur in Honduras. Many areas are unexplored entomologically, and it is probable that complete studies will show many more forms.

18. Of all species, the most widespread and important is Anopheles albimanus. It is the most dangerous malaria vector in the region, and is undoubtedly responsible for most of the malaria which occurs. It may be found breeding in a wide range of sunlit waters. Peak periods of malaria transmission coincide with peak periods of breeding of albimanus; these occur at the end of the rainy season when quiescent bodies of water are widespread over most of the lowlands. Although principally a lowland species, there is evidence that albimanus is responsible for transmission of malaria at Lake Amatitlan, Guatemala, at an elevation of 4,000 feet.

19. Other Anophelines of importance in Central America are pseudopunctipennis, whose role in the transmission of highland malaria must still be established, darlingi, a dangerous vector in South America which has been found in British Honduras, Guatemala and Honduras, and argyritarsis, which has been implicated in transmission in Costa Rica.

5/ Komp, W.H.W.: The Anopheline Mosquitoes of the Caribbean Region. National Institute of Health Bulletin No. 179 (1942).

6/ Zepeda, J.E.: Los Mosquitos Anopheles de Honduras. Unpublished paper read at 2nd Panamerican Congress of Pharmacy (1951).

/Prior.....

20. Prior to World War II, the majority of the anti-malarial campaigns in Central America were based upon species sanitation, directed primarily against albimanus. Drainage projects were established around many of the more important population centers, with consequent reduction in malaria incidence. Most Health Departments furnished free anti-malarial drugs to the population suffering from malaria.

21. With the discovery of DDT and other synthetic organic insecticides, a new tool became available for insect control, and for the first time unit costs could be reduced so that with a small capital outlay, great numbers of people could be protected. As experience was gained and possibilities became apparent, Health Departments in Central America established services for residual house spray programs. Thus the foundations were laid for a large-scale insect control program, of the type envisaged in early discussions between WHO/PASB and UNICEF.

D. Objectives of the Cooperative Insect Control Programs

22. As stated in the Agreements between the Governments of Central America and the WHO/PASB, the objectives of the insect control programs are as follows:

1.-To control malaria and eradicate Aedes aegypti throughout the zones where these exist, by the application of modern insecticides.

2.-To control other diseases borne by insects which are affected by the same insecticides.

3.-To reduce morbidity and mortality among children by reducing the fly population.

4.-To evaluate the results of such a program by comparing the morbidity and mortality rates of insect-borne diseases, and by determining the Aedes aegypti index.

5.-To train local professional and auxiliary personnel in the most effective methods of insect control by the application of modern insecticides.

6.-To assist the Ministries of Public Health on these and related problems.

/E. Participation....

E. Participation by WHO/PASB in the Cooperative Programs

23. Responsibility for the technical aspects of the programs has rested with WHO/PASB. Since 1949, the following personnel has been assigned to the programs, with headquarters at the Zone III Office of the PASB in Guatemala City.

1 Entomologist	10 months
1 Medical Officer, specialized in yellow fever control and *Aedes aegypti* eradication	1 year and 9 months
1 Sanitary Engineer	2 years and 8 months (Part-time to programs)

24. In addition, all countries were visited in 1950 by the WHO Regional Consultants on malaria and Chagas' disease. During these visits the scope of the problems and control methods were reviewed, and recommendations made for future programs of investigation and control.

F. Participation by UNICEF in the Cooperative Programs

25. In its March 1950 meeting, the Executive Board of UNICEF allocated $514,000 for Central American insect control programs. (Document E/ICEF/145.) At subsequent meetings in May and November 1951 and April 1952, additional amounts of $29,000, $180,000, and $26,000 respectively were allocated. Thus, the total amount allotted to the programs in Central America is $749,000, of which $738,000 have now been spent.

26. Specific allocations by countries have been as follows:

British Honduras	$ 22,000
Costa Rica	91,000
El Salvador	167,000
Guatemala	118,000
Honduras	117,000
Nicaragua	234,000

27. The greatest part of these funds, amounting to $615,000 or 83.4% of the total, has been spent in the purchase of insecticide. For the most part, this

/has.....

has been 75% DDT wettable powder, with smaller amounts of 100% DDT and DDT emulsifiable concentrate also being furnished. For typhus control, 10% DDT dusting powder has been employed.

28. Of the remaining funds, $28,700 or 3.9% have been spent for supplies and equipment (sprayers, flashlight batteries and bulbs, solvent, etc.) and $92,600 (12.5%) has been spent for vehicles.

29. In addition to these sums, UNICEF has expended a total of $112,725 in freight charges to Central American ports of entry. The Governments are responsible for internal transportation. The costs of freight are not charged to country allocations, but are borne by UNICEF as part of the routine administrative costs. They are included, here and in the country summaries, for purposes of cost analysis.

G. Resume of Program Development

30. UNICEF-furnished supplies for the programs began arriving in Central America in April and May of 1950, and by July of that year operations had begun in all countries. Prior to that time it had been necessary to train the required number of local personnel in residual spray techniques.

31. The Table on the following page summarizes operational data by six-month cycles. In four countries localities are sprayed every six months. In Honduras and British Honduras, eight-month cycles are used. Data from Honduras and British Honduras have been tabulated in this Table in six-month periods, so as to afford uniformity, although the country analyses will show the data by eight-month periods.

32. In tabulating costs of the programs, the following methods have been used. UNICEF "World Average Prices" have been charged against country allocations, and are used here as the basis for cost calculations. Insecticide unit costs are calculated per kilogram of DDT as 100%, since this terminology is normally used

/by the...

COOPERATIVE INSECT CONTROL PROGRAMMES IN CENTRAL AMERICA

SUMMARY OF OPERATIONS FOR SIX COUNTRY PROGRAMMES*

	May – Dec. 1950	Jan. – June 1951	July – Dec. 1951	Jan. – June** 1952	Totals**
Localities treated	2,431	4,448	4,026	3,279	14,184
Houses treated	227,668	289,517	280,434	237,874	1,035.493
Population protected	1,203,740	1,544,467	1,537,476	1,298,595	5,584,278
Square meters of surface treated	54,329,555	67,350,884	79,947,463	67,422,661	269,050,563
Kilograms DDT (as 100%) used	85,273	137,592	132,657	95,563	451,085
GOVERNMENT COSTS					
Personnel	$ 146,075	$ 187,500	$ 182,560	$ 161,765	$ 677,900
Supplies and Equipment	33,805	22,095	38,005	29,705	123,610
Transportation	16,510	16,370	21,030	19,320	73,230
Total:	$ 196,390	$ 225,965	$ 241,595	$ 200,790	$ 874,740
UNICEF COSTS					
Insecticide	$ 74,365	$ 142,065	$ 137,070	$ 93,050	$ 446,550
Supplies and Equipment	5,005	4,705	3,990	4,355	18,055
Vehicles	12,240	11,005	7,155	6,750	37,150
Freight Charges	13,990	23,670	21,135	15,820	74,615
Total:	$ 105,600	$ 181,445	$ 169,350	$ 119,975	$ 576,370
TOTAL COSTS:	$ 301,990	$ 407,410	$ 410,945	$ 320,765	$ 1,451,110
Cost per person protected:	$ 0.25	$ 0.26	$ 0.27	$ 0.25	0.26

* British Honduras, Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua.

** Data for June, 1952 incomplete for British Honduras and Honduras.

by the countries in reporting DDT consumption, and total costs are shown. Supplies and equipment have been given an arbitrary depreciation of 33-1/3% per year. Depreciation of vehicles has been assigned on the basis of the U.S. Automobile Manufacturers' "Blue Book" values; 25% depreciation the first year of use, and 15% per year thereafter.

33. Wherever possible, actual costs as reported by the countries have been shown. Where this is not possible, budget figures have been used, and have been classified under the appropriate headings of Personnel, Supplies and Equipment, and Transportation. However, Government expenditures for DDT have not been included unless this DDT has actually been used in the program, when unit costs are then calculated and the totals shown. Thus, although Nicaragua and Honduras have made substantial expenditures for DDT, these sums do not appear since this DDT has not yet been used.

34. A word should be said here about Totals for all programs, as well as Totals shown in the individual country summaries. The number of houses and the population shown in the Totals does not correspond to distinct individuals, since the majority of houses have been treated four times, and the population protected once every cycle. These totals are shown for the purpose of calculating overall averages for the programs.

35. During the course of the operations, many changes in techniques have been made, as experience is gained under conditions in Central America. Experience in one country which has proved useful in improving efficiency has been adapted in other countries of the region.

36. In March 1950 a basic change was recommended by the Regional Office of WHO/PASB. It was recommended that the dosage of DDT per square meter be changed from 2 grams to 1 gram, when wettable powder was used, from 2 grams to 1.0-1.5 grams

/when....

when emulsion was used, and from 2 grams to 1.5-2.0 grams when solutions of DDT were employed. At the same time, the Regional Office recommended that one or two treatments per year be made, but that if at all possible only one. These recommendations have been adopted in Nicaragua, and reductions in DDT dosage have been adopted in modified form in Honduras.

37. Although it was envisioned that these recommendations would permit wider coverage of the population with DDT, this has not been possible. This method reduces unit costs to UNICEF, but not to the Governments, since costs of personnel, supplies and equipment, and transportation are more or less independent of dosage. The net effect has been to extend the period of availability of UNICEF supplies in those countries which have reduced dosage.

38. In summary, program operations have expanded tenfold, since the cooperative programs were initiated. Operations were under way in 1949 in three countries, with protection being afforded to some 150,000 persons. At the present time, roughly 1,500,000 persons are being protected during each cycle of treatment, and it is planned to increase this figure in subsequent cycles.

H. Government Personnel Responsible for the Development of the Cooperative Programs

39. In the discussion of operations in the individual countries, an attempt has been made to mention the names of those persons who have had the responsibility for the development of the program.

40. In the final analysis, the success of a program of this type depends upon the personnel executing it. This statement applies as far down the administrative ladder as the individual spraying a house in a locality, and in the local authorities and householders assisting him. It is sometimes easy to overlook this fact in preparing summaries of large operations such as this. For this reason, names of individuals have been included in the country summaries. These persons are responsible for the

/planning...

planning and execution of the program within their countries; they must make the innumerable daily decisions connected with an operation of this type; whatever success has accrued is due in large measure to their efforts.

I. Status of Insect Borne Diseases as of June 30, 1952

41. Statistical data which may be subject to analysis and which may be presented to show quantitative results for these programs are meager. Those which are available for each country are presented in the individual discussions. What is desired at this time is to explain some of the limitations existing, both as to the amount and kind of data present.

42. At the time the programs were initiated, no attempts were made to establish malaria surveys which would give an accurate picture of the disease incidence beforehand. Rather, it was felt that instead of survey work what was needed was the establishment of insect control services, once it was accepted that malaria was endemic in many areas throughout the region. Therefore, data prior to the programs are either several years old, and may be influenced by cyclic changes in malaria incidence throughout the region, or apply to only a limited number of localities in each country.

43. Data on morbidity and mortality are conceded to be of doubtful quality in Central America. The long experience of the population with malaria has probably resulted in over-reporting, particularly from areas where medical services are inadequate or non-existent. Indeed, one might say with security that throughout most of Central America "Fever and/or Chills resulting in death automatically equals Malaria." One specific example will suffice to illuminate this condition.

44. The specific death rate from malaria for the city of Managua, Nicaragua averaged around 350 per 100,000 per year in the years prior to the establishment of the cooperative program. It has remained at that level throughout the program.

/However ....

However, data from malaria surveys during 1951 and 1952, as shown in the report on Nicaragua, indicate clearly that malaria is disappearing from the city. A study of this anomalous situation reveals that all deaths are reported to the Civil Registrar, whose office is part of the Ministry of the Interior. The Registrar must list as the cause of death whatever information is given him by either the physician who attended the case or the person reporting the death. Only a small percentage of the total deaths are seen by physicians, so that in the majority of cases a layman's opinion as to the cause of death is incorporated into the official statistics. Apparently, the law regarding chills and/or fever proposed above is valid for Managua.

45. To ascertain the true picture of malaria in Managua, an arrangement has been made between the Health Department and the Registrar whereby all deaths reported from malaria to the registrar are immediately reported to the Health Department. Acting on this information, a physician and entomologist from the Insect Control Section then visit the house where the death occurred, and attempt to establish whether the death was due to malaria, by means of a study of a clinical history, movement of the deceased prior to death, blood films from other members of the family, and a search for Anopheles within the house. This service has been established only recently, and no specific information can yet be given as to results.

46. Spleen Indices and Parasite Indices, where reported in the individual country summaries, generally provide accurate information regarding the incidence of malaria at the time of survey, and of its history for some time past. Surveys of this type are generally carried out in a representative group of the population, except in those localities small enough so that all persons can be included in the survey. In general, groups of 100 or 200 persons are selected from each of four quadrants of a community.

/Of particular ....

47. Of particular interest is the incidence of malaria in the age group below 1 year, an accurate indication of the amount of transmission taking place. It is planned to emphasize data of this type in future surveys.

48. An indirect indication of the reduction in transmission may be obtained by a comparison of the relative incidence of the types of malaria parasites. This information is particularly valid when consumption of anti-malarial drugs by the general population has been limited. In the case of Central America, a rise in the percentage of infections caused by Plasmodium vivax has been generally noted, while P. falciparum infections are apparently on the wane. In view of the fact that vivax is more apt to cause relapses than falciparum, and that there is evidence that the overall incidence of all forms of the infections has been reduced, the inference may be made that an appreciable percentage of all cases are due to relapses.

49. Not included in the individual country summaries, but worthy of mention at this point, is the layman's appraisal of the programs. There is widespread belief in Central America that the incidence of malaria has been reduced. In numerous localities, comments have been made by teachers to UNICEF and WHO/PASB personnel about the increased attendance by children as a result of the programs. While such information cannot be pictured quantitatively, it represents an appreciation on the part of the people of the efforts of their Governments and the United Nations to solve one of the problems which has confronted Central America for centuries.

50. With reference to yellow fever, the programs have been very effective in controlling Aedes aegypti, the vector of the urban form. Although yellow fever transmitted by forest mosquitoes appeared in Costa Rica in 1951, the outbreak was limited to forest regions and did not penetrate into population centers. The vaccination campaigns being carried out by the several Governments have provided

/additional ....

additional protection to the population most likely to be affected by the disease.

51. The results of the typhus control program in Guatemala, in operation since 1945, are shown in the report on Guatemala, and demonstrate clearly the effectiveness of the program.

52. With reference to other diseases transmitted by insects, much work must still be done to determine their incidence and extension. During the first cycles of spraying, high fly mortalities were observed, but flies rapidly developed a resistance to DDT, as was anticipated. Onchocerciasis, in Guatemala, is the subject of a separate research project, a cooperative study by the Guatemalan Health Department, the PASB, and the National Institutes of Health of the U.S. Public Health Service. It is hoped that the results of these studies will point the way to a control program in the future.

J. Plans for the Future

53. Enough insecticide is on hand in all countries, with the exception of Guatemala, to carry the programs through the coming 12-month period, at least. In some countries, both UNICEF and Government supplies will be used; in others, there is still a sufficient quantity of UNICEF DDT on hand. Guatemala has purchased 106,000 lbs. of DDT, and its arrival is expected during July, so that spray activities may be resumed.

54. For the period of the next twelve months, two countries (Guatemala and Nicaragua) have entered into a Technical Assistant Agreement with the WHO/PASB, regarding a continuation of the insect control programs. Panama will also participate in this program, and it is hoped that Honduras will do so. In Costa Rica, El Salvador and British Honduras, contact with the programs and consultant service when necessary will be carried out as a regular function of PASB personnel from the Zone III Office. The objectives of the Technical Assistance Program will be

/similar ....

similar to those previously outlined; the programs are wider in scope in that additional personnel will be furnished by WHO, more emphasis will be placed on yellow fever due to the danger involved, and fellowships for specialized studies will be included for national technicians.

55. The PASB, in cooperation with the Governments of Central America, has also initiated a study of the epidemiology of jungle yellow fever. The study was begun in July in Nicaragua, and will include entomological studies of mosquitoes in the forest canopies, as well as investigations on the existence of yellow fever in the animal population of the forests.

56. Future plans call for intensification of malaria surveys, to determine the incidence of the disease in the various countries and to provide a check on the day when residual house spraying need no longer be carried out. In several isolated instances, there is evidence that this technique alone is not sufficient to control malaria in population centers. The reasons for this failure will be investigated, and, if possible, other preventive measures adopted. It is also hoped that the knowledge of vectors and vector habits in Central America can be added to, thrcugh surveys and special studies of the type indicated above.

Annex I

B R I T I S H H O N D U R A S

A. Incidence of Insect-Borne Disease Prior to the Cooperative Program

The Colony of British Honduras has an area of 8,600 square miles and an estimated population of 69,000, almost half of whom live in Belize, the Capital City. Much of the terrain in the Colony is coastal marsh land extending back from the Gulf of Honduras from distances of ten to twenty miles. Rainfall is heavy, in many places averaging more than 100 inches per year.

Previous medical history in the Colony indicates that malaria was the leadin communicable disease. According to data in 1947 the attack rate for hospital patients was 1,626/100,000, and should previous in- and out-patients' records from malaria be valid, one might presume an annual attack rate for the Colony of approximately 15,000/100,000, or some 10,000 cases annually.

The principal species of Anophelines found in the Colony have been albimanus vostitipennis, and darlingi.

Yellow fever had been non-existent in the Colony for more than a generation at the time the program was initiated. The Medical Department of the Colony was controlling Aedes-aegypti by larvicidal oils and by distributing predatory fish to householders, which were stocked in the cisterns used to catch rainwater for water supply. In 1949 a small scale residual house spray program using 5% DDT in kerosene was begun.

B. First Discussions with UNICEF and WHO/PASB and the Development of the Official Requests

Following exchange of correspondence in 1949, a representative of the WHO/PASB visited British Honduras in October of that year to discuss the possibilities of a cooperative program with the Government and to assist in drawing up a formal request to the Executive Board. Encouraged by the success of the small campaign of this year, the Government requested assistance in the form of insecticides, auxiliary equipment, and transportation. Technical grade DDT was requested, since the Department had experience with this type of spray and most of the houses in the Colony are constructed of wood; later, the request was modified to include solvent and emulsifier as well, rather than apply the insecticide as a solution in kerosene.

In January of 1951 representatives of UNICEF and WHO/PASB visited the Colony to assist in drawing up a proposed plan of operations. At the time of this visit, the Medical Department requested that an experienced person from one of the other Central American countries be sent to the Colony to train local personnel. The Basic Agreement with UNICEF was signed on December 19, 1949 and with the WHO on January 2, 1951.

/The preliminary ....

The preliminary plan of operations called for the spraying of all houses in the local areas of the Colony and when sufficient experience had been gained, to transfer operations to the urban centers. The amount of DDT requested from UNICEF was sufficient to protect the entire population of the Colony during several cycles of spraying.

At the time that training of local personnel was begun, it was discovered that the spraying pumps on hand at the Medical Department warehouse would be inadequate for the Programme, and UNICEF was requested to furnish 30 sprayers from the allocation for British Honduras.

C. Allocation by the Executive Board of UNICEF for the Cooperative Programme.

In March 1950 the Executive Board allocated $22,000 to British Honduras for the Insect Control Programme.

The breakdown on the supplies furnished by UNICEF is as follows:

Item	Units	Costs
Insecticide		
DDT, 100%, technical grade	50,000 lbs.	$ 13,700
Supplies and Equipment		6,400
Solvent and emulsifier	11,340 gals.	
Sprayers and spare parts	30	
Ancillary equipment	various	
Vehicles		2,000
Universal Jeep, spare parts and tires	1	
Project Personnel		500
Salary and expenses of Honduran technician during one month, to train British Honduras personnel	1	
TOTAL:		$ 22,600

The deficit of $600 has been made up from the unprogrammed balance in the overall British Honduras allocations.

In addition, UNICEF has expended the following amount in freight charges to the port of entry in British Honduras:

Insecticide	$ 1,522.33
Supplies and equipment	3,265.17
Vehicles	101.24
TOTAL:	$ 4,888.74

/These amounts

These amounts are not charged to the British Honduras allocation, but are included in the costs of the Programme for purposes of analysis.

Following the original allocation, supplies for the Programme began arriving in British Honduras in April of 1950.

D. Government Personnel Responsible for the Development of the Cooperative Programme.

The responsibility for the execution of the Programme rested with the Medical Department of the Colony. The Programme has been organized under the supervision of the Sanitary Inspectors in the various Districts of the Colony, who are charged with the supervision of the Programme in addition to their regular duties. The following personnel have been responsible for operations:

Senior Medical Officers:	Dr. L.P. Younglao Dr. L.A.P. Slinger Dr. G.G. Smith
Chief Sanitary Inspector:	Mr. M. Cervantes

E. Programme Operations.

Prior to the arrival of UNICEF supplies, Mr. Bernardo Avila was loaned by the Government of Honduras to train personnel in the Colony in the proper techniques of residual house spray operations. Mr. Avila spent one month in British Honduras with the Sanitary Inspectors who were then charged with training the necessary number of men for the spray crew.

The Programme in British Honduras began in May of 1950; for purposes of comparison, however, the first cycle is considered to have terminated in December of that year and is so shown on the accompanying table.

As a further measure, the Government proposed in 1950 that an airplane larviciding campaign be established around Belize, the capital. However, in view of the fact that the Programme was designed as a Residual House Spray Programme by the WHO, this proposal was not accepted by the Geneva Office of the WHO.

In the development of the Programme, it has not been possible to spray all houses, due to objections on the part of some householders. This is particularly true in the capital, and undoubtedly has contributed to the continued presence of Aedes aegypti in Belize.

Following the recommendations of the Regional Office of the WHO, eight month cycles are now being employed. It is usually possible to complete spraying within a five-month period.

F. Incidence of Insect-Borne Diseases as of June 30, 1952.

Perhaps the best indication of the success of the campaign in British Honduras can be had from an examination of data on hospital admissions for malaria

/and other causes.

and other causes. It must be borne in mind, however, that outside of the General Hospital in Belize, which receives some 50% of the admissions and where laboratory services are readily available, malaria is diagnosed clinically.

Nevertheless, the data are indicative of the results of the Programme.

Year	Malaria	Admissions to Hospitals Total Admissions	% of Admissions due to Malaria
1947	1,010	4,978	24.3
1948	954	6,015	15.8
1949	898	6,301	14.3
1950	806	6,910	11.7
1951	534	6,823	7.8

Attached to this report is a graph, showing the reduction in out-patients seen for malaria, by months, over the past three years. Again, the data indicate a steady decline in malarial incidence, which, as the Director of Medical Services points out in his Annual Report for 1951, can only be attributed to the Insect Control Programme activities.

During 1951, an extensive inspection for Aedes aegypti was conducted by Government personnel, with the assistance of Sanitary Inspectors of the PASB. Of thirteen localities inspected, geographically representative of the Colony, only Belize and Corozal were positive. With these results at hand, it has been recommended that all houses be sprayed, and inspections again be made in these two localities.

The Government has on hand a stock of Yellow Fever vaccine, and plans to use this among workers in the rural areas.

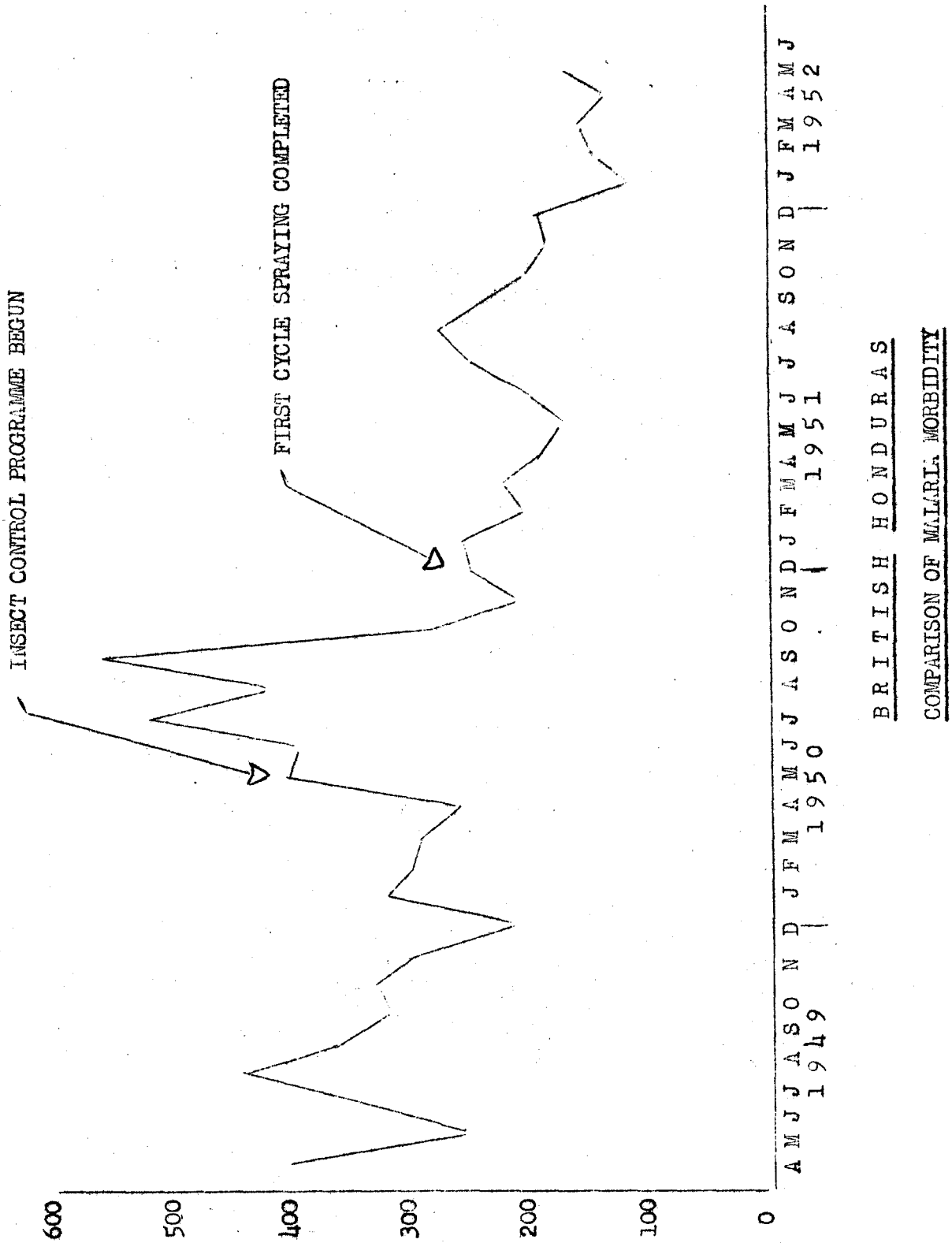
G. Plans for the Future.

The Government has now expended some 40% of the DDT furnished by UNICEF. Supplies should therefore last for three or four more cycles, depending upon the increased consumption in spraying all houses in the Colony. There is, therefore, enough DDT on hand to continue the Programme for two more years. It is probable that supplies of solvent will be expended more rapidly; this has been brought to the attention of the Government.

The Government is taking steps to secure the services of a Malariologist, who will be charged with systematic surveys throughout the Colony, to determine the real incidence of the disease and the reasons for its persistence. In this connection, the PASB has made plans to conduct a malaria survey in the Stann Creek District, where A. darlingi had previously been found. Almost 50% of the total hospital cases of malaria come from this district, and it is hoped to be able to discover the reasons for this high incidence, and report on them later.

NUMBER OF CASES OF MALARIA

SEEN IN HOSPITALS AND CLINICS



BRITISH HONDURAS

COMPARISON OF MALARIA MORBIDITY

BRITISH HONDURAS

Cooperative Insect Control Programme - Summary of Operations

	First Cycle May - Dec 1950	Second Cycle Jan - June 1951	Third Cycle Nov. 1951 March 1952	Fourth Cycle June 1952 Sept. 1952	Totals as of June 1, 1952
Localities treated	---	---	---	June 1952 data not received at time of report	---
Houses treated	11,004	8,585	9,317		28,906
Population protected	47,558	37,463	40,629		125,650
Square meters of surface treated	1,675,634	1,163,191	1,350,561		4,189,386
Kilograms DDT (as 100%) used	3,625	2,625	2,934		9,184
Man - Days spraying	1,519	1,054	1,043		3,616
Man - Days supervising	592	366	393		1,351
AVERAGES					
Houses/Man-Day spraying	7.3	8.2	8.9		8.0
Sq. Mt./Man-Day spraying	1,102	1,105	1,295		1,159
DDT applied, grams per square meter	2.16	2.26	2.17		2.19
GOVERNMENT COSTS					
Personnel	$ 3,205	$ 2,655	$ 2,770		$ 8,630
Supplies and Equipment	---	---	---		---
Transportation	360	255	295		910
Total:	3,565	2,910	3,065		9,540
UNICEF COSTS					
Insecticide	$ 2,190	$ 1,580	$ 1,770		$ 5,540
Supplies and Equipment	1,065	1,065	1,065		3,195
Vehicles	250	250	150		650
Freight charges	800	735	750		2,285
Total:	$ 4,305	$ 3,630	$ 3,735		$ 11,670
TOTAL COSTS:	$ 7,870	$ 6,540	$ 6,800		$ 21,210
Cost per person protected	$ 0.17	$ 0.17	$ 0.17		$ 0.17

ANNEX II

COSTA RICA

A. Incidence of Insect-Borne Disease Prior to the Cooperative Programme

The Republic of Costa Rica is located at the extreme southern part of Central America, it has an area of approximately 50,000 Km. and in December 1952 the population was estimated as 838,084. Approximately one-half of this population lives in the lowlands, the remainder on the Meseta Central or Central highlands, concentrated in the vicinity of San Jose, the Capital.

Transportation is good within the central highland regions but difficult in the lowlands, where most of the insect-borne diseases exist.

Malaria has occupied a leading position in the causes of death in Costa Rica; the death rate from malaria was 78/100,000 in 1948; morbidity from malaria in 1948 was 9/1,000. It is significant, however, that in the coastal provinces of Guanacaste, Puntarenas and Limon morbidity and mortality rates were 10-20 times the rates for the provinces of the Meseta Central.

Prior to the initiation of the Cooperative Programme there had been no case of Yellow Fever in Costa Rica since 1918, although the appearance of cases in Panama in 1948 emphasized the great danger which existed for Costa Rica should yellow fever, particularly the urban form, spread throughout the country.

Other insect-borne diseases in Costa Rica included Filariasis and Chagas' disease. The former was prevalent in the area around Puerto Limon; scattered surveys had shown the latter to exist in several localities throughout the country.

B. First Discussions with UNICEF and WHO/PASB and the Development of the Official Requests

In 1949 representatives of UNICEF and WHO/PASB visited Costa Rica to discuss the possibilities of a Cooperative Programme in Insect Control. The Government was highly receptive to the idea and a request for insecticide, spray pumps, vehicles and auxiliary equipment, as well as funds for training local personnel were requested from UNICEF. Later in the year, representatives of both organizations again visited Costa Rica to obtain more specific information regarding the plan of operations of the programme and ports of entry desired for materials.

The preliminary plan of operations called for the protection of the entire Province of Guanacaste or a population of approximately 100,000 inhabitants. During subsequent cycles the work was to be expanded to other provinces.

C. Allocations by the Executive Board of UNICEF for the Cooperative Programme

In March 1950 the Executive Board of UNICEF allocated $91,000.00 for the Insect Control Programme in Costa Rica. The breakdown on supplies furnished by UNICEF for the Costa Rican Programme is as follows:

/Item

Item	Units	Costs
Insecticide		
75% DDT, wettable powder	180,000 lbs.	$ 56,700
100% DDT, technical grade	2,000 lbs.	
Supplies and Equipment		
Sprayers and spare parts	80 *	3,000 *
Microscope	1	
Adding Machine	1	
Calculating Machine	1	
Ancillary Equipment	various	
Vehicles		
Jeep Station Wagons, spare parts and tires	6	14,700
Project Personnel		
Travel Grant for Chief of malaria investigations	1	200
	Total	$ 74,600

* An additional 60 pumps are being procured.

This credit balance of $16,400 has been added to the unprogrammed balance in the overall allocation for Costa Rica.

In addition, UNICEF has expended the following amount in freight charges to the ports of entry of Costa Rica:

Insecticides	$ 12,240.47
Supplies & Equipment	147.43
Vehicles	1,599.00
	$ 13,986.90

These amounts are not charged to the Costa Rican allocation but are included here in the cost of the programme for purposes of analysis.

Following the original allocation, supplies for the programme began arriving in May 1950.

D. Government Personnel Responsible for the Development of the Cooperative Programme

The Ministry of Public Health of Costa Rica is responsible for the execution of the Insect Control Programme. Specifically, responsibility rests with the Insect Control Section of the Public Health Department within the Ministry. The following personnel have been responsible for the programme:

/Ministers of

Ministers of Public Health: Dr. Carlos Saenz Herrera
Dr. Jose Cabezas Duffner

Director General of Public Health: Dr. Oscar Vargas Mendez

Chief of Insect-Control Section: Eng. Horacio Ruiz Soto

Chief of Malaria Investigation: Lic. Manuel Antonio Martinez M.

E. Data on Operations

Before the programme began in Costa Rica, Mr. Martinez spent several weeks in Guatemala, El Salvador and Honduras observing the insect control operations in those countries.

Field operations in Costa Rica began in June 1950. Work was concentrated in the Province of Guanacaste although parts of other provinces were also treated. The areas covered and the population protected were increased during the second cycle of treatment.

In April of 1951 a case of yellow fever was reported in Panama, near the Costa Rican border, on the Atlantic side of the isthmus. The Health Department of Costa Rica immediately began preparations for a large scale vaccination campaign, which was begun in May. In June suspected cases of jungle yellow fever began to be reported from the Province of Limon and it became apparent that a serious outbreak of jungle yellow fever was occurring in Costa Rica. A part of the history of this outbreak has been reported elsewhere and it is hoped that the entire history will soon be detailed; suffice it to say at present that 50 deaths from yellow fever have been confirmed, 135 clinical cases have been confirmed and estimates of the total number of cases have run into the thousands.

Faced with the outbreak of jungle yellow fever, the Health Department increased its efforts in the vaccination campaign. The Inter-American Cooperative Health Service (SCISP) of the Institute of Inter-American Affairs assisted greatly in this campaign, and a helicopter and crew were obtained from the U.S. Air Force to help reach isolated population centers. During 1951, 188,241 persons were vaccinated and an additional 40,813 have been vaccinated during the first six months of 1952. At the same time, as is shown from the data in the accompanying table, there was an actual increase in the number of people protected by the Residual House Spray campaign.

Other agencies which participated in the campaign against yellow fever in Costa Rica were the Gorgas Memorial Laboratory, and the Board of Health of the Canal Zone through its Laboratories.

It is perhaps impossible in a report of this type to convey an idea of the efforts expended by the Health Department personnel and the assisting agencies in combating this epidemic. However, the results outlined below will afford an idea of the progress made.

F. Incidence of

F. Incidence of Insect-Borne Diseases as of June 30, 1952

With reference to yellow fever, three (3) deaths and five (5) cases have been reported during 1952. Thus the epidemic has apparently been arrested in Costa Rica. These figures are included in the totals previously cited.

The success of the Insect Control Campaign in limiting yellow fever to jungle areas in the country may best be appreciated from the following data:

1076 localities were initially inspected for Aedes aegypti; of these, 103 were positive on first inspection. In June of 1952 only one locality remained positive; it has been treated during the course of the Programme and is awaiting a subsequent inspection to determine its present status. Should Aedes aegypti not have been controlled in Costa Rica, it is entirely probable that the history of the outbreak of yellow fever would have been written in another and far more serious form.

With referenc to malaria, Table I shows the percent reduction in malaria cases at the General Hospital in San Jose. This hospital serves the entire country and data have been tabulated by provinces.

In 1951 malaria surveys were carried out by the Insect Control Section in localities not under treatment in the programme, to establish the incidence and delineate areas to be included in future cycles of treatment. These data are summarized in Table II.

In 1952, surveys were begun by the Section in localities previously treated, as a measure of evaluation. These data are summarized in Table III.

A comparison of Tables II and III clearly reveals the success of the Insect Control Programme. Guanacaste, historically the most malarious of the provinces, now shows a strikingly low incidence of malaria. Furthermore, the majority of positive examinations in Guanacaste occurred in the age groups above 5 years; thus, it would be difficult to differentiate new infections. No positive slides were found in the 151 examinations affected in the below 1 year age group in Guanacaste, however, thus indicating that transmission of new cases is being halted.

The two positive examinations in the age group below 1 year, in Table III, occurred in Canton Central of Puntarenas Province. All 33 positive examinations in this Canton occurred on the Island of Chira, which apparently presents a special problem in malaria control, which will be the subject of a later investigation.

G. Plans for the Future

In the first 4 cycles of treatment the Government has expended approximately 40% of the insecticide furnished by UNICEF, as will be seen from the table summarizing operations. However, the rhythm of work is constantly increasing and plans for the year 1953 call for an increase in the number of spray crews operating. At the same time, it is planned to continue with the malaria surveys so as to provide a constant evaluation of the work being done.

/With reference

With reference to yellow fever, vaccination of the rural population in the zones exposed to the disease will continue until the entire population has been reached. Costa Rica will also participate in the Epidemiological study of jungle yellow fever, which will be carried out by the PASB in cooperation with the Government of Central America.

CASES OF MALARIA TREATED IN
SAN JUAN DE DIOS HOSPITAL, SAN JOSE

	ADULTS			CHILDREN (0-14)		
	Cases		Per Cent	Cases		Per Cent
Province	1950	1951	Reduction	1950	1951	Reduction
San Jose	220	139	37%	18	14	23%
Alajuela	56	29	48%	9	7	23%
Cartago	27	8	70%	11	1	91%
Heredia	7	1	86%	0	0	--
Guanacaste	54	20	63%	7	0	100%
Puntarenas	135	100	25%	28	21	25%
Limon	157	33	79%	27	11	59%
	656	330	50%	100	54	46%

Totals for all ages:

Cases 1950	756
Cases 1951	384
Per Cent Reduction	49%

/Parasite Indices

PARASITE INDICES, 1951
FROM LOCALITIES NOT TREATED

Province	Number of Examinations	Positive for Malaria	Per Cent Positive
SAN JOSE	2,099	50	2.4
CARTAGO	1,567	89	5.7
ALAJUELA	4,342	265	6.1
PUNTARENAS	1,114	184	16.5
LIMON	3,049	215	7.1
HEREDIA	502	30	6.0
GUANACASTE	15	2	13.3
COUNTRY TOTALS:	12,688	835	6.6

AGE DISTRIBUTION OF PERSONS EXAMINED

Age in Years	Less than 1	1-4	5-9	10-14	15-19	20 and over
No. Examined	233	2,011	4,308	3,674	847	1,615
Positive for Malaria	20	147	246	223	68	131
Per Cent Positive	8.6	7.3	5.7	6.1	8.0	8.1

PARASITE INDICES, 1952
FROM LOCALITIES PREVIOUSLY TREATED

Province and Canton	Number of Examinations	Positive for Malaria	Per Cent Positive
SAN JOSE			
Turrubas	1,202	19	1.7
Puriscal	135	0	0.0
PUNTARENAS			
Buenos Aires	344	9	2.6
Central	282	33	11.7
GUANACASTE			
Abangares	163	1	0.6
Nicoya	1,272	25	2.0
Carillo	85	0	0.0
Liberia	26	0	0.0
COUNTRY TOTALS:	3,509	87	2.5

AGE DISTRIBUTION OF PERSONS EXAMINED

Age in Years	Less than 1	1-4	5-9	10-14	15-19	20 and over
No. Examined	277	1,310	1,287	439	55	141
Positive for Malaria	2	28	32	14	2	9
Per Cent Positive	0.7	2.1	2.5	3.2	3.2	6.4

COSTA RICA

Cooperative Insect Control Programme - Summary of Operations

	First Cycle June - Dec. 1950	Second Cycle Jan. - June 1951	Third Cycle July - Dec. 1951	Fourth Cycle Jan. - June 1952	Totals as of June 30, 1952
Localities treated	679	943	943	901	3,466
Houses treated	15,663	19,579	20,445	23,520	79,207
Population protected	84,650	101,309	103,006	122,469	411,434
Square meters of surface treated	2,561,376	3,135,825	3,312,150	3,441,063	12,450,414
Kilograms DDT (as 100%) used	5,461	5,709	6,803	5,423	23,396
Man - Days Spraying *	- - -	- - -	- - -	- - -	- - -
Man - Days Supervising *	- - -	- - -	- - -	- - -	- - -
AVERAGES					
Houses/Man-Day Spraying *	- - -	- - -	- - -	5.1	- - -
Sq.Mt./Man-Day Spraying *	- - -	- - -	- - -	- - -	- - -
DDT Applied, grams per square meter	2.1	1.8	2.1	1.6	1.88
GOVERNMENT COSTS					
Personnel	$ 12,685	$ 24,810	$ 24,810	$ 23,600	$ 85,905
Materials	1,325	4,435	4,435	3,600	13,795
Transportation	80	460	465	465	1,470
Total:	$ 14,090	$ 29,705	$ 29,710	$ 27,665	$ 101,170
UNICEF COSTS					
Insecticide	$ 4,970	$ 5,195	$ 6,190	$ 4,935	$ 21,290
Supplies and Equipment	500	500	500	500	2,000
Vehicles	1,840	1,840	1,100	1,100	5,880
Freight Charges	1,295	1,345	1,480	1,210	5,330
Total:	$ 8,605	$ 8,880	$ 9,270	$ 7,745	$ 34,500
TOTAL COSTS:	$ 22,695	$ 38,585	$ 38,980	$ 35,410	$ 135,670
Cost per person protected	$ 0.27	$ 0.38	$ 0.38	$ 0.29	$ 0.33

* Data on Houses/Man-Day reported for Fourth Cycle only.

ANNEX III

EL SALVADOR

A. Incidence of Insect-Borne Disease Prior to the Cooperative Programme.

The Republic of El Salvador is the smallest and most densely populated on the American Continent. The superficial area of the country is estimated at 21,160 square kilometers, and the population, according to the 1950 census, was 1,858,656. The over-all population density is therefore 88/sq. km., or 225/sq. mi.

Topographically, two mountain ranges cross the country longitudinally. The coastal plain extends inland for some 10 miles, to a volcanic chain of mountains. These then slope away northward to form the valley of the Lempa River; farther to the north the elevation rises to form part of the Cordillera which runs from eastern Guatemala through Honduras.

Historically, malaria has been either the first or second cause of death in El Salvador. Based upon extensive studies carried out by the Health Department in the years 1938-1940, zones of malarial incidence had been established as follows:

1. Zone of low endemicity. Elevation above 900 meters. Spleen rates from 5% to 20%. Approximately 825,000 inhabitants.

2. Zone of moderate endemicity. Elevation from 601 to 900 meters. Spleen rates from 21% to 35%. Approximately 500,000 inhabitants.

3. Zone of high endemicity. Spleen rates between 36% and 50%. Approximately 300,000 inhabitants.

4. Hyperendemic Zone. Spleen rates above 50%. Approximately 225,000 inhabitants.

Following these surveys, anti-malarial drainage projects were established in 6 communities to afford protection to some 100,000 people. In 1946, a DDT service was initiated which, at the time of first discussions with UNICEF and WHO/PASB, was affording protection to an additional 20,000 people.

Although no case of Yellow Fever has been diagnosed in El Salvador for some 25 years prior to 1949, entomological studies had shown Aedes aegypti to exist in 11 of 14 localities surveyed, with indices of from 1% to 22%. Thus, the country was susceptible to an outbreak of Yellow Fever, should the virus become established in urban centers.

Chagas' Disease had been reported from several localities in El Salvador, but little was known about its extent in the country.

/First Discussions

B. First Discussions with UNICEF and WHO/PASB and the Development of the Official Requests.

In 1949, following an exchange of correspondence between the Organizations and the Government, representatives of both UNICEF and WHO/PASB visited El Salvador to discuss the establishment of an Insect Control Programmeand to assist the Government in the preparation of a formal request. This first request gives much useful information regarding the incidence and distribution of malaria in El Salvador. In January, 1950, representatives of both Organizations again visited the country, to outline a specific plan of operations, establish a schedule for supply shipments, and fix the ports of entry to be used for supplies.

The UNICEF Basic Agreement was signed with El Salvador on 18 January, 1950, and on January 2, 1951, an Agreement was signed with the WHO/PASB covering the Insect Control Programme.

The preliminary plan of operations proposed by the Government in January, 1950, called for the protection of some 250,000 people in the hyperendemic and highly endemic Zones, principally among the rural population.

Based upon the intermediate results of the campaign, in August, 1950, a second request was prepared for presentation to UNICEF, in which additional supplies of insecticide and vehicles were requested. At the time of this request, it was planned to initiate an airplane larvicidal campaign in the region of the coastal plain at the delta of the Lempa River. However, considering that the Programme should be primarily a Residual House Spray Programme WHO/Geneva did not approve this phase of the programme. Solvent for these activities, requested in August, 1950, and furnished by UNICEF, has so far not been used.

C. Allocations by the Executive Board of UNICEF for the Cooperative Programme.

In March, 1950, the Executive Board allocated $100,000 for the Programme and in May, 1951, an additional $67,000 was allocated.

The breakdown on the supplies furnished by UNICEF is as follows:

Item	Units	Costs
Insecticide		$ 135,100
75% DDT, wettable powder	380,000 lbs.	
10% DDT, dust, in pyrophilite	5,000 lbs.	
Supplies and Equipment		4,900
Solvent	6,264 gals.	
Sprayers and spare parts	150	
Microscope	1	
Adding Machine	1	
Ancillary Equipment	various	

/Vehicles

Item (cont'd)	Units (cont'd)	Costs (cont'd)
Vehicles		$ 27,000
Jeep Station Wagons	2	
Jeep Pick-Up Trucks	5	
Universal Jeeps	3	
Truck, 5 ton, Chevrolet	1	
Spare parts, tires, and wire rope		
	TOTAL:	$167,000

In addition, UNICEF has expended the following amount in freight charges to the ports of entry of El Salvador:

Insecticide	$ 21,040.74
Supplies and Equipment	1,911.87
Vehicles	1,833.42
TOTAL	$ 24,786.03

These amounts are not charged to the Salvadoran allocation, but are here included in the cost of the Programme for analytical purposes.

Following the original allocation, supplies for the Programme began arriving in El Salvador in May, 1950.

D. Government Personnel Responsible for the Development of the Cooperative Programme

Operational activities of the Insect Control Programme are a function of the Division of Epidemiology of the Health Department. Since the beginnings of the Programme in 1949, the following persons have been responsible for its realization:

Minister of Public Health and Social Assistance	:	Dr. Eduardo Barrientos
Sub-Secretaries	:	Dr. Leon Avila h. Dr. Carlos Gonzalez Bonilla Dr. Roberto Caceres Bustamante
Director General of Public Health		Dr. Juan Allwood Paredes
Chiefs of the Division of Epidemiology	:	Dr. Alberto Aguilar Rivas Dr. Ricardo J. Peralta
Chiefs of the Section of Malariology	:	Dr. Julian Rodriguez Dr. Jacinto Avalos Dr. Julio C. Hernandez
Chief of the Section of Vector Control	:	Dr. Carlos A. Sasso / Programme

E. Programme Operations.

Operations in connection with the UNICEF-supported Insect Control Programme began in June, 1950. For purposes of this analysis, the first cycle of treatment is considered to have terminated at the end of 1950; subsequent cycles are shown on a six-month basis.

Using the crews on hand at the beginning of 1950 as a nucleus, the Government expanded the programme in 1950 to afford protection to over 130,000 people, as is shown on the accompanying Table which summarizes operations. Again in 1951, the Programme was expanded, and additional areas included in those under treatment. During the Third and Fourth cycles of treatment, Government supplies and equipment, purchased in 1950 as a matching contribution to UNICEF supplies, were used in the Integral Demonstration Area. This Demonstration Area is a cooperative project of the Government of El Salvador and three of the specialized agencies of the United Nations, WHO, FAO, and UNESCO.

In addition to the anti-aegypti work in El Salvador, which parallels that carried out in other countries in Central America, experiments have been carried out, with excellent results, on techniques for dosing public water supplies with 1 part per million of DDT to control A. aegypti. Eight population centers have so far been treated in this manner. All are now negative for A. aegypti.

Stimulated by the possibilities of nation-wide malarial control afforded by the Cooperative Programme, the Health Department of El Salvador devoted the Second National Sanitary Congress in 1950 to the subject of malaria. Representatives of UNICEF and WHO/PASB attended the Congress, at which plans were discussed for the expansion of the present program to include all malarious zones in the country over a five-year period. The expansion of operations, already noted in the Third and Fourth Cycles, is the first step in this plan. One of the principal difficulties confronting the Health Department in its desires to extend the scope of the Program is the lack of trained personnel, particularly in the Squad Leader category. The Vector Control Section is, however, training personnel at the present time to serve in this category.

In areas not reached by the Residual House Spray Program, the Health Department has enlisted the aid of volunteers who collaborate in the free distribution of anti-malarial drugs to the public. The number of distribution stations has increased considerably since the beginning of the campaign.

F. Incidence of Insect-Borne Diseases as of June 30, 1952.

Systematic malaria surveys of localities previously treated in the Program have not yet been carried out in El Salvador. It is planned to establish such surveys during the course of the coming year.

As a measure of the effectiveness of the Program, in addition to what can be deduced from comparable data in other countries, Table I shows the numbers of deaths due to malaria during the period 1941-1951, as well as the specific death rate per 100,000 population.

/ In connection

In connection with the campaign against Aedes aegypti, 135 localities have been found to be positive since the inception of the campaign. In 26 of these, aegypti no longer exists, while the number of foci still existing in the other 109 have been considerably reduced.

G. Plans for the Future.

The total amount of DDT on hand is sufficient for the coming year's operations.

In accordance with the availability of personnel and funds, the Health Department plans to continue extending the Programme to other localities of the country, and to keep as its goal a nation-wide campaign for the ultimate eradication of malaria, and of Aedes aegypti.

As previously mentioned, it is planned to review the requirements for systematic malaria surveys during the coming year, and establish a control programme for zones previously treated.

EL SALVADOR

Deaths and Death Rates from Malaria.

Year	Number of Deaths	Death Rate per 100,000
1941	3,380	188.3
1942	4,870	263.7
1943	4,446	247.2
1944	3,691	192.7
1945	3,288	168.1
1946	2,946	147.6
1947	2,780	134.2
1948	2,787	131.2
1949	2,247	103.0
1950	1,701	91.5

/Cooperative Insert

EL SALVADOR

Cooperative Insect Control Programme - Summary of Operations

	First Cycle June - Dec. 1950	Second Cycle Jan. - June 1951	Third Cycle July - Dec. 1951	Fourth Cycle Jan. - June 1952	Totals as of June 30 1952
Localities treated	269	301	539	403	1,512
Houses treated	27,327	27,479	58,434	54,088	167,328
Population protected	131,398	133,908	312,186	279,992	857,484
Square Meters of surface treated	9,820,000	10,360,828	22,905,444	13,580,197	57,166,469
Kilograms DDT (as 100%) used	15,557	22,131	47,309*	27,118*	112,115*
Man - Days spraying	3,451	3,840	7,101	6,139	20,531
Man - Days supervising	937	1,318	2,238	2,121	6,614
AVERAGES:					
Houses per Man-Day spraying	7.9	7.2	8.2	8.8	8.2
Sq.met.per Man-Day spraying	2,845	2,825	3,220	2,210	2,780
DDT Applied; grams per square meter	1.6	2.03	2.07	2.0	1.96
GOVERNMENT COSTS:					
Personnel	$ 13,270	$ 15,930	$ 26,825	$ 28,510	$ 84,535
Supplies & Equipment	- - -	- - -	22,810*	14,600	37,410*
Transportation	4,550	3,230	2,870	3,240	13,890
TOTAL:	$ 17,820	$ 19,160	$ 52,505	$ 46,350	$ 135,835
UNICEF COSTS:					
Insecticide	$ 16,200	$ 23,000	$ 35,400	$ 19,300	$ 93,900
Supplies & Equipment	815	815	815	815	3,260
Vehicles	3,375	3,375	2,025	2,025	10,800
Freight Charges	3,060	4,115	5,945	3,455	16,575
TOTAL:	$ 23,450	$ 31,305	$ 44,185	$ 25,595	$ 124,535
TOTAL COSTS:	$ 41,270	$ 50,465	$ 96,690	$ 71,945	$ 260,370
Cost per person protected:	$ 0.24	$ 0.38	$ 0.31	$ 0.26	$ 0.30

*Government DDT used in Integral Demonstration Area.

ANNEX IV

GUATEMALA

A. Incidence of Insect-Borne Disease Prior to the Cooperative Program.

Guatemala is the largest of the Central American Republics. The population, according to the census of 1950 was 2,786,403. The superficial area is estimated at some 109,000 square kilometers.

Insect-borne diseases in Guatemala may be classified in terms of the topography of the country. The lowland diseases, including malaria and Chagas' disease, are found at elevations up to 4,000 feet. Malaria, particularly, is considered endemic below this altitude. In the highlands, louse-borne typhus was, historically, one of the principal Public Health problems, although an intensive vaccination campaign begun in 1945 by the Health Department, in cooperation with the PASB, has done much to control this disease.

A malarial survey of 11 population centres during 1949 showed that the spleen indices varied from 3.3% to 76.9%, while the parasite indices varied from 1.6 to 25%. Estimates of the total number of cases occurring in Guatemala in years past has run as high as 500,000.

The last reported case of Yellow Fever occurred in Guatemala in 1921, so that in 1949 a non-immune population was highly susceptible to the disease, should it become established.

Roughly one-half the population of Guatemala lives in areas above 5,000 feet elevation, the region where exanthematic typhus has been prevalent since the Colonial epoch, and, according to some historians, since the time of the Mayan civilization. Incomplete data, due to the fact that some areas are without medical services, show that the following number of cases and deaths occurred in Guatemala in the period 1943-1945.

Year	Cases	Deaths	Fatality Rate
1943	1,338	213	15.9%
1944	2,144	381	17.8%
1945	2,834	323	11.4%

In 1943, the Health Department of Guatemala, in cooperation with the Inter-American Cooperative Health Service (SCISP), organized a Typhus Control Section. In 1945, a three-year program was initiated in cooperation with the PASB. Vaccination of the entire population living in the highlands region was planned. With the advent of DDT as 10% dusting powder, this insecticide was incorporated into the campaign.

In 1948, the Section of DDT and Aedes aegypti Control was established in the Health Department. Prior to the arrival and use of UNICEF supplies, some 145,000 persons were being protected against malaria, and routine inspections against aegypti were being carried out.

/ B. First Discussions

B. First Discussions with UNICEF and WHO/PASB and the Development of the Official Requests.

First discussions of the Cooperative Program began in October, 1949, when representatives of UNICEF and WHO/PASB visited the Health Department to exchange views with the authorities. This led to the presentation of the official request by Guatemala, in which was requested insecticide for all three programs, spray pumps, and vehicles.

In December, 1949, discussions were again held with Health Department officials to draw up a specific plan of operations, establish ports of entry for materials, and a schedule for shipments.

The preliminary plan of operations called for spray operations to be expanded to protect approximately 300,000 persons, primarily in the rural population, in those Departments most affected by malaria.

Original calculations estimated that the DDT requested from UNICEF for Typhus Control operations would be sufficient to protect 225,000 people. However, the amount of DDT furnished was later reduced by 50%, in an agreement between the Organizations and the Health Department.

C. Allocations by the Executive Board of UNICEF for the Cooperative Program.

The Executive Board, in March, 1950, allocated $94,000 for the combined Insect Control Program in Guatemala, and in November, 1951, and additional $24,000 was allocated.

The breakdown on supplies furnished by UNICEF is as follows:

Item	Units	Costs
Insecticide		$ 97,500
DDT, 75%, wettable powder	228,000 lbs.	
DDT, 100%, technical grade	1,000 lbs.	
DDT, 10% dust, in pyrophilite	25,000 lbs.	
Supplies and Equipment		2,000
Sprayers and spare parts	100	
Microscopes	2	
Ancillary equipment	various	
Vehicles		23,000
Jeep Station Wagons, spare parts, tires, wire rope	9	
	TOTAL:	$122,500

/This debit balance

This debit balance of $4,500 has been absorbed by the overall allocation for Guatemala.

In addition UNICEF has expended the following amounts in freight charges to the ports of entry of Guatemala.

Insecticide	$14,568.50
Supplies and Equipment	$ 165.20
Vehicles	$ 1,791.68
TOTAL:	$16,525.38

These amounts are not charged to the Guatemalan allocation but are included here in the cost of the program for purposes of analysis.

It should be pointed out at this time that the Government of Guatemala assists in the support of the UNICEF Area Office for Central America and the Caribbean. The costs of part of the office rent, several personnel of the Area Office, official communications, and maintenance and repair of vehicles are borne by the Government. These costs are not included in the analysis of the programme, since they should be apportioned among all programmes in the Area.

Following the original allocations by the Executive Board of UNICEF, supplies for the programme began arriving in May, 1950.

D. Government Personnel Responsible for the Development of the Cooperative Program.

Within the Ministry of Public Health and Social Assistance, the National Health Department is the agency responsible for the Insect Control Program. Until March of this year the specific responsiblity for operations rested with the three Sections of the Department involved; DDT, Anti-aegypti, and Typhus. In March the three Sections were combine into one Insect Control Section.

The following persons have been responsible for the development of the cooperative Programme:

Ministers of Public Health and Social Assistance:	Dr. Victor Giordani Dr. J. Augusto Gonzalez Dr. Carlos Tejeda F. Dr. Jorge Luis Arriola
Directors General of Public Health:	Dr. Luis F. Galich Dr. Roberto Gandara Lacappe
Chiefs of DDT Campaign:	Dr. Miguel A. Panagos.
Chief of Anti-aegypti Campaign:	Dr. J. Victor Avila B. (deceased) Dr. Domingo Serrano
	/ Chiefs of Typhus

Chiefs of Typhus Control Campaign: Dr. J. A. Cabrera
Dr. L. Arroyave

Chief of Laboratory: Dr. Francisco Aguilar

E. Data on Operations.

Although UNICEF supplies did not begin to be used in the Malaria Control Programme until October, 1950, this report covers the period July, 1950 - June, 1952, so that comparisons are afforded with other Central American countries. The accompanying Table shows the progress of the campaign, by cycles of treatment.

Operations of the Typhus Control Section are shown in the second Table which summarizes the activities over the two-year period indicated above.

The programme for Malaria Control, following an initial expansion during the second cycle of treatment, suffered a reduction in budget for fiscal year July 1951 - June 1952. As a result of this a number of spraying men had to be discharged, and the resulting indemnities reduced the budget even more.

Of the total of 228,000 lbs. of 75% DDT furnished by UNICEF, 199,000 lbs. have been used by the Malaria Control Programme and another 3,000 lbs. have been used in the Anti-aegypti campaign and in spraying public markets in Guatemala city. All supplies of DDT in the country were exhausted on the 15th of June, 1952. The Government is initiating an investigation to determine the status of the 26,000 lbs. of DDT so far unreported.

In 1951 it was decided to suspend the vaccination campaign against Typhus when stocks of vaccine on hand were exhausted. This accounts for the low number of vaccinations reported during the first half of 1952. At the same time it will be noted that there was an increase in the number of persons treated with 10% DDT for Typhus control.

The Anti-aegypti Section has been working in population centres, which have not been treated by the DDT Section in its campaign of Malaria control.

F. Incidence of Insect-Borne Diseases, as of June 30, 1952.

As an indication of the success of the DDT Campaign against malaria, the following table shows the reduction in cases of malaria attended by the Health Unit in Salama in the department of Baja Verapaz.

Municipalities	Years 1947	1948	1949	1950	1951
Salama	129	152	172	81	78
San Jeronimo	82	64	27	65	22
Rabinal	182	118	91	122	73
Purulhe	43	15	8	12	11
Granados	19	14	29	22	14
Cubulco	200	91	143	113	61
El Chol	11	17	6	15	7
San Miguel	119	177	82	123	42
Total	785	648	558	553	308

/The Insect Control

The Insect Control Campaign was begun in Baja Verapaz in 1949.

The following table shows the reduction in Malaria cases seen by the Mobile Health Unit, which operates in the Department of Guatemala.

Year	Cases
1949	3,934
1950	2,472
1951	791

Since the beginning of the Anti-aegypti Campaign, the following data has been obtained:

Localities inspected	422
Localities originally negative	319
Localities now negative following .... treatment.....	69
Localities still positive.....	34

It should be pointed out that the number of foci in localities still positive has been considerably reduced.

The success of the Typhus Control Campaign may best be shown from the following Table.

NUMBER OF CASES AND DEATHS FROM TYPHUS BY YEARS.-

Year	Cases	Deaths
1943	1,338	213
1944	2,144	381
1945	2,834	323
1946	1,043	135
1947	251	37
1948	69	9
1949	26	2
1950	10	2
1951	8	0
Totals:	7,723	1,102

F. Plans for the Future

Guatemala has signed an agreement for a technical assistance program with the WHO for the coming year. This program will provide fellowships for Guatemalan technicians in the field of Insect Control and Yellow Fever control.

The Zone Office of PASB has been requested by the Health Department to assist in the reorganization of the combined Insect Control Section.

/In May 1952

In May 1952 the Government purchased 100,000 lbs. of 75% DDT and 6,000 lbs. of technical grade DDT to continue the Insect Control Programme; as soon as these supplies arrive and the reorganization of the Insect Control Programme is effected, field operations will resume.

It is planned to devote more activity to malaria surveys in Guatemala in order to establish the incidence of the disease in those localities which have been treated several times.

Typhus control activities will be incorporated in the Insect Control Section and 10% DDT dust will continue to be acquired as has been done previously.

GUATEMALA

Cooperative Insect Control Programme - Summary of Operations

	First Cycle July - Dec. 1950	Second Cycle Jan. - June 1951	Third Cycle July - Dec. 1951	Fourth Cycle Jan. - June 1952	Totals as of June 30, 1952
Localities treated	380	1,200	711	318	2,609
Houses treated	44,986	103,553	59,618	32,436	240,593
Population protected	221,725	545,873	297,837	155,933	1,221,368
Square meters of surface treated	5,700,000	14,682,100	9,286,831	7,874,502	37,543,433
Kilograms DDT (as 100%) used	16,292*	31,631*	23,114	15,329	86,336
Man - Days spraying **	- - -	- - -	- - -	- - -	- - -
Man - Days supervising **	- - -	- - -	- - -	- - -	- - -
AVERAGES:					
Houses per Man-Day **	- - -	- - -	- - -	- - -	- - -
Square Meters per Man-Day**	- - -	- - -	- - -	- - -	- - -
DDT applied, grams per square meter	2.8	2.1	2.5	1.95	2.3
GOVERNMENT COSTS:					
Personnel	$ 36,850	$ 64,265	$ 38,510	$ 28,645	$ 168,270
Supplies and Equipment	24,830	11,530*	- - -	- - - ***	36,360
Transportation	2,670	3,385	3,535	2,725	12,315
TOTAL:	$ 64,350	$ 79,180	$ 42,045	$ 31,370	$ 216,945
UNICEF COSTS:					
Insecticide	$ 4,095	$ 31,810	$ 26,160	$ 18,800	$ 80,865
Supplies and Equipment	335	335	335	335	1,340
Vehicles	2,875	2,875	1,725	1,725	9,200
Freight charges	805	4,555	4,000	2,685	12,045
TOTAL:	$ 8,110	$ 39,575	$ 32,220	$ 23,545	$ 103,450
TOTAL COSTS:	$ 72,460	$ 118,755	$ 74,265	$ 54,915	$ 320,395
Cost per person protected:	$ 0.33	$ 0.22	$ 0.25	$ 0.35	$ 0.26

* Government DDT consumed during first year of operations, as well as UNICEF DDT.

** Guatemala does not report data on man-days of operations.

*** During Fourth Cycle, the Government purchased 106,000 lbs. DDT for use.

GUATEMALA

TYPHUS CONTROL PROGRAM

Item	July - Dec. 1950	Jan. - June 1951	July - Dec. 1951	Jan. - May * 1952	Totals*
Number of vaccinations	137,102	193,795	225,026	1,961	557,884
DDT Treatments:					
Persons	46,304	42,769	38,326	103,035	230,434
Pieces of Clothing	697,689	332,688	247,959	586,685	1,847,021
Pieces of Furniture	78,004	108,449	85,761	144,876	417,090
Rooms	19,991	17,971	22,853	61,497	122,312
Lbs. 10% DDT used	8,681	8,781	10,627	25,708	53,797
Government costs:					
Vaccine	$ 5,895	$ 8,325	Costs not reported	Costs not reported	
Medicines	375	360			
Salaries	11,550	13,280			
Transportation	1,785	2,335			
Miscellaneous	1,345	975			
TOTAL:	$ 20,950	$ 25,275			
Cost per person:	$ 0.11	$ 0.11			

* Figures for June, 1952 not available at time of this report.

ANNEX V

H O N D U R A S

A. Incidence of Insect-Borne Disease Prior to the Cooperative Programme.

The Republic of Honduras has a population of approximately 1,500,000 inhabitants and a territorial extension of 153,226 square kilometers. The southern eastern and central portions of the country are accessible from the Capital of the existing road system, but much of the country is inaccessible except by airplane, launch, or horseback.

Malaria has been widespread throughout Honduras and in 1949 it was considered the Number One cause of death in the country. The total death rate from malaria consistently averaged in the neighbourhood of 550/100,000 inhabitants. Approximately one third of the total deaths in Honduras were reported to be caused by malaria.

The principal vector of malaria in Honduras has been demonstrated to be Anopheles albimanus, which is quite prevalent during the rainy season. Other possible vectors of malaria included A. pseudopunctipennis and A. darlingi.

During the last six morths of 1949, 9 localities were inspected for Aedes aegypti, the vector of urban yellow fever. 6 of these localities were found to be positive and from their geographic distribution it was assumed that Aedes aegypti would be found throughout the country. In view of the fact that no case of yellow fever had been reported in Honduras during the last 25 years, the majority of the population was susceptible to the disease and the presence of Aedes aegypti constituted a danger should the virus of yellow fever become established in urban centers.

B. First Discussions with UNICEF and WHO/PASB and the Development of the Official Requests.

Following exchange of correspondence with the Government of Honduras in 1949, representatives of UNICEF and WHO/PASB visited the country in order to assist the Government in its official request to the Executive Board. On October 5, 1949 this request was presented, which embodies insecticides, vehicles, spray pumps, a microscope, and auxiliary equipment. In December of the same year representatives of both organizations again visited Honduras to obtain further specific information regarding the development of the Programme in the country, the consignee for UNICEF materials and the ports of entry to be used for supplies.

The Basic Agreement with UNICEF was signed on 17 January 1950 and on January 2, 1951 the Agreement covering this Programme was signed with the WHO/PASB.

The preliminary plan of operations proposed by the Government of Honduras called for the spraying of 15,000 houses during the first cycle of treatment and during the succeeding cycles the number of houses to be sprayed was to be raised.

/Originally operations

Originally operations were to be limited to localities accessible by truck, except that in a few cases arrangements were made to fly men and materials to centers known to be malarious.

Based upon the intermediate results of the spray programmes, in April 1952 a second request for spray pumps and an additional quantity of insecticide was presented to the Board by the Government. This quantity of insecticide was matched by the Government for the continuation of the Programme.

C. Allocations by the Executive Board of UNICEF for the Cooperative Programme.

The Executive Board allocated $86,000 in March of 1950; an additional $5,000 in November of 1951 to cover excess costs, and in April of 1952 a further $26,000 was allocated for the Insect Control Programme in Honduras.

The breakdown on the supplies furnished by UNICEF is as follows:

Item	Units	Costs
Insecticide		$ 96,100
75% DDT, wettable powder	250,000 lbs.	
100% DDT, technical grade	15,000 lbs.	
26% DDT, emulsifiable concentrate	5,500 gals.	
Supplies and Equipment		4,100
Sprayers and spare parts	160	
Microscope	1	
Ancillary equipment	various	
Vehicles		18,600
Jeep Station Wagons	3	
Jeep Pick-up Trucks	4	
Spare parts and Tires		
TOTAL:		$118,000

The deficit of $1,800 has been made up from the unprogrammed Balance in the overall Honduran allocation.

In addition, UNICEF has expended the following amount in freight charges to the ports of entry of Honduras:

Insecticide	$ 13,853.30
Supplies and Equipment	935.72
Vehicles	1,583.15
TOTAL	$ 16,372.17

These amounts are not charged to the Honduran allocation, but are included in the costs of the Programme for purposes of analysis.

Following the original allocation, supplies for the Programme began arriving in Honduras in May 1950.

/D. Government Personnel

D. Government Personnel Responsible for the Development of the Cooperative Programme.

The Government of Honduras selected the Inter American Cooperative Health Service (SCISP) as the agency responsible for the development of the Insect Control Programme. The SCISP is a cooperative agency of the Ministry of Government, Justice, Health and Welfare of the Republic of Honduras and of the Institute of Inter-American Affairs, an agency of Department of State of the United States of America; thus the Programme in Honduras is in every sense a cooperative one. In addition the SCISP signs working agreements with municipalities scheduled to be treated in the Programme, in which agreements it specifies that the municipalities must contribute something toward the cost of the Programme should this only involve local transportation or warehouse facilities.

The following personnel have been responsible for operations:

Minister of Government, Justice, Public Health and Welfare :	Mr. Julio Lozano
Director of the Inter-American Cooperative Public Health Service:	Mr. J. L. Hummel
Chief of the Division of Malariology:	Dr. Jorge E. Zepeda

E. Programme Operations.

At the request of WHO/PASB and UNICEF the SCISP made available the services of Mr. Bernardo Avila, Chief of Operations in the northern zone of Honduras, for training personnel in British Honduras. Mr. Avila's services were very valuable in assuring the development of the Programme in that Colony.

The Programme in Honduras began in May of 1950; operations were begun on the south coast and after that was covered they were extended inland toward the capital. Later on as materials arrived on the north coast operations were begun there. Because of the previous studies made by the SCISP on malaria transmission it was decided to use 8 month-cycles in Honduras rather than cycles of 6 months as were used in the other countries. As will be seen from the accompanying chart summarizing spray operations by cycles of treatment, the scope of the Programme in Honduras has been constantly increased. It should also be realized that costs shown of expenditures by the Government are probably low since expenditures by the municipalities themselves are sometimes impossible to include.

Late in 1951 an outbreak of poliomyelitis occurred on the north coast of Honduras, and at the end of the year cases appeared in Tegucigalpa. As a consequence, the SCISP engaged in a campaign against flies, consisting of space spraying of aerosol fogs to combat adult flies, and the addition of Chlordane to the DDT furnished by UNICEF, to attack DDT-resistant strains. These operations were carried out in Tegucigalpa and in San Pedro Sula and several other localities along the north coast.

/F. Incidence of Insect-Borne

F. Incidence of Insect-Borne Disease as of June 30, 1952.

In 1952, the SCISP purchased laboratory equipment to carry out malaria investigations throughout the country. This phase of the programme is to begin during Fiscal Year 1952-1953, and in the absence of data from systematic malaria surveys, records on out-patient examinations in the Health Centers of Tegucigalpa and Choluteca have been summarized in Tables I and II, respectively, to demonstrate the reduction in malaria. The Center in Tegucigalpa serves not only the Capital but from the neighboring rural districts from other Departments, while Choluteca is attended by persons from the south coast only. From the results in Tables I and II, a continual decrease in positive examinations is shown.

Of particular interest is the change in type of infection. In both centres, P. vivax, the form from which relapses may be expected, is now relatively more common than before, while the incidence of P. falciparum is being reduced. The relation between relapsed cases of P. vivax to new infections is unknown, but the overall picture presents evidence, however indirectly, of a reduction in malaria transmission as a result of the campaign.

With reference to the eradication campaign against Aedes aegypti in Honduras, the following data attest to the success of the Insect Control Programme:

Localities inspected	265
Localities positive for A. aegypti on first inspection	41
Localities originally positive but now negative	40
Localities still to be inspected	1

The one locality still to be inspected is Danli, in the Department of El Paraiso. It was scheduled for inspection in June 1952, but the results of this inspection were not available at the time this report was written.

In connection with the results of the anti-aegypti campaign, it is also interesting to note that Anopheles darlingi has also disappeared from localities treated by the Insect Control Programme. This parallels the experience in British Guiana.

G. Plans for the Future.

Approximately 60% of UNICEF-furnished insecticide has now been consumed in the Programme. The remaining portion of the UNICEF contribution, and the amount purchased by the Government, will assure a continuance of the Programme for at least three more cycles, or until July of 1954, and allow for an expansion of future cycles.

Now that the Malariology Laboratory is established, it is planned to conduct systematic surveys in localities treated during the first three cycles, to determine the present incidence of malaria and plan for future control.

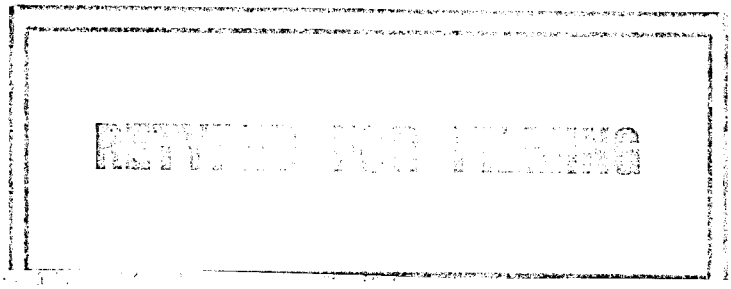
/The Health Department

The Health Department will continue the vaccination of the population in rural zones exposed to the menace of Jungle Yellow Fever.

It is expected that Honduras will join the Regional Programme for Insect and Yellow Fever Control, a Technical Assistance programme of the WHO. Included in the programme are Fellowships for three Hondurans for specialized studies related to Insect Control and Yellow Fever.

The SCISP will send Mr. Zuniga, the Assistant Chief of the Malariology Division, to Venezuela for specialized studies at the IX International Malariology Course, held this year at Maracay.

Honduras will also participate in the studies on the epidemiology of Jungle Yellow Fever, to be carried out by the PASB in cooperation with the Governments of Central America.



CHOLUTECA HEALTH CENTRE

EXAMINATIONS FOR MALARIA

FISCAL YEARS	1945 1946	1946 1947	1947 1948	1948 1949	1949 1950	1950 1951
Number of persons examined	3,266	1,384	1,337	1,092	348	497
Number of positive examinations	2,522	565	933	655	142	200
Per cent of examinations positive	77.2	40.8	69.8	60.0	40.8	40.2
Per cent distribution of malaria parasites in positive examinations:						
P. vivax	79.5	75.0	84.1	85.3	92.9	94.0
P. falciparum	20.0	23.8	15.2	13.4	7.1	6.0
P. malariae	0.5	1.2	0.7	1.3	0.0	0.0

TEGUCIGALPA HEALTH CENTRE

EXAMINATIONS FOR MALARIA

FISCAL YEARS	1945 1946	1946 1947	1947 1948	1948 1949	1949 1950	1950 1951
Number of persons examined	4,222	3,546	2,904	1,833	1,666	1,019
Number of positive examinations	757	544	253	119	98	31
Per cent of examinations positive	17.9	15.3	8.7	6.4	5.8	3.0
Per cent distribution of malaria parasites in positive examinations:						
P. vivax	56.6	68.3	66.0	66.3	73.5	87.0
P. falciparum	41.6	28.1	32.0	31.9	26.5	9.6
P. malariae	1.8	3.6	2.0	1.8	0.0	3.4

COOPERATIVE INSECT CONTROL PROGRAMME - HONDURAS

Summary of Operations

	First Cycle May - Dec. 1950	Second Cycle Jan. - August 1951	Third Cycle Sept. 1951 April 1952	Fourth Cycle** May - Dec. 1952	Totals as of June 30 '52
Localities treated	101	183	213	24	521
Houses treated	28,137	42,615	46,275	3,416	120,443
Population protected	147,412	194,557	242,755	15,358	600,082
Square meters of surface treated	5,010,000	8,977,500	9,949,000	656,000	24,592,500
Kilograms DDT (as 100%) used	10,801	18,989	16,213	1,069	47,072
Man - Days spraying	2,792	4,224	4,337	299	11,652
Man - Days supervising	625	809	867	89	2,390
AVERAGES:					
Houses per Man-Day spraying	10.1	10.1	10.7	11.4	10.3
Square Mt. per Man-Day spraying	1,790	2,120	2,300	2,193	2,110
DDT applied, grams per square meter	2.16	2.12	1.63	1.62	1.91
GOVERNMENT COSTS:					
Personnel	$ 17,925	$ 29,795	$ 30,285 *	$ 1,845	$ 79,850
Supplies and Equipment	2,850	2,230	4,130 *	725	9,935
Transportation	4,050	7,135	6,870 *	575	18,630
TOTAL:	$ 24,825	$ 39,160	$ 41,285 *	$ 3,145	$108,415
UNICEF COSTS:					
Insecticide	$ 10,690	$ 18,800	$ 16,050	$ 1,060	$ 46,600
Supplies and Equipment	910	910	910	115	2,845
Vehicles	2,650	2,120	1,590	200	6,560
Freight Charges	2,020	3,135	2,685	200	8,040
TOTAL:	$ 16,270	$ 24,965	$ 21,235	$ 1,575	$ 64,045
TOTAL COSTS:	$ 41,095	$ 64,125	$ 62,520	$ 4,720	$172,460
Cost per person protected:	$ 0.28	$ 0.33	$ 0.26	$ 0.31	$ 0.29

* During this period, the Government also purchased 50,000 lbs. of 75% DDT, at a cost of $27,000.

** Report for June, 1952 not received at time of this Report.

ANNEX VI

NICARAGUA

A. Incidence of Insect-Borne Disease Prior to the Cooperative Programme.

The Republic of Nicaragua has an extension of 148,000 square kilometers, and in 1950 had a population of 1,053,189, according to the census taken that year. Politically, the country is divided into sixteen departments. Managua, the capital and largest city, had a population of 107,444 at the time of the census.

Topographically, Nicaragua is distinguished among Central American countries by the fact that most of its territory is low in elevation. Although crossed from northwest to southeast by the Cordillera, the foothills rise abruptly from the coastal plains, and are narrow in their extension. These features, combined with th presence of two large lakes in the country, have helped to make malaria endemic in the entire country. The city of Jinotega, the highest in the country (elev. 3,000 ft.) has suffered from endemic malaria.

During 1943 and 1944, malaria surveys were carried out in eighteen population centers in Nicaragua. The Parasite Indices disclosed that from 7% to 75% of the population suffered from malaria at the time of the survey. Some drainage work has been carried out in the interim, but this has not been extensive, and it is doubtful if fluctuations in the malaria pattern between the period 1943-44 and the initiation of the Insect Control Programme could be attributed to any but normal annual and periodic variations in incidence.

Although Yellow Fever, either in urban or sylvatic form, had not appeared in Nicaragua for some 25 years prior to the Programme, the presence of Aedes aegypti in 14 of 18 localities originally inspected indicated that the danger of rapid propagation existed should the virus once again infect urban centers.

Scattered surveys had shown that Chagas' Disease and Filariasis existed in Nicaragua, but the extent and incidence had not been clearly established. Likewise, no estimates had been made of the amount of gastro-enteric infections caused by houseflies.

B. First Discussions with UNICEF and WHO/PASB and the Development of the Official Requests.

Following exchange of correspondence in 1949, UNICEF and WHO/PASB representativ visited Nicaragua in October of that year to begin formal discussions leading to the establishment of the Insect Control Programme and to assist the Government in preparing its official request. This document requested supplies of insecticides, spra pumps and spare parts, vehicles and launches, and other auxiliary equipment. In December 1949, representatives of both Organizations again visited Nicaragua to obtain more specific information regarding the proposed development of the Programme

On 17 January the Agreement with UNICEF was signed, and on 25 September 1950 an Agreement covering the Programme was signed with the WHO.

/ The preliminary

The preliminary plan of operations proposed by the Government called for the spraying of all houses in Nicaragua, thus protecting 1,000,000 persons. It was estimated that UNICEF supplies would be sufficient to protect the entire population during three cycles of spraying, the Government undertaking to carry out the fourth cycle of spraying with its own resources.

Based upon the intermediate results of the campaign, in May of 1951 a second request for assistance was presented by the Government to the Executive Board. This request covered additional supplies of insecticides, and equipment for an entomological laboratory to be developed in Managua. At this time, the Government committed itself to procure DDT in an amount equal to that requested of UNICEF.

C. Allocations by the Executive Board of UNICEF for the Cooperative Programme.

The Executive Board allocated $121,000 in March 1950, and in May of 1951 an additional $113,000 for the Insect Control Programme.

The breakdown on the supplies furnished by UNICEF is as follows:

Item	Units	Costs
Insecticide		$ 215,900
75% DDT, wettable powder	534,000 lbs.	
100% DDT, technical grade	40,000 lbs.	
Supplies and Equipment		4,000
Solvent and emulsifier	4,300 gals.	
Sprayers and spare parts	125	
Outboard motors	6	
Equipment for Entomological Laboratory	1	
Ancillary equipment	various	
Vehicles		10,000
Jeep Station Wagons and spare parts	4	
Project Personnel		1,000
Travel grant for training of Gov't. Medical Officer	1	
TOTAL:		$ 234,900

The deficit of $900 has been made up from the unprogrammed balance in the over-all Nicaragua allocation.

In addition, UNICEF has expended the following amount in freight charges to the ports of entry of Nicaragua:

/Insecticides

Insecticides	$32,376.43
Supplies & Equipment	2,696,79
Vehicles	1,092.65
TOTAL:	$36,165.87

These amounts are not charged to the Nicaraguan allocation, but are included in the costs of the Programme for purposes of analysis.

Following the original allocation, supplies for the programme began arriving in Nicaragua in May 1950.

D. Government Personnel Responsible for the Development of the Cooperative Programme

The responsibility for the execution of the Programme rests with the Ministry of Public Health. Originally, the Rural Sanitation Section of the Ministry was charged with Programme operations; later, a special Section of Insect Control was formed within the Ministry to execute the Programme. The following personnel have been responsible for operations:

Ministers of Public Health:	Dr. Alejando Sequeira Rivas Dr. Leonardo Somarriba
Chiefs of the Insect Control Programme :	Mr. Carlos D. Garcia Dr. Roberto Chacon Dr. Alejando Robleto Perez

E. Programme Operations.

Prior to the arrival of UNICEF supplies, the Medical Officer selected for training was sent to Mexico City and to Georgetown, British Guiana, for special studies on Insect Control and on the vectors of Chagas' Disease and Filariasis.

The Programme in Nicaragua began on July 1, 1950. Prior to that date, it was necessary to create a new branch within the Rural Sanitation Section of the Ministry which was charged with Programme operations. This branch of the Section grew within a few weeks to comprise 27 Squad Chiefs, 102 Sprayers, and some 50 other persons for the necessary administrative and transportation aspects of the Programme. Field personnel were given the necessary training prior to the initiation of the Programme.

For purposes of the Programme, the country has been divided into four Zones, as shown on the accompanying map. Communications between Zone IV and the capital are by air, or by a lengthy trip across Lake Nicaragua and down the San Juan River, at the Costa Rican frontier, to the sea. The outboard motors furnished by UNICEF have been utilized in Zone IV. Communications in the other Zones are easier, although many localities can be reached only by horseback.

Due to these difficulties of transportation, the Government has not been able to expand its coverage as much as had originally been desired. Roughly, two-thirds of the population has been protected; to expand the programme to full coverage

/immediately would

immediately would probably more than double the total costs, due to increased time spent in travel with the resultant decreased output per man-day. It should be pointed out, however, that all funds originally appropriated by the Government for the Programme have been spent, and that this Programme is reaching the greatest number of people of any in Central America.

Details of operation are given in the accompanying Table. Data on costs to the Government are taken from the Budgets of the Fiscal Years. Data on actual expenditures are unavailable, and although there may be some transfer between budget categories during the course of the year, within the Insect Control Section itself, the Section has informed the PASB that the entire budget is spent each year.

F. Incidence of Insect-Borne Diseases as of June 30, 1952.

Systematic surveys to determine post-treatment malarial indices are just beginning on a large scale in Nicaragua. Nevertheless, there are some data available for the City of Managua, and from one Departmental Capital, which indicate the success of the campaign.

PARASITE INDICES

	1943	1951	1952
Managua, D.N.			
Barrio La Perla	11.3%	3.5%	0.0%
Barrio La Reynaga	44.8%	13.7%	0.0%
Barrio Prixiones	31.8%	16.0%	0.0%
Barrio Calle Colon	20.7%	6.0%	1.0%
Barrio Silva	49.8%	0.0%	- -
Barrio Riguero	- -	22.0%	0.0%
Barrio Santa Ana	- -	0.0%	0.0%
Barrio Los Pescadores	- -	1.5%	0.0%
Rivas, Rivas	31.4%	8.1%	- -

These figures give a clear picture of the effectiveness of the Programme in protecting the Capital. The reduction in infection from as high as 50% in some Wards to almost zero in a city of 100,000 inhabitants means incalculable benefits to the population, in terms of lower mortality, better health, and reduced man-days lost to illness.

As was indicated in the General Discussion, an epidemiological service has now been set up in the City of Managua, to investigate all deaths said to occur from malaria. In this manner, and with the systematic survey it is hoped to accurately determine new cases of malaria, and ascertain the cause for transmission within Managua. UNICEF-furnished laboratory facilities and equipment are proving useful in carrying out this phase of the work.

/With reference

With reference to the campaign against Aedes aegypti, 375 localities have now been inspected for this vector. Localities originally positive have been found on second inspection to be negative, and no more positive localities have been found.

To guard against the outbreak of sylvan Yellow Fever which appeared so explosively in Costa Rica in 1951, the Government has carried out a vaccination programme, giving emphasis to protecting the population living in the forests and at the fringe of the forest areas. As of June 30, 1952, 165,684 vaccinations against Yellow Fever had been carried out.

With reference to Chagas' disease and Filariasis, entomological studies are in progress to obtain more data regarding the habits of the vectors of these diseases in Nicaragua.

As had been anticipated, houseflies developed an early resistance to DDT, and are appearing again throughout the country. Until such time as the insecticide is changed, it is doubtful that further reduction in numbers can be expected from spray operations.

G. Plans for the Future.

To carry on operations in the immediate future, the Government purchased 240,000 lbs. of 75% DDT, at a cost of $144,000 during Fiscal Year 1951-1952. Figures on the cost of this insecticide do not appear in the analysis of the programme, since so far only UNICEF supplies have been used. Eighty-six percent (86%) of UNICEF-furnished insecticide has so far been consumed.

It is anticipated that both residual spray operations and vaccination against Yellow Fever will be extended during the next fiscal year (July, '52 - June, '53).

The Government and the WHO signed an Agreement on April 4, 1952 for an extension of the Technical Assistance given for the Insect Control Programme. Included in the provisions of this Agreement are two Fellowships, one of which will be used to give further training to the Entomologist now in charge of the Laboratory furnished with UNICEF supplies.

The Government, the Gorgas Memorial Laboratory, and the PASB will also participate in a cooperative study of the epidemiology and entomology of sylvatic Yellow Fever during the coming fiscal year.

Nicaragua has enough insecticide on hand for the coming year. In addition to spray operations, more emphasis will be given to surveys, and to control the results of the campaign so far.

NICARAGUA

Cooperative Insect Control Programme – Summary of Operations

	First Cycle July – Dec. 1950	Second Cycle Jan. – June 1951	Third Cycle July – Dec. 1951	Fourth Cycle Jan. – June 1952	Totals as of June 30, 1952
Localities treated	1,002	1,874	1,659	1,453	5,988
Houses treated	100,551	105,001	103,850	92,974	402,376
Population protected	570,997	600,498	628,975	567,250	2,367,720
Square meters of surface treated	29,562,545	31,658,940	36,735,125	35,151,781	133,108,591
Kilograms DDT (as 100%) used	33,537	63,317	40,474	35,623	172,951
Man – Days Spraying*	- - -	- - -	- - -	- - -	- - -
Man – Days Supervising*	- - -	- - -	- - -	- - -	- - -
AVERAGES:					
Houses per Man-Day*	- - -	- - -	- - -	- - -	- - -
Sq. Meters per Man-Day*	- - -	- - -	- - -	- - -	- - -
DDT applied; grams per square meter	1.1	2.0	1.1	1.0	1.3
GOVERNMENT COSTS: **					
Personnel	$ 62,140	$ 62,140	$ 63,460***	$ 63,460	$ 251,200
Materials) Transportation)	9,600	9,600	15,590	15,590	50,380
Total:	$ 71,740	$ 71,740	$ 79,050	$ 79,050	$ 301,580
UNICEF COSTS:					
Insecticide	$ 36,220	$ 68,380	$ 43,710	$ 38,500	$ 186,810
Supplies and Equipment	1,380	1,380	1,380	1,380	5,520
Vehicles	1,250	1,250	750	750	4,000
Freight charges	6,010	10,820	7,070	6,240	30,140
Total:	$ 44,860	$ 81,830	$ 52,910	$ 46,870	$ 226,470
TOTAL COSTS:	$ 116,600	$ 153,570	$ 131,960	$ 125,920	$ 528,050
Cost per person protected	$ 0.21	$ 0.26	$ 0.21	$ 0.22	$ 0.22

(Footnotes – see next page.)

Cooperative Insect Control Program, cont'd.

Footnotes:

* Nicaragua does not report data on Man-Days of operation.

** Costs are from National Budgets; expenditures unavailable.

*** In addition, the Government purchased 240,000 lbs. of DDT during Fiscal Year 1951-1952, at a cost of $144,000. This will be used during subsequent cycles.

UNICEF

MICROFICHE INPUT CONTROL AND INSTRUCTIONS RECORD

No. 130 (1)

(15#) STRIPE COLOUR: White Blue Grey - Yellow - Green - Brown - (Pink) - Red

Date 1/June/77 (2)

(4) (5)

(3)	77.CF.0108	E/ICEF/206
		COOPERATIVE Insect Control Program
A (17#)	ENGLISH	IN CENTRAL America UNICEF
(6)(7)(8)	"NR"	1/Oct/52 "[illegible]" 1/2 = $1-50 1/2 = 50p +16.

(16#) Blank 1 (10)

(9)

(11)

B (12) (18#)	B-1 CLEAR	B-2 1/2 77.CF .0075 (4)	B-3 CLEAR	B-4 1	B-5 2	B-6 3	B-7 4	B-8 5	B-9 6	B-10 7	B-11 8	B-12 9
C	C-1 10 10	C-2 10A 11	C-3 0 12	C-4 p. 11 13	C-5 p. 12 14	C-6 15	C-7 16	C-8 17	C-9 18	C-10 19	C-11 20	C-12 21
D	D-1 22	D-2 23	D-3 24	D-4 25	D-5 26	D-6 27	D-7 28	D-8 29	D-9 30	D-10 31	D-11 32	D-12 33
E	E-1 34	E-2 35	E-3 36	E-4 37	E-5 38	E-6 39	E-7 40	E-8 41	E-9 42	E-10 43	E-11 44	E-12 45
F	F-1 46	F-2 47	F-3 48	F-4 49	F-5 50	F-6 50 51	F-7 52	F-8 53	F-9 54	F-10 55	F-11 56	F-12 57

1 2 3 4 5 6 7 8 9 10 11 12

(13)

Code "NR", appearing in any location of Row A MUST NOT be reproduced on microfiche.

(19#) ENVELOPE COLOUR: (White) - Blue - Yellow - Pink - Green - Grey

TRAILERS YES( ) NO (14)