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ACTION MEMORANDUM FOR THE ADMINISTRATOR

THRU: ES
THRU: AA/PPC, Alexander Shakow /s/
FROM: AA/AFR, Goler T. Butcher /s/ GOLER T. BUTCHER

Problem: Your approval is required for (1) an extension of the Life of Project for six years through FY 1985; (2) an increase in L.O.P. funding from $7.7 million to $[illegible] million; (3) a grant of $15.[illegible] million from the Population and Health appropriation (Section 104 of the Foreign Assistance Act of 1961, as amended) to the Onchocerciasis Trust Fund administered by the International Bank for Reconstruction and Development, and (4) authorization for A.I.D. to participate with other Onchocerciasis Control Program (OCP) members in extending the OCP area to the south of Benin, Ghana, and Togo. It is anticipated that a grant of $2.0 million will be made to the Trust Fund in FY 1980 under this Project and that [illegible] will be utilized by A.I.D. for program related needs, such as assistant monitoring and project evaluation activities.

The Onchocerciasis Control/Volta River Project was originally authorized on February 11, 1975. An amendment to the original project paper was authorized on September 14, 1978. Since the revisions to the 1978 project paper amendment which are being sought herein are extensive, you are being asked to sign a document which supersedes the 1978 amendment rather than one which merely amends the earlier document in part.

Discussion:

a. Brief Description

1. Project Purpose - The Onchocerciasis Control Program began in 1974. The first six year phase of this activity to control river blindness has been successfully completed and the international donors have agreed to a second six year phase from 1980 - 1985.

The purpose of the program (as modified several years ago) continues to be that of reducing the impact of onchocerciasis in the Volta River and adjacent river basins to a sufficiently low level so that it no longer represents either a public health problem or an obstacle to socio-economic development, and also to maintain and adjust control activities so as to stabilize the disease at a tolerable level. Achievement of this purpose will help lead to the socio-economic development of this 655,000 km. area of which approximately 65,000 km. are underpopulated river valleys. The area has a total population of over 10 million people.

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2. **Conformance of A.I.D. Strategy** - The project is in conformance to the A.I.D. Health Sector Strategy. Onchocerciasis (river blindness) affects over ten percent of the people in the target area. It has contributed to movement of people out of fertile river valleys. The onchocerciasis control program is stopping transmission of the disease and enabling persons to inhabit areas more safely, to put new land under cultivation and to intensify other development--thus contributing to A.I.D. development objectives.

3. **Beneficiaries of the Project** - The project benefits over 10 million people who inhabit the area by preventing those who do not have the disease from contracting it. Already children under five in 80% of the control area are oncho-free and there is a stabilization of the intensity of the disease in adults who already have it.

Funds will be paid into a separate account administered by the IBRD. Financial procedures are set forth in the Onchocerciasis Fund Agreement 1979. A.I.D. funds will be co-mingled with contributions from other donors. Contributions from all donors have been and will be untied and procurement of goods and services for the program will be accomplished through worldwide bidding. The Bank has confirmed to A.I.D. that neither it nor WHO will earn interest on the U.S. contribution, or if either has earn such interest, it will be returned to the USG.

B. Brief Financial Summary

1. **Phase I** - First year A.I.D. financing in FY 1974 totaled $2 million; A.I.D. contributions to Phase I (FY 74-79) totaled $7.7 million. This was approximately 14% of total OCP expenditures of $53.6 million during the period.

2. Phase II - (Funds requested in this amendment - $000)

	First Year (FY 80)	LOP (FY 80-85)
Untied Grant to Trust Funds	$ 2,000	$ 15,100
A.I.D. Miscellaneous	50	300
A.I.D. Sub-Total	**2,050**	**15,400**
Other Donors	**13,027**	**106,700**
African Participating Govts.	-	1,440
Phase II Total	$15,077	$123,540

C. Bureau Review and Findings

The Project Paper was originally approved on February 11, 1975 for an initial six year phase of a 18-20 year activity. A technical evaluation was performed by WHO and the IBRD conducted an economic review the summer of 1978. Based on these findings the Bureau for Africa agreed to consider an extension of the project. The seven US A.I.D. Missions involved endorse

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continuation of the project. It also has strong backing from the Chairman of the sub-Committee of the Committee on Appropriations of the House of Representatives.

D. Socio-Economic Technical and Environmental Description

1. Socio-Economic - The project is stopping onchocerciasis transmission in fertile river valleys from which large numbers of farmers have migrated. Planned resettlement of these empty valleys is underway in Upper Volta; in other countries the program has resulted in intensification of development efforts in the oncho transmission free areas. One social aspect is the labor-related productivity benefits resulting from reduced debility, avoidance of blindness and reduced nuisance effects of blackfly bites.

2. Human Rights - Not applicable to regional projects.

3. Technical Analysis - On the basis of the analysis contained in the original project paper, which has been proved valid during Phase I of the project, the project has been found to continue to be technically, economically and financially sound, and to meet all applicable A.I.D. criteria.

4. Environmental Analysis - An Initial Environmental Examination (IEE) was approved with Revision 1 of the project paper on August 25, 1978. This IEE is still valid for the original control area and the Ivory Coast extension. Certain aquatic monitoring actions are necessary prior to approval of an extension of the project southwards and are described in Amendment No. 1 to the IEE attached as Annex B to the Project Paper. We will assure that these actions are completed prior to AID.'s concurrence in an extension. Since pre-control monitoring is underway, we anticipate no problem.

E. Conditions and Covenants:

Prior to the concurrence of A.I.D.'s delegate to the Joint Review Committee in the proposed southerly extension of the project: (1) a feasibility study shall have concluded that such extension is warranted to protect the existing OCP area from reinvasion by the blackfly vector; (2) the Ecological Group shall find that adequate environmental data have been collected in the new area so that when larvicide is applied, a comparison can be made to determine adverse impacts; (3) a system for meaningful monitoring in the new areas has been designed and can be implemented; (4) the IEE for the Project shall have been amended by A.I.D. to reflect the environmental consequences of the proposed southerly extension, and (5) the Assistant Administrator shall have made a negative determination on the basis of the amended IEE or any EA or EIS required by the amended IEE shall have been completed.

F. Committee Action and Congressional Notification

1. A Project Review held on August 11, 1980 recommended approval of the project paper amendment. No outstanding issues remain.

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2. The project appears in the FY 1980 Congressional Presentation on page 407 showing an intended FY 1980 obligation in the amount of $2,700,000.

G. Officers Responsible for Project

The Project Officer for this project is Dominic D'Antonio (AFR/RA) with technical backstopping provided by Dr. Joe Stockard (AFR/DR/RS). Project activities are monitored in AFR/W with limited assistance from US A.I.D. offices in the seven participating countries.

Recommendation: That you sign the project authorization amendment attached hereto. (Tab A).

Attachments:

1. Tab A - Project Authorization Amendment
2. Tab B - Amendment - Chronology of Amendment Actions
3. Tab C - Memo 8/13/80 Speers, AAA/AFR/DP Waiving ECPR

Clearances:

AFR/RA:DDAntonio	draft	Date 8/21
AFR/RA:EDConroy		Date 8/20/80
AFR/DR:LBond		Date 8/27
AFR/DR:JHester		Date 8/27/80
AFR/DR:JLStockard	draft	Date 8/25
AFR/DR:NCohen		Date
AAA/AFR/DR:JWKoehring	JWK	Date 8/27/80
AFR/DP:JGovan	phone	Date 8/25/80
DS/AGR:FWhittemore	draft	Date 8/22
DS/HEA:ABuck	phone	Date 8/25
DAA/AFR:WHNorth		Date
GC/AFR:SBarrington		Date
GC:NHolmes		Date 8/26/80
A-AA/PPC/PD/RR:SKlein		Date 8/27/80

AFR/RA:EDConroy:mma:8/20/80:x29102
Revised:AFR/RA:mm:8/26/80:x29102

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Tab B

Project Amendment Authorization Actions

— PID Submission Date	- Not Applicable
— PID Approval Date	- Not Applicable
— PP Submission Date	- August 4, 1980
— Project Review Meeting Date	- August 11, 1980
— EIPM Waived	- August 13, 1980

UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D.C. 20523

Project Authorization Amendment

Name of Country/Entity: Africa Regional

Name of Project: Onchocerciasis Control/Volta River

Number of Project: 698-0399

1. Pursuant to Section 104 of the Foreign Assistance Act of 1961, as amended, I hereby authorize an amendment to the Onchocerciasis Control/Volta River Project for the Africa Region, No. 698-0399, involving additional planned obligations of not to exceed $15.4 million in grant funds, raising the total life of project authorization to $23.1 million and extending the life of the project through FY 1985, subject to the availability of funds and in accordance with the AID/OYB allotment process, to help in financing foreign exchange and local currency costs for the Project.

I also hereby authorize the AID representative to the Onchocerciasis Control Program to concur in a southerly extension of the project in Benin, Ghana, and Togo, should the conditions set forth in paragraph 3 herein below be satisfied.

2. The Project consists of AID participation in a multidonor program, ongoing since 1974, to assist in the control of onchocerciasis in the Volta River Basin of West Africa, and to promote settlement and development of the areas in which the risk of onchocerciasis transmission is reduced to an acceptable level. The project paper amendment herein approved extends AID's participation in the Onchocerciasis Control Program (OCP) through FY 1985 and increases L.O.P. funding by AID by $15.4 million, from $7.7 million to $23.1 million.

3. Prior to the concurrence of A.I.D.'s delegate to the Joint Review Committee in the proposed southerly extension of the project: (a) a feasibility study shall have concluded that such extension is warranted to protect the existing OCP area from reinvasion by the blackfly vector; and (b) the Ecological Group shall find that adequate environmental data has been collected in the new area so that when larvicide is applied, a comparison can be made to determine adverse impacts; (c) a system for meaningful monitoring in the new areas has been designed and can be imple-

mented; (d) the IEE for the Project shall have been amended by A.I.D. to reflect the environmental consequences of the proposed southerly extension, and (e) the Assistant Administrator shall have made a negative determination on the basis of the amended IEE or any EA or EIS required by the amended IEE shall have been completed.

4. The Project Authorization and Request for Allotment of Funds, Part II, dated September 14, 1978 for the referenced project is superseded by this document.

August 29, 1980
Date

Administrator (Acting)
Agency for International Development

Clearances:
GC, NHolmes
AA/PPC, AShakow
AA/AFR, GButcher

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT DATA SHEET

1. TRANSACTION CODE: C (A = Add, C = Change, D = Delete) — Amendment Number 2

DOCUMENT CODE 3

2. COUNTRY/ENTITY: Africa Regional

3. PROJECT NUMBER: 698-0399

4. BUREAU/OFFICE: AFR — 06

5. PROJECT TITLE (maximum 40 characters): Oncho Control in the Volta River Basin

6. PROJECT ASSISTANCE COMPLETION DATE (PACD): MM 12 DD 30 YY 86 — 9/30/85

7. ESTIMATED DATE OF OBLIGATION (Under 'B.' below, enter 1, 2, 3, or 4)

A. Initial FY 74 B. Quarter 2 C. Final FY 85

8. COSTS ($000 OR EQUIVALENT $1 =)

A. FUNDING SOURCE	FIRST FY 80 B. FX	C. L/C	D. Total	LIFE OF PROJECT E. FX	F. L/C	G. Total
AID Appropriated Total	2,050			23,100		23,100
(Grant)	(2,050)	( )	( )	(23,100)	( )	(23,100)
(Loan)	( )	( )	( )	( )	( )	( )
Other U.S. 1.						
Other U.S. 2.						
Host Country				2,080		2,080
Other Donor(s)				137,222		137,222
TOTALS	2,050			162,402		162,402

9. SCHEDULE OF AID FUNDING ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE 1. Grant	2. Loan	D. OBLIGATIONS TO DATE 1. Grant	2. Loan	E. AMOUNT APPROVED THIS ACTION 1. Grant	2. Loan	F. LIFE OF PROJECT 1. Grant	2. Loan
(1) PH	510	550		7,700		15,400		23,100	
(2)									
(3)									
(4)									
TOTALS				7,700		15,400		23,100	

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each): 100, 910

11. SECONDARY PURPOSE CODE:

12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)

A. Code	BS	ENV					
B. Amount	20,000	3,100					

13. PROJECT PURPOSE (maximum 480 characters)

Reduce the impact of onchocerciasis in the Volta River and adjacent river basins to a sufficiently low level so that is no longer represents either a public health problem or an obstacle to socio-economic development, and also to maintain and adjust control activities so as to stabilize the disease at a tolerable level.

14. SCHEDULED EVALUATIONS

Interim MM 12 YY 80 — MM 12 YY 81 — Final MM 12 YY 84

15. SOURCE/ORIGIN OF GOODS AND SERVICES: ☐ 000 ☐ 941 ☐ Local ☐ Other (Specify) Untied Grant

16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a ____ page PP Amendment.)

Extend project for six years, extend control area southwards, and increase authorized financing by $15,400,000.

17. APPROVED BY

Signature: E. Dennis Conroy

Title: E. Dennis Conroy, Director, AFR/RA

Date Signed: MM 08 DD 04 YY 80

18. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION: MM 08 DD 04 YY 80

AID 1330-4 (8-79)

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Annex E. Economic Review Mission of IBRD (available in AFR/RA)
Annex F. Evaluation Report Part I OCP/78.2 (available in AFR/RA)

I. Summary and Recommendation

A. Face Sheet (attached)

B. Recommendations:

The following actions are recommended herein:

A. Authorization of an extension of Life of Project by six years, to enable A.I.D. to participate with other donors in Phase II (CY 1980-1985) of this highly successful disease control program;

B. Authorization to increase the magnitude of LOP funding by $15.4 million, raising the previously authorized level of $7.7 million (for FY 1974-79) to $23.1 million (through FY 1985);

C. Authorization for A.I.D. to participate with other Onchocerciasis Control Program (OCP) members in extending the OCP area farther to the south in Benin, Ghana and Togo, should the feasibility study underway conclude that an extension is necessary to protect the existing OCP area from re-invasion of the blackfly vector. No additional A.I.D. funding will be required.

C. Description of Project:

The goal of the program continues to be the socio-economic development of the original 655,000 km2 area in the Volta Basin area of which approximately 65,000 km2 are abandoned valleys. The area has a total population of 10 million people. (The actual spraying area has been Expanding to 764,000 square kilometers).

The purpose of the program (modified several years ago) continues to be that of reducing the impact of onchocerciasis in the Volta River and adjacent river basins to a sufficiently low level so that it no longer represents either a public health problem or an obstacle to socio-economic development, and also to maintain and adjust control activities so as to stabilize the disease at a tolerable level.

This amendment is to provide for A.I.D.'s continuing participation in the second six-year phase of this multi-donor activity to attain the above-mentioned goal. The OCP will continue to be implemented by the World Health Organization, in collaboration with the IBRD, UNDP, FAO, some twenty donor agencies and seven participating African countries. The Program will continue to entail systematic interuption of disease transmission by application of a larvicide, entomological surveillance of the treated areas, epidemiological evaluation, and ecological monitoring to ensure that there are no adverse effects on the environment. The OCP will also provide for basic research including investigations into more cost effective control measures and in chemotherapy research. Training will continue to be provided to African personnel in vector control, the epidemiology of the disease, and in environmental protection. The seven African participating countries will continue to be encouraged to provide for the socio-economic development of lands within the OCP area as they are freed from onchocerciasis transmission.

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a/ Upper Volta, Ivory Coast, Mali, Togo, Benin, Niger and Ghana

To attain this purpose the program will continue to pursue a series of activities (outputs) initiated and developed during Phase I (1974-79). These include:

- aerial larvicide operations;
- entomological surveillance of the treated areas;
- evaluation of the health effects by regular epidemiological investigations;
- monitoring of the environmental impact of the larvicide treatment;
- study and encouragement of economic development projects in the area.

A supporting program of chemotheopy research will be undertaken in collaboration with the WHO Special Program for Research and Training in Tropical Diseases (WHO/TDR).

The Program will also arrange for the training of national personnel in various disciplines to prepare for the progressive transfer to, and continuation of the Program by, the African participating governments. The Program will encourage these governments to plan and promote health infrastructure as part of their national primary health programs within the area covered by the Program.

Two new constituent documents, defining the institional arrangements for participating in Phase II of the Program, were adopted at the close of 1979. They are the Onchocerciasis Fund Agreement, 1979, and its Annex, the Memorandum of Agreement on the Onchocerciasis Control Program.

D. Progress to Date:

By the end of 1979 approximately eighty percent of the control area was freed from onchocerciasis transmission and thus declared safe for resettelment. Sample medical observations in Mali reveal that the level of endemicity has been reduced from over 50% of the population to 10% and the prevalence of the disease in children in 15 years of age has fallen from 15% to 4%. A recent report indicates that parasitiological and clinical re-examination of 41 villages originally examined in 1974-75, reveals that no new case of infection of onchocerca volvulus has been found in the 798 village children under 5 years of age. In ages 5 to 9 a marked decrease of prevalance has been found. Resettled populations are examined yearly and no fresh infection has so far been detected.

The OCP is providing basic information toward development of a new control strategy. It has been estimated that a prevalence of infection of o. volvulus of 30% or less carries little risk of higher blindness rates than is found in comparable area without onchocerciasis.

The vector control program consists of weekly treatment of turbulent sections of flowing rivers and streams with a larvicide, Abate. An extensive aquatic monitoring program is underway. Results of the monitoring so far give no indication that Abate has had an adverse, irreversible long term effect on invertebrate fauna or fish. The International Ecological Panel recently gave the International Union for the Conservation of Nature the assurance that OCP activities were having no measurable effect on fishes and wildlife and [illegible] statement was accepted by that organization.

A total of 74 African [illegible] countries have been funded for short and long term training in ophthalmology, entomology and related fields.

E. Financial Summary:

The total cost of Phase II, within the present OCP area, is estimated at $106.7 million, including an 8% contingency for inflation. If, on the basis of an ongoing feasibility study, the OCP donors agree to extend the Program area southwards to combat re-invasion, it is provisionally estimated that an additional $15 million will be required to finance operations there over the period 1982-1985.

1. A.I.D. Inputs: As in the case of all contributions to Phase I of the Program the A.I.D. input would consist of annual untied grants to the OCP, plus the annual availability of $50,000 to AFR/RA, which would permit that office to finance independent evaluations, studies and related activities in response to A.I.D. requirements. This amendment would authorize A.I.D. inputs totalling $15.4 million over the six-year period, rising progressively from $2.05 million in FY 1980 to $3.15 million in FY 1985. A.I.D. contributions to Phase I amounted to $7.7 million, or approximately 14% of Program expenditure. The proposed level of funding for Phase II would enable A.I.D. to continue its participation in the same approximate proportion as Phase I, since estimated costs of Phase II are double those of the first six years of the Program, owing to operations in the entire program area and inflation.

2. Host Countries: It has been agreed in principle that the seven African participating (beneficiary) countries will continue to contribute, as a group, at the rate of 1% of Program cost. The following Phase II assessments for individual countries have been established on the basis of a weighted formula based on their respective GNPs and the proportion of their populations within the OCP area: Benin ($120,000), Ghana ($250,000), Ivory Coast ($430,000), Mali ($120,000), Niger ($80,000), Togo ($170,000), and Upper Volta ($270,000).

3. Other Donors: Although the United States would remain a large contributor, other donors have already made substantial commitments for Phase II. The Netherlands Government has pledged $13.7 million (nearly 13% of estimated Phase II costs; the World Bank Group up to $12 million (11.2%); Switzerland $7.2 million (nearly 7%); France, $7.14 million (6.7%); and Kuwait, $6 million (6.6%). Some countries have so far announced pledges only for the first year of Phase II; the largest pledges being those of Saudi Arabia ($1.67 million), Japan ($1.6 million), and Germany ($1.12 million). Excluding any U.S. contribution 1980, pledges by other donors already exceed $64 million.

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4. Summary of Planned U.S. Inputs (in $ millions):

	FY 1980	FY 80-85 Total	LOP Total
OCP Annual CY est. budget	$15	$106.8	$162.4
AID contribution	$ 2.	$15.1	$22.8
AID miscellaneous	.05	.3	.3
Total AID input	$ 2.05	$15.4	$23.1

F. Project Implementation:

The Onchocerciasis Control Program will continue to be implemented by the World Health Organization, with custody and control of funds adminstered in close collaboration with the World Bank. A.I.D. will not have any direct involvement in project implementation, although it will be represented by AFR/RA in the periodic meetings of the OCP Joint Program Committee of which the United States and other donor governments, agencies, and participating countries are members.

The activity outputs described in para. 1.3 will be undertaken by the OCP staff, recruited by WHO with headquarters in Ouagadougou. Aerial application of the larvicide will continue to be performed under a contract with a private firm, such contracting and procurement being subject to World Bank regulations and procedures on competitive bidding. Agreements between OCP and individual African participating governments will continue to extend to OCP staff and contract personnel the same privileges and immunities, including rights of passage, which were accorded in Phase I.

G. Findings:

On the basis of the analysis contained herein, the Director of AFR/RA concludes that the PP amendment is technically, economically , and financially sound. The analysis reflected herein supports the conclusion that the amendment meets all applicable A.I.D. criteria and will not have an adverse impact on the environment.

H. Issues:

1. Economic Justification

Is a long-term disease control program justifiable in relation to the size of the OCP zone (currently about 764,000 square kilometers) and its current 12 million population?

Upper Volta will be a major beneficiary in this regard, as it is already suffering from chronic overpopulation and overcultivation of its plateau regions. Movement of some of its agricultural population into "empty lands"

in southwestern Upper Volta freed of Oncho-transmission will serve a twofold purpose in increasing agricultural productivity and lessening over-exploitation of other parts of the country. Togo, Benin and Ghana will also have underpopulated areas of the northern parts of the country opened up for agricultural production. Ivory Coast is engaged in extensive development of the north, including production of estate crops such as pineapples and sugar, and agro-industry.

An Economic Review Mission of the IBRD, headed by Professor Elliot Berg, examined this question in detail in the summer of 1978. Their conclusions were that "the COP will have a significant effect on economic development by increasing the quantity and quality of the area's productive factors--labor and land". The direct, "conventional" economic benefits of the disease control program are modest, they found, due largely to the low income of the population affected. The major economic benefits will come from opening new lands but the control program alone is not a panacea for development. There are other obstacles such as drinking water, heavy soils and other diseases which must be considered in planning the development of these areas. The Economic Review Mission recommended continuation of the program.

In December 1978 the Project Control Committee (PCC) on the basis of the IBRD Economic Review Mission report, agree that the program be continued for Phase II.

2. <u>Is the current control methodology the most cost effective?</u>

The entomologists in OCP and the experts on the Scientific and Technical Advisory Committee believe strongly that it is. The issue was explained by the IBRD Economic Review Mission who were concerned since it would be difficult for most of the African governments to find the recurrent costs in their budgets to keep the program going in the distant future. The Mission recommended that intermediate, more appropriate techniques and approaches be sought although they did not identify any possibilities.

A Commission on the Long Term Future of the Program was established largely as a result of this recommendation and an important part of their analysis is the possibility of developing more cost-effective approaches. The interim report of the Commission is scheduled for late 1980.

3. <u>Humanitarian Justification</u>:

Can such a program be justified on health and humanitarian grounds, particularly when onchocerciasis is merely one of several debilitating diseases prevalent in this part of Africa?

The 1978 IBRD Economic Review Mission answers affirmatively, even if control of this disease were to be the sole objective of this program. Onchocerciasis is the most serious of the prevalent diseases, as it affects persons of all ages and leads to early blindness. Furthermore, OCP research has established that the mortality rate for onchocerciasis

victims is four times higher than for unafflicted persons of comparable ages. Schistosomiasis and trypanosomiasis will afflict the OCP populations even after onchocerciasis is brought under control; but it is not thought that these will cause as much human suffering and debilitation as has onchocerciasis.

4. Single vs Multiple Disease Control Activity:

Is it possible to utilize the efficient and effective OCP operation to attack other diseases in the OCP zone?

This question was also addressed by the IBRD Economic Review Mission in 1978. It does not appear to be feasible to develop a multi-disease control campaign which would include onchocerciasis as well as other major debilitating diseases within the area; each disease has its own peculiarities which do not lend themselves to a common control approach. Nor do the remaining diseases seem to contribute major barriers to human resettlement once onchocerciasis transmission has been eliminated.

There is an important need, however, for the participating African countries to develop a health infrastructure which can address other diseases particularly in the resettlement areas. Such actions are encouraged by the Memorandum of Agreement which is an amendment to the Onchocerciasis Fund Agreement 1979 which states: "The Program should encourage the Governments to plan and encourage a health infrastructure as part of their national primary health programs within the area covered by the Program." Primary health care activities are being assisted by separate bilateral programs in most of the participating countries.

5. Reinvasion:

Is reinvasion by infected blackflies from outside the control area a problem which jeopardizes the program?

Reinvasion is a phenomena which was expected from the outset but the extent of the phenomena and the range of the fly was not known. OCP studies now conclude that the blackfly vector, borne by seasonal winds, has a reinvasion range of up to 300 kms. from SW to NE. Fortunately, not all blackflies are of the same species, and each species seems incapable of living outside its indigenous climatic zone. Thus it appears that the savannah regions are not threatened by blackflies indigenous to the tropical forest zones to the south.

The control area boundary has already been extended southwards to include a much larger portion of the Ivory Coast (originally at the latter's own expense) than had originally been envisaged. A study is underway to examine the feasibility of an extension deeper into Ghana Togo and Benin. It is believed that the presently defined OCP area

(which is already 80% transmission-free even with reinvasion) when augmented by the proposed southernly extension farther into Ghana, Toto and Benin, will constitute an adequate area for combatting the major savannah blackfly sub-species (members of the S. damnosum complex).

6. Environmental Impact:

To what extend, if any would the proposed southerly extension have an adverse environmental impact in the areas of Ghana, Togo and Benin?

The first aspect to be considered is the effect of larviciding. No significant adverse effects on the environment has been detected with use of Abate. No resistance to Abate has occurred so it is believed that Abate will be practical to use during Phase II. Baseline studies of riverine ecology have been stated and monitoring will be extended to the extension area.

The second aspect concerns OCP-induced effects on the environment. The "extension" area of the countries are more heavily populated than the northern portions and there is already more existing development and economic activity. The justification for the extension is to protect the original control area. Major development in the extension areas is not contemplated as a result of the extension.

7. Host Country Involvement:

A program of this magnitude depends for its effective implementation on the involvement of a large number of trained expatriates and sophisticated and costly control techniques. Is it possible that the African beneficiary countries will ever be able to assume a major responsibility for post-project surveillance, monitoring and control operations?

While it is unrealistic to envisage that the African states will have the resources to maintain a control program at the present level of effort, it is reasonable to anticipate that they will gradually acquire the trained cadres to perform the necessary follow-up actions after the project has attained its control objective.

The Commission on Long Term Future is examining the question of training and the assumption of responsibility by the participating countries and will recommend approaches for consideration by the Joint Program Commission (JPC) in 1980 and 1981

II. Project Goals, Purpose and Outputs

The goal of the program continues to be the socio-economic development of a 655,000 km2 area in the Volta River and adjacent river basin areas of which approximately 65,000 km2 are abandoned valleys. The area has a total population of 10 million people.

The prupose of this program continues to be reduction of the impact of onchocerciasis in the Red, White, and Black Volta River Valleys and adjacent river basins, so that it no longer constitutes either a public health problem or an obstacle to socio-economic development in the region concerned, and also to maintain and adjust control activities so as to stabilize the disease at a tolerable level.

The program seems to interrupt transmission of the disease through periodic applications of a larvicide to flowing rivers in the area. This entails aerial application, entomological surveillance of the treated areas, epidemiological evaluation of project effects, and ecological monitoring of operations to ensure that there is no adverse effect on the environment.

The program undertakes applied research in the field of chemotherapy to develop new measures of broader treatment of the afflicted. Research is also undertaken into more cost-effective measures for vector control. The project provides training African personnel in vectorcontrol, in the epidemiology and chemotherapy of the disease, and in ecological monitoring. During the course of control operations, as new areas are opened for resettlement and development, the project encourages and assists the participating African governments to plan for the socio-economic development of these new areas. The actual social and economic development is the responsibility of the African govenments, with assistance to be provided by bilateral and multilateral sources other than OCP.

Project outputs and inputs continue substantially as in the original PP. To attain the outputs, the following specific activities will be undertaken over the period, 1980-1985:

(a) vector control operations: Aerial application of larvicide will continue at roughly the same level as established in 1979, so that a total of about 590,000 kilometres of river will be treated during each year of Phase II. Ground application will also be explored. Some 78 vector collecting teams will operate a total of 270 blackfly capture points along the treated rivers.

(b) epidemiological evaluation: About 140 villages within the Program area will be regularly re-examined, and an additional 45 villages will be the subject of detailed evaluation.

(c) applied research: The research effort will continue to be geared to OCP operational needs, with more basic research sponsored by the WHO Special Program for Research and Training in Tropical Diseases (with which OCP maintains close collaboration). The Program's technical units will undertake an increasing amount of research, particularly in relation to specialized aspects of epidemiology, vector ecology and control, and applied chemotherapy.

(d) training: Short-term specialized training will continue to be offered to African personnel assigned to the Program, in accordance with OCP operational requirements. In addition, the OCP will offer long-term advanced level training in such fields as entomology, ophthalmology and parasitilogy to a number of African candidates possessing university diplomas.

(e) environmental protection: Aquatic monitoring will continue with efforts being made to improve the quality and efficiency of operations by increasing the quantity of pre-treatment data, and by adopting analysis in the examination of fish samples. Attention will also be given to the protection of forest galleries along water courses, in order to preserve the ecological balance from the effects of unplanned migration and resettlement within onchocerciasis transmission free lands.

(f) economic development: During Phase II the African participating governments will prepare annual reports to the OCP concerning development activities within their respective portions of the OCP area. This is in recognition of the prevailing view that each country has distinctive problems which do not lend themselves to the formulation of a common socio-economic development formula for the entire OCP area. The OCP will encourage these countries' efforts to establish development projects. Particular attention will be focussed on the need to integrate public health components within development projects.

III. Project Description for Phase I

A. Problem:

Onchocerciasis (river blindness) is an infection by a parasitic filarial worm, transmitted by the bite of an infected female blackfly of the species *Simulium damnosum*. The fly becomes infected by taking a blood meal from an infected human host. The larvae of the insect vector develop in fast-flowing rivers, hence the common name "river blindness" for the disease.

The clinical manifestations of the disease include intensely itching rashes, wrinkling, thickening and depigmentation of the skin, skin nodules in which adult worms are to be found, and eye lesions leading to blindness. Those heavily infected often lose weight and suffer from debilitation, In the Volta River Basin, approximately one million out of an estimated total population of ten million persons were infected by onchocerciasis at the start of the project and of these at least 70,000 are totally or partially blind.

From a socio-economic point of view, the consequences of this debilitating disease include diminuation of productivity of persons even lightly affected by the disease, total loss of productivity of those seriously ill or blind, migration of the young and less-affected members of the community (and the loss of their contribution to local production), over-exploitation and over-population of other parts of the countries where

the migrants seek to re-establish themselves. This leads to an imbalance in the age and sex distribution of the population left behind as well as the loss of productive capacity. Older and more dependent members of the remaining communities become numerically more important and impose an increasingly disproprotionate social burden on the decreasing number of younger, more active inhabitants who remain.

B. Background

Onchocerciasis has been identified as a major public health problem in West Africa, and a serious obstacle to the economic development of lands within the Red, White and Black Volta River Valleys and adjacent river basins. (See Figure1)

The OCP is a long-term collaborative endeavor, entailing vector control and related activities over an eighteen to twenty-year period. It was instituted in 1974 under the joint auspices of the World Health Organization (WHO), the Food and Agricutlure Organization (FAO), the United Nations Development Program (UNDP), the IBRD, as well as seven African beneficary countries (Benin, Ghana, Ivory Coast, Mali, Niger, Togo, and Upper Volta), and other members of the international donor community. The OCP area now covers 764,000 square kilometers.

WHO as executing agency for the OCP, has mounted an intensive campaign of larviciding, epidemiological surveillance, ecological monitoring, scientific research, and training. These activities have been financed by the united contributions of the Untied States and some twenty other governments and international development agencies. Custody of contributions and financial responsibility for OCP are assured by the IBRD. In terms of program duration, at least three phases were envisaged, each of six years' duration. Phase I of the Program (1974 - 1979) cost $53.6 million, towards which United States contributions totalling $7.7 million, amounted to about 14%. (Actual receipts from the international community totalling $63.9 million for Phase I, in relation to which the U.S. contribution amounted to slightly over 12%).

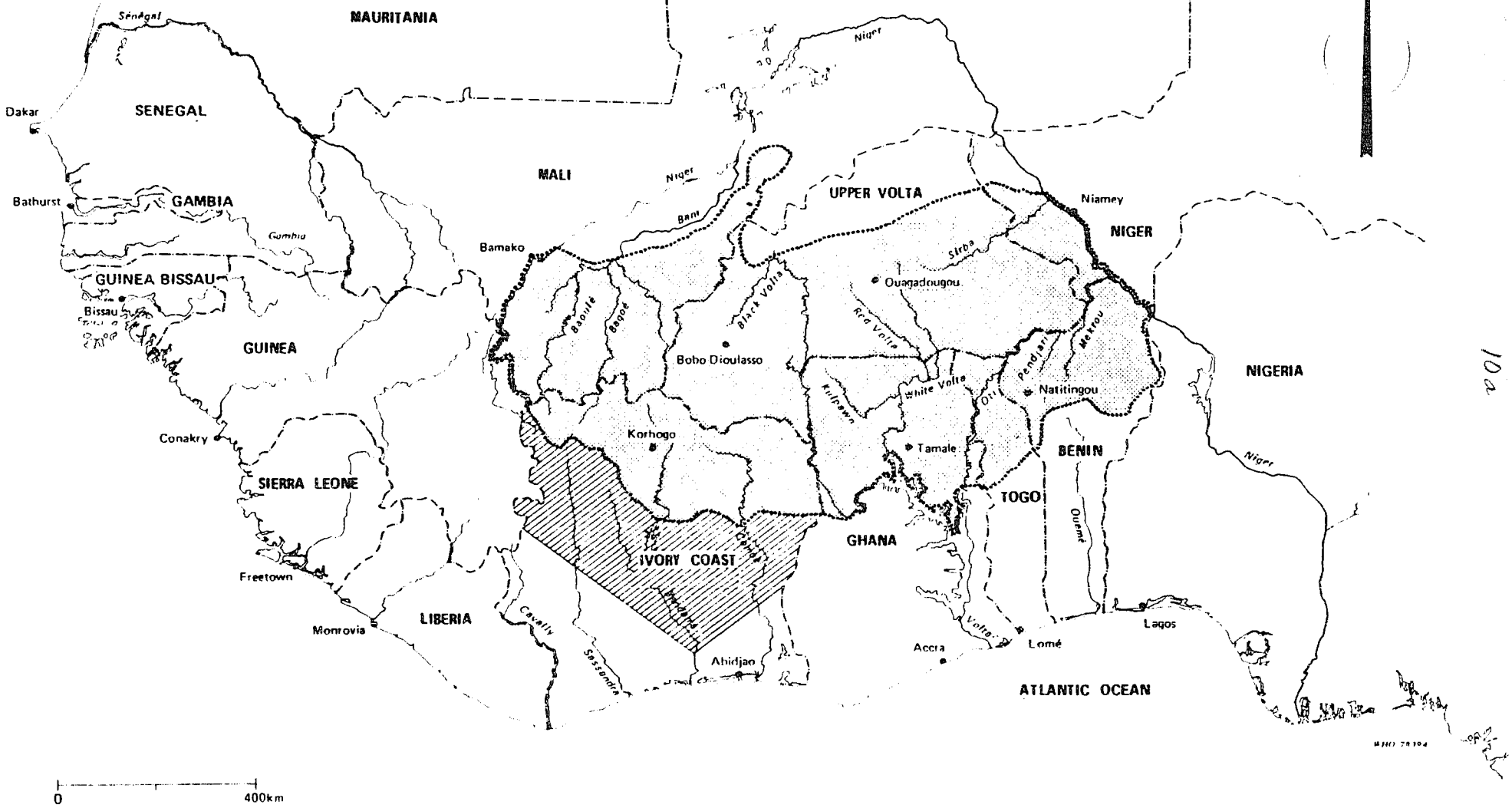
C. Progress to Date:

On the basis of evaluations to date, vector control has been highly successful and its results very much in line with those predicted in the original feasibility study. Continuous larviciding has led to a great reduction in the numbers of blackflies. This has greatly reduced transmission resulting in a general decline in the prevalence of the disease - particularly noticeable amongst young children as well as a stablization of symptons in persons previously infected. Even taking into account the limitations imposed by difficult terrain and the phenomenon of blackfly re-invision in the south-east portion of the OCP area, the WHO characterizes vector operations during the first six years of the Program as a "remarkable success."

Application of the larvicide Abate to turbulent river waters in which the blackfly larvae temporarily pupate is still considered to be the most effective method of combatting the disease. Abate is expensive both to

FIG. I-1

PROGRAMME AREA AS OF 1 JANUARY 1978



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purchase and to apply. Most of the river breeding sites where the larvae hatch are not easily accessible to land-based spraying crews, and control operations have relied entirely on the use of low-flying aircraft and helicopters. Trial operations are under way to examine the feasibility of less costly application methods, as well as to test alternative larvicides which have to be ecologically safe.

A river valley is considered safe for resettlement once the Annual Biting Rate (ABR) is reduced to, and maintained below 1,000; and the Annual Transmission Potential (ATP) is brought below 100. (See Annex A). By the close of 1979 these levels had been achieved in approximately eighty percent of the control area and thus considered to be satisfactory for resettlement.

Sample Medical observations in one part of Mali, have confirmed that the level of endemicity has been reduced from over 50% of the population to 10%, and--even more encouraging--the prevalence of the disease amongst children under 15 years of age has fallen from 10% to 4%. Another recent report, based on WHO parasitiological and clinical re-examination of forty-one villages originally examined in 1974-75, reveals that no new case of infestation with O. volvulus has been found in the 798 village children under 5 years of age. (This is in contrast to the figure of eighty-two infections noted in 810 children of the same age group examined three years earlier). In the 5 to 9 years age group a marked decrease of prevalence has also been noted, especially in those villages where transmission is thought to have been interupted.

Populations resettling OCP river valleys are examined yearly, and no fresh infections has so far been detected among them.

A greater understanding has been achieved of the epidemiology of this disease. Since October 1978 parasitological and ophthalmological teams have been carrying out evaluations in Ghana, Mali, and Upper Volta, as well as in parts of the Ivory Coast and Benin.

The recent evaluation of the Ivory Coast reveals the very clear epidemiological differences between the northern savanna zone and the rain forests to the south, with the same level of parasitic infestation producing more severe risks to health in the north than in the south. In south Benin, it was possible to determine the absolute limit of the disease and to pinpoint several important hyperendemic zones.

Although an aquatic monitoring program was instituted in the early stages of operations, little or no baseline data was available as a basis for comparasion. Consequently, studies of some rivers initialy covered by the Program were preceeded by spraying operations. A protocol for aquatic monitoring was developed and followed consistently on eight rivers principally in the southern section of the Program area. This has been found to be generally adequate and sufficiently sensitive to record any significant alteration to the composition of riverine fauna. Studies on

the fish population have not revealed the disappearance of any species, notwithstanding the regular application of larvicide, and the high number of young fish suggests that breeding has not been adversely affected. In recent discussions, however, a need for additional tests was recommended and agreed upon.

Training of African personnel continues to be a priority activity, and the OCP has trained staff not only to meet its own operational needs but also has provided fellowships to epidemiologists, ophthalmologists, and entomologists from the particiupating African countries with a view to strengthening national health infrastructrure. Two levels of training are included: university level scholarships in public health administration or to support specific aspects of OCP operations, and training courses for government health workers, which are intended to provide a disease control and public health overview. As of September 1979 OCP had provided short-term training to 46 African staff members as well as more specialized (generally longer term) training to 28 non-program Africans.

One of the major impacts of this disease is the reduction in the quantity and quality of work performed by disease victims. One interesting product of recent OCP-financed social research (conducted in Upper Volta,) suggests that the mortality rate of victims blinded by onchocerciasis is four times higher than for non-victims of the same age.

Research is being conducted into more cost-effective methods of disease control as an alternative to aerial spraying. Notable progress has been made in other fields of research linked to operational needs, such as in identifying and plotting the distribution of the different species of the blackfly and determining the principal vectors within the OPCP area. One OCP research entomologist, for example, has discovered a blackfly strain capable of mating in captivity and the possibility of selecting out a captive mating strain is being explored.

Applied chemotherapy studies were accelerated in 1978. Chemothearaphy research continues to be closely coordinated with the Tropical Disease Research program of WHO, and in 1979 chemotherapy trials involving 78 infected persons were initiated at one hyperendemic village on the Red Volta River

D. Institutional Arrangements:

This is a multi-national undertaking in which A.I.D. is one of twenty-one donor agencies. A.I.D. does not have a direct implementing role; the latter being performed by the WHO as executing agency for the OCP.

Phase I operational arrangements were based on two international agreements: (a) a Onchocerciasis Fund Agreement governing the operations of the Onchocerciasis Control Program in the Volta River Basin Area (concluded between the IBRD, WHO, and other non-regional donors dated March 1, 1974), and (b) the Memorandum of Understanding (between the IBRD, WHO and African beneficiary countries, dated February, 1975).

Overall policy review of the Program was assured by a Joint Coordinating Committee (JCC), composed of the seven African participating countries, all non-regional donors, and the four United Nations agencies principally involved (IBRD, WHO, UNDP, and FAO).

The JCC meets once a year and exercises policy guidances over the planning and implementation of the Program. To provide the JCC with continuous independent evaluation of the technical aspects of the Program, WHO formed a Scientific and Technical Advisory Committee (STAC), composed of twelve members. This committee met twice yearly and prepared an annual report to the JCC. An Ecological Panel was also established to ensure satisfactory protection of the environment. Its membership was limited to a small group of specialists having wide experience in river basin ecology, epidemiology of river basins, and the ecological effects of pesticides. Finally, an Economic Development Advisory Panel (EDAP) was formed to assure the continuous review of information relating to the economic development aspects of the Program. The Panel, composed of economists and specialists in agriculture and rural development, was also to meet twice yearly and report to the JCC.

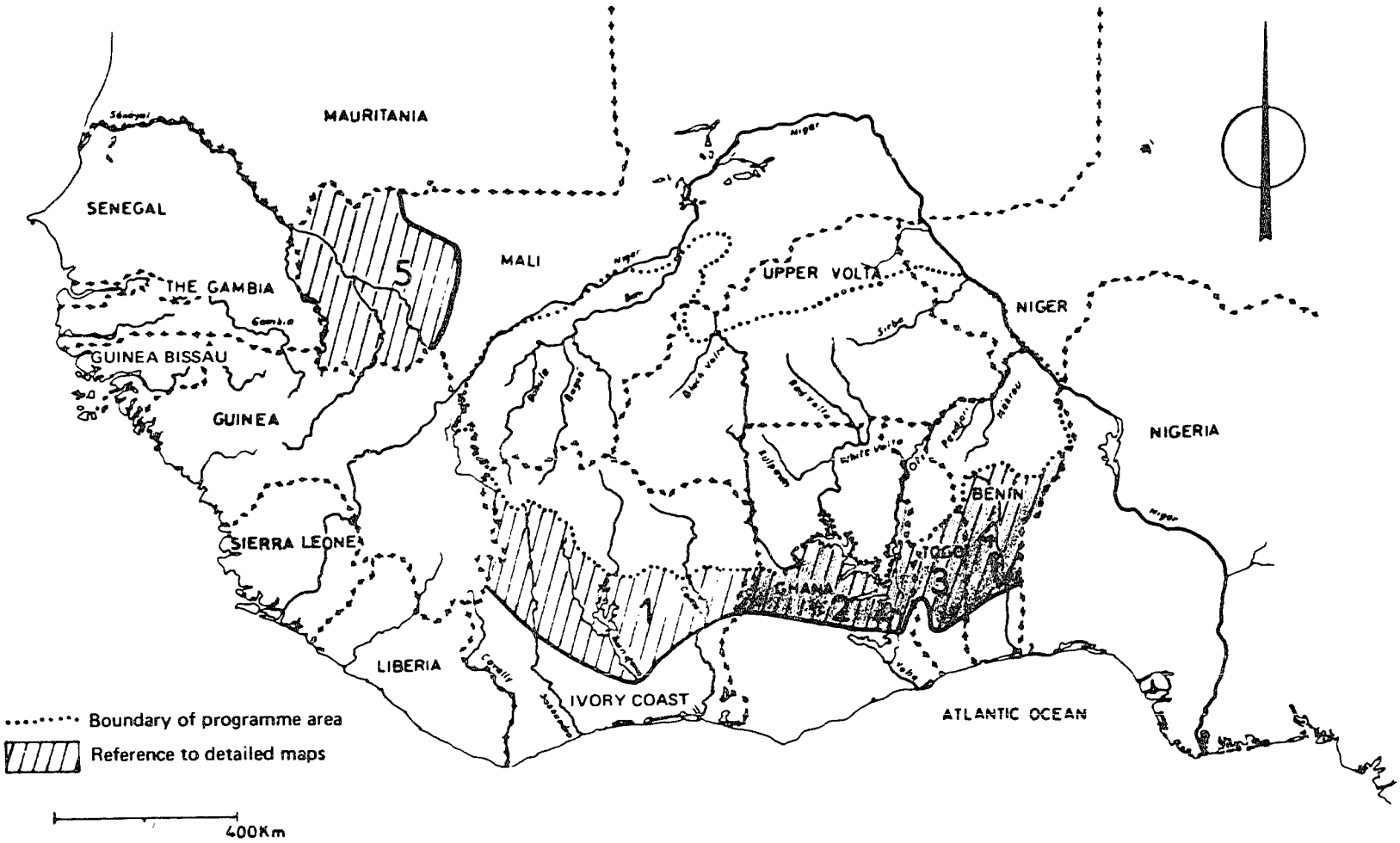
Phase I of the Program terminated on 31 December 1979, and the two aboved-mentioned legal instruments have been superseded by a new international agreement defining the modalities of participation in Phase II. These, together with the minor institutional changes, are discussed later in this amendment.

E. Re-invasion and Possible Southerly Extension:

A problem for the OCP has been the phenomenon of reinvasion by the blackfly vector, chiefly--but not entirely--from areas outside the geographic confines of the OCP zone. Experience in recent years has confirmed that re-invading flies, borne by seasional winds, can be carried as far as 300 kilometers into the present control area. As much as twenty percent of the OCP zone, lying along its western and southeastern peripheries, is affected to some degree by re-invasion.

Extension of OCP control operations southwards to rivers in the central Ivory Coast was authorized by the JCC in 1977. Aerial applications of larvicides began in 1978 (with the costs of the extension for two years borne by the Ivory Coast itself,) and have had a pronounced remedial effect. The JCC has requests from Benin, Ghana and Togo (countries already participating) for the extension of OCP operations farther to the south in these countries. The JCC concluded that a feasibility study should be undertaken. The justification for such an extension would depend largely on the extent to which any proposed extension would protect the existing OCP area from re-invasion. It was anticipated that the study would require two years and an A.I.D. policy authorization was accordingly included in the PP amendment of September, 1978.

FIG. 1 GEOGRAPHICAL SITUATION OF EXTENSIONS REQUESTED BY STATES



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An interim report on the status of the extension study was submitted to the JCC in November, 1979. It was explained that, because of difficulties in obtaining sufficient hydrological data and the need for Benin, Ghana and Togo to establish new hydrological monitoring stations, detailed recommendations would be not possible until completion of the study in 1980 or 1981. Research and field visits had, however, already led to the following findings:

- the savanna species of the S. damnosum complex are widespread within the proposed extension area;

- there is heavy transmission of onchocerciasis in that area;

- epidemiologically speaking, onchocerciasis is a severe disease in the Oueme, Mono and Asukawlaw valleys;

- the savanna species exist farther south than the southern limit previously identified;

- present knowledge of the dynamics of the blackfly populations and of the southern limit of the savanna species is not sufficient to establish a final detailed surveillance plan;

- there are not enough hydrological data available for the comprehensive planning of a larviciding campaign and for a precise estimate of costs;

- also requiring clarification is the question of the impact which operations within the extension area would have on (i) the operational costs in the initial OCP area, (ii) the effect of the reduction of the re-invasion phenomenon on the principal OCP area, and (iii) on alternative methods of vector control.

The members of the JCC decided in December 1979, that the feasibility study should continue, leaving open until it is completed the question as to whether the OCP area should be extended southwards. From an entomological viewpoint, however, it appears certain that the Extension will be recommended.

F. Economic Development in the OCP area:

An OCP Economic Development unit began working early in 1976 with the tasks of collecting and disseminating basic socio-economic data and of maintaining liaison with the development agencies of the OCP-associated countries. A multi-disciplinary approach (sociology, agro-economics, development economics, and public health) was followed by the unit in the formulation of questionnaires to the African beneficiary governments and field visits by members of the unit. The purposes for which the unit had been established were not being adequately fulfilled, and in 1978 the African beneficiary governments decided that they themselves would assume the responsibility for reporting on their national development programs within th OCP area.

Six of the seven beneficiary governments presented their reports in December, 1979. The report for Upper Volta focussed on the development activities of its Volta Valley Authority (AVV). This agency, which was created in 1974, is charged with promoting, coordinating implementating, and supervising the execution of all operations required for the economic and social development of the Volta River Basin--an area where the soil was thought to be the most fertile, but where a systematic approach to development had been the most lacking. The Upper Volta authorities see the Volta River Basin development as a means for relieving population pressure in other parts of the country as well as a contributor to national productivity. In the initial years of AVV operations, particular emphasis was placed on development of rain-fed agriculture. Since 1977, additional activities have focussed on forestry, stock-raising and hydro-agricultural development. Basic sociological, soil and geo-hydrological studies have been undertaken on the basis of aerial photography and cartographic surveys, and these are being followed by water prospecting and test drillings. Planning and construction of community infrastructure to accommodate incomming settlers has, since 1978, involved the participation of private enterprise in building of community centers, schools, dispensaries and storage facilities. However, the AVV itself undertakes the construction of roadworks, land clearance, and well-drilling. The AVV also provides instruction to farmers not only in crop and livestock production but also in protection of their natural environment.

The report on the Ivory Coast notes continuing activities to modernize cultivation of coffee, cocoa, oil and coconut palms in the forest region, and continuing emphasis on construction of sugar plantation complexes in the savanna region. It is estimated that total production from the six complexes will amount to 275,000 tons annually from 1983 onwards, of which two-thirds will be destined for export. Most of the complexes are situated alongside major watercourses, where onchocerciasis infestation has ranged from moderate to severe. The Ivorian authorities estimate that the OCP control measures are responsible for the stabilization and improvement of health conditions, which in tern will make it possible for the sugar complexes alone to directly and indirectly provide livelihoods for about 250,000 people. Other activities include projects for market gardening and canning, fruit-growing, soybean, rice, coffee and cocoa production. An important increase in cotten-growing has also been noted in the savanna region, with acreage under cultivation doubling between 1976 and 1979. It is also significant to note that the operating OCP zone budget for the Ministry of Public Health and Population has doubled between 1975 and 1979. A considerable number of livestodk projects are also included within the Ivoran part of the OCP area.

There are numerous livestock projects underway in the northern Ivory Coast, with virtually all cattle living within the savanna zone. Since the Ivory Coast only produces about 40% of the animal foods it consumes, and since the Sahel drought has substantially reduced the availability from this traditional source of meat imports, considerable importance

is attached to increasing domestic livestock productivity. Animal forms of trypanosomiasis still constitute a major obstacle to stock-breeding, and an extensive study to tsetse fly and trypansomal infestation is currently under way under UNDP auspices. Fish are another important source of animal protein, with domestic production meeting less than 50% of demand in 1975. It is estimated that the productive capacity of rivers and watercourses could be more than tripled through creation of major lakes (Kossou, Buyo and Taabo), and through fish farming in ponds and underwater cages--projects which will also benefit directly from reduced onchocerciasis infestation to the riverain and rural population.

The report of Mali records some 50 development projects totalling $200 million under way or planned, indicating that a high priority has been accorded to the OCP zone government developmental policy. A major dam construction project is under way at Selingue, with energy production scheduled to begin in 1981. Navigation and irrigation will also be improved as a result of the dam. Plans are already being made for resettling the population, once the dam is filled. The Mali authorities consider that the onchocerciasis zones within Mali remain the most productive in the country and possess unutilized potential for energy and mining, as well as agriculture. Since two-thirds of the country is desert, protection of Mali's vegetation cover is of great concern. Cereal production within the zone has shown an average increase of 70,000 tons a year, although crop production throughout the country suffered a serious setback in 1977-78 due to inadequate rainfall.

The Benin authorities place particular emphasis on the OCP as a means for speeding-up economic and social development of the northern half of its territory. Particular importance is attached to the collection of basic data, and reliance is placed on external donors for the necessary financing. The report itemizes projects for which funding is "to be found," as well as a number of projects entailing agricultural development and training, road construction, experimental fishponds, national parks development planning, and mining prospecting, funded chiefly by UNDP and IBRD.

The Togo report notes continuing progress with the pilot resettlement projects being undertaken in the Kara valley. These involve the work of inter-disciplinary teams, representing health, development and social affairs, in order to prepare integrated development project proposals. Experimental programs are also proceeding in the Oti valley, one recently-started project involving pilot cultivation of rice and the introduction of cattle. Preparations are under way to start a topographical survey of the Tchiri region (financed by A.I.D.), and the feasibility of constructing a dam on the Namiele River is the subject of a Swiss-financed feasibility study. Some of the above and and related projects within the oncho zone involve the financial participation of UNDP, the World Bank, and various European donors.

The report of Niger described projects under way or being contemplated by the Say <u>arrondissement</u> of south-western Niger. This region was

thought to offer considerable economic potential, owing to the availability of good fertile land (which, owing to the present low population denisty indicated the existance of almost 600,000 hectares of cultivable but uncultivated land), the availability of pasture land for cattle, and considerable mining potential (phosphates and iron). Obstacles to development include the existence of endemic diseases, including animal trypanosomiasis as well as onchocerciasis, the isolated nature of the region, and the scarcity of water, notwithstanding better rainfall averages than elsewhere in the country. Since 1974 the Niger authorities have concentrated efforts on an integrated approach to the development of the Say region, and a number of studies had been carried out under UNDP, A.I.D., and other donor auspices. The first objective of planning for the Say region is increased production of cereals and . estock, with surpluses to be used in other parts of the Country. The Government aims at a balanced program in which the needs of agriculture, livestock and mining production can be accommodated, and the interests of migrants reconciled with those of the current inhabitants.

IV. Plan of Action for Phase II (1980-85)

A. Vector Control Operations

The plan of action for vector control over the period 1980-1985 calls for the protection of a cumulative total of 3,552,438 km of river compared to 2,095,207 km during the period of 1974- 1979, i.e. an increse of 70%. This is due to the gradual build-up of activities during the period 1974-1979 (larviciding beginning only in 1975) as compared to the period 1980-1985, during which it is envisaged to maintain an annual level of activities similar to that projected for 1979. Additional details on river distances protected by phase by year in kilometers is contained in OCP report 78.2 on page 60.

During 1980, attempts will continue to further reduce dry season aerial treatments. The feasibility of basing a helicopter at Kandi, Benin, to treat the easternmost river of the Programme area will be studied as an alternative to more costly ferry flights from Tamale. Ground control methods will also be explored.

A total of 270 vector capture points will be serviced by 77 teams operating from 21 subsectors and six sectors. There is no increase in the number of vector collecting teams, sectors, and subsector, respectively, per kilometre of river protected, compared to the status quo as anticipated at end 1979.

B. Epidemiological Evaluation

The total number of villages included in the first evaluation of the Program area was 313, of which 45 were detailed evaluation villages (DE). Not all these 300 villages will be included in future follow-up for reasons such as change of population and very low endemicity of onchocerciasis. About 50% of the total number of simple evaluation villages (SE) will be regularly re-examined, whereas nearly all the 45 detailed evaluation villages will be included in the follow-up.

The sample for the future longitudinal study will therefore be, approximately, 150 villages SE and 45 villages DE, in principle equally distributed within the three phases of the Program area.

In some of the SE villages a stratification of the sample may be used to confirm the absence of transmission in certain areas, for instance, examination only of children born since the beginning of the vector control program. For the same reason non-infected populations resettling oncho-freed areas may also be included. Additional details are included in OCP/79.1, pages 5.7.

The selected villages will be re-examined every third year. Areas of very stable and successful vector control will be controlled every fifth year by simple evaluation, to confirm the absence of transmission, whereas it may be necessary to make more frequent passages in areas of doubtful transmission control.

The criteria for selection of villages to be included in the future follow-up will be based mainly upon:

- the duration of vector control;
- the level of ongoing transmission, if any.

The third factor to take into consideration will be the statistical background i.e. a sufficient number of carefully selected villages must be examined to enable reliable conclusions.

C. Training:

The training program will continue to aim at three objectives:

(a) to improve the skills of personnel already employed;

(b) to prepare new personnel as may be required;

(c) to instruct personnel from other African countries in the procedure of survey, control and evaluation of onchocerciasis and its vectors.

The program has three levels of training for which it can offer assistance.

First Level: Specialization in entomology, ophthalmology, etc., of candidates already possessing a university diploma.

The role of the Program will be to advise candidates as to the most appropriate branch of study to follow and to transmit the candidature to the WHO Regional Office for Africa for the initiation of enrolment procedures. The Program can consider financial assistance to candidates for this level of training in accordance with th availability of funds. This training lasts, in general, three years.

Second Level: candidates already trained in entomology, ophthalmology, parasitology, etc., who wish further specialization in onchocerciasis. The role of the Program will be to coordinate the enrolement of candidates at training centers such as OCCGE. The Program will consider financing directly these candidates.

Third Level: candidates already trained in onchocerciasis and who wish to become familiar with the methodology of OCP. This type of training will imply the direct involvement of the OCP Units.

D. Research

The research activities undertaken or sponsored by the Program during 1980-1985 will continue to be closely related to its changing requirements.

The principal objectives of future entomological research are as follows:

(i) to find a series of alternative larvicides and formulations to replace Abate;

(ii) to locate the resting sites of the adult blackflies in order to determine the feasibility of employing adulticides to strengthen control measures;

(iii) to prepare suitable keys for the identification of the adult females and males, pupae and larvae of the different species of *S. damnosum* common to the Program area;

(iv) to study the movements of *S. damnosum* s.l and the factors influencing migration; this would enable the Program to predict when reinvasion would take place and from where, and to take appropriate action before, rather than after, the event;

(v) to develop appropriate technologies which will facilitate the control, including environmental manipulation, to reduce the source of the vector.

The OCP secretariat recognizes that there has been little basic research into the socio-economic effects and implication of onchocerciasis control. More had to be learned about the impact of the Program within the OCP area, the true economic costs of the disease in terms of lost labor, the location of fertitle soils, the scale of migration to the OCP zones and its ecological effect, the importance accorded to OCP in public health policies, the gravity of the obstacle posed by other prevalent diseases (such as trypanosomiasis), and the lessons to be drawn for primary health care systems within the OCP area. To find answers to such questions, OCP will be funding from 10 to 15 research projects during the course of Phase II (including a training and research program totalling $250,000 in 1980).

Medical research will continue to emphasize studies involving the epidemiology of the disease and the search for a safe and efficient therapeutic agent. This will include the evaluation of drug trials and

their eventual application on selected populations, as well as applied research to define cases at risk of blindness and in need of tratement. Another important aspect of research will be the investigation of more refined evaluation techniques that may become available in the future, and which may improve the diagnosis or treatment of onchocerciasis.

Close liaison will be maintained with the WHO Special Program for Research and Training in Tropical Diseases, regarding basic research oriented towards greater understanding of the disease.

E. Environmental Protection:

The ORSTOM Hydrobiology team based in Bouake will continue for several years. This team has played a large part of developing the aquatic monitoring program and has been responsible for all monitoring in the Ivory Coast.

Work in Ghana by the Institute of Aquatic Biology is expected to continue at three sites in the original OCP area and at two sites farther south. It has been recognized that the quality and efficiency of monitoring should be improved, and that the quantity of pre-treatment data should be increased.

In addition to those actions that are directly the responsibility of OCP there is the recognized need by each participating African country to integrate the oncho zone into the national economy, to incorporate public health components into development projects, to develop basic socio-economic infrastructure into the resettled areas, and to continue to study and review anticipated development problems and bottlenecks.

F. Institutional Arrangements:

Two new documents have been developed for Phase II, the Onchocerciasis Fund Agreement, 1979, and its Annex, the Memorandum of Agreement on the Onchocerciasis Control Program. (See Annex C). The former covers contributions to, and disbursements from, the Phase II Fund, the proposed countibutions of the major donors, and IBRD and WHO custody, control and reporting responsibilities. The latter document describes the institutional and operational arrangements for the Program and includes, as Appendix 1 thereto, a detailed description of guidlelines for privileges and immunities to be accorded OCP-related entities by the African states ("Participating Countries").

For the signatories of the Onchocerciasis Fund Agreement, the provisions of the Memorandum form an integral part of the Agreement; whereas signatories only of the Memorandum are not ipso facto parties to the Agreement. The Agreement has so far been signed by the representatives of Belgium, France, Germany, Japan, Kuwait, Netherlands, United Kingdom, Swiss Confederation, United States, IBRD, International Development Association, UN Development Program, FAO, WHO, African Development Bank, and OPEC Special Fund. The

Memorandum has been signed by respentatives of Benin, Ivory Coast, Mali, Niger, Toto, and Upper Volta. (Pending Ghanian preliamentary approval, the Ghanian Government has approved the continuing application of the 1974 Memorandum as an interim measure).

Institutional changes for Phase II include the redesignation of the Joint Coordinating Committee (JCC) as the Joint Program Committee (JPC). The latter will have the same membership and exercise the same functions as its predecessor.

The former OCP Steering Committee (representing IBRD, WHO, UNDP, and FAO) has similarly been redesignated as the Committee of Sponsoring Agencies. Its membership remains unchanged, and it will continue to review work plans, budgets, and committee reports before transmitting them to the JPC. It may also study any aspects of the Program which may be referred to it.

The role of the WHO, as executing agency of the Program, and that of the IBRD remain unchanged also.

Other institutional developments include the formation of an Expert Advisory Committee (EAC), which supersedes three Phase I committees--the Economic Development Advisory Panel, the Ecological Panel, and the Scientific and Technical Advisory Committee. EAC will have all Phase II scientific, technical and ecological issues within its mandate. It will incorporate a permanent Ecological Sub-Group and may establish any ad hoc working groups it considers necessary. EAC has twelve representatives of the international scientific community as its members, and the Ecological Sub-Group five.

G. Independent Commission on the Long-Term Future of the Program

The only really "new" function for Phase II is the establishment, by the Director-General of WHO, of an independent commission of internationally-known scientists to study the long-term future of the Program. This Commission would consider the experience gained in control activities to date and of the intended gradual transfer of this responsibility to the African beneficiary countries. It would aim at finding a more cost-effective approach to vector control, and determine whether there exist simpler technologies, better adapted to the financial and human resources of these countries.

The Commission has a core membership of eight individuals, and has created sub-groups for the study of the following specific items: vector control, extension of vector control operations, infrastructues for vector-borne diseases, evaluation and monitoring.

The Commission will present a draft report to WHO in late 1980. This report will form the basis for discussion between interested parties, in preparation for drafting of the final report by 1981. This will be presented to the JPC at the close of that year.

H. End of Project (Phase II) Status

During the course of Phase II the original control area will have been determined to be safe for development as a result of sustained larvicide applications. Through applied research, increased knowledge will have been gained of the epidemology, transmission and chemotherapy and onchocerciasis. Research into the effects of larvicides on aquatic environment may lead to the development of new more cost-effective insecticides and delivery techniques. The socio-economic benefits of the Program will follow both directly and indirectly, through the improved health effects on existing projects and on the feasibility of initiating new rural development projects.

The actual economic and social development of the onchocerciasis transmission free areas continues to be the primary responsibility of the African beneficary governments. The OCP has no financial responsibility for development activities, and the development of the area will proceed, as it has done during Phase I, as a separate activity of the host governments concerned. Projects will be introduced as lands within the OCP area are determined to be safe for development and need not await the completion of the long-term Program before they can be initiated. Planning of development programs for various parts of the OCP area began, on a selective basis, early in Phase I, and is described on a country-by-country basis in Part III F.

V. Project-Specific Analysis

A. Economic Feasibility:

In 1978 the sponsoring United Nations agencies of the OCP--IBRD, WHO, UNDP, and FAO--commissioned a comprehensive economic review to reexamine the development implications of the Program. Under the leadership of Professor Elliot Berg of the University of Michigan, a ten-member international team of economists, agriculturalists and sociologists studied the existing documentation and visited the seven OCP-related African countries. Their objectives included determining the key obstacles of economic development within the Program area, reviewing national development strategies, determining the extent to which the Program was opening up new land for cultivation, and assessing current resettlement and migration policies and infrastructrure within the individual countries. Their report was submitted to the JCC in December, 1978, and provided the primary economic basis for the JCC's decision to undertake the second six-year phase of the Program.

The Report's main points may be paraphased as follows:

(1) the avoidance of blindness is the major source of economic benefits, and should not be lightly discounted. These benefits accrue to low-income beneficiaries--numbering approximately one million--and constituting some of the poorest people in the world.

(2) Considerable attention is given to cost-benefits methodology, recognizing that its applications to the OCP project are "highly sensitive to the assumptions adopted." The Report nevertheless concludes that a purely economic analysis of the Program "yields favourable results" on the basis of conservative assumptions concerning productivity effects, new land benefits, ratres of discount, and time horizons.

(3) Major economic benefits can be expected from the OCP "new lands" aspect. These will be derived not only from the additional output generated by migration from old to new (previously under-exploited) lands within the OCP area, but also from the erosion-reducing effect of emigration away from overpopulated "old" lands, since this will reduce overcultivation of the latter.

(4) The evaluation team felt that there was no universally-applicable development strategy for the OCP area as a whole, although some general conclusion was appliable: more development resources are "desperately needed" for the region as a whole.

(5) The vector control aspects of the Program should not be too closely dependent on subsequent development projects for their justification; this would lead to "a dubious linking in program terms." While the Program will undoubtedly create new development opportunities, vector control and development should be considered on their merits quite separately.

B. Social Analysis:

The dehabilitating effects of onchocerciasis have been explained elsewhere in this amendment, but the socio-economic consequences of this disease should also be understood. These include: loss of labor of those seriously ill or blind; abandonment of fertile lands; over-population and over-exploitation of other lands where the migrants seek to re-establish themselves; and--through migration of the young--the consequent loss of their contribution to local production.

Emigration from oncho-infested areas has a disproportionate effect on local society, as it is the younger more productive member of society who are usually the first to leave. This leads to an imbalance in the age and sex distribution of the population left behind, as well as to the loss of productive capacity. Older and more dependent members of the remaining population are numerically more important and impose an increasingly disproportionate social burden on the decreasing number of younger, more active inhabitants. Where the incidence of the disease is heavy, entire villages may be abandoned or transferred to new sites.

In Benin, the existing OCP area covers the northern parts of Atacora and Borgou provinces. The proposed extension would cover the upper basin of the Oue, thereby adding and additional 25,000 dm2 and bring the total number of persons benefitting from the Program to 618,000. Atacora and

Borgou provinces comprse half the land surface of Benin, and yet are the least populated owing in part to the prevalence of onchocerciasis in some areas. The population consists almost entirely of poor subsistence farmers, some 97% of whom are illiterate. These northern provinces have suffered from comparative neglect and isolation, and are lacking in basic infrastructure and social services. The proposed extension area shares with the northern provinces common Sudan-Savanna zone attributes of forests, game reserves, and national parks.

The proposed extension for Togo would double the existing OCP area within that country (currently 23,000 km2), covering the whole of the Mono basin and adding 836,000 persons to the 600,000 curently within the OCP area. As in the case of Benin, both the existing OCP area and proposed extension are characterized by terrain inhabited by poor farmers and herdsmen.

In Ghana, the OCP currently covers the northern and upper regions north of Lake Volta. The proposed extension includes the Brong-Ahafo region to the west and the Volta region lying to the east, and would add 42,000 km2 and 800,000 inhabitants to the existing OCP/Ghana area of 98,000 km2 and population of 1.6 million. Together, the OCP area plus extension would constitute 61% of the surface of the country and yet only 28% of the population. Both current and proposed extension areas are important for production of rice, yams, and other food crops, as well as livestock. OCP measures could have a significant impact on the national campaign to grow more food and industrial raw materials.

From the foregoing it will be seen that the proposed extension areas share with the current OCP areas of Benin, Togo and Ghana common topographic demographic and economic features. The terrain belongs to the Sudan-Savanna zone. These lands have suffered from comparative neglect at the hands of planners and administrators, and the combined effect of limited infrastructure and adverse health conditions has caused these areas to be underpopulated in comparsion with the southern parts of the same countries. The remaining inhabitants are among these countries' poorest, depending on agriculture and livestock for their livelihood. Aerial surveys have confirmed the existence of numerous breedings sites along the watercourses of the extension areas, and OCP team surveys reveal the presence of five of the six species of the S. damnosum complex, including the two responsible for most transmission on the savanna.

The primary objective of the proposed extension would be to neutralize sources of re-invasion into the existing OCP zone, and--by doing so-- this will also reduce the incidence of onchocerciasis amongst extension area inhabitants. This is particularly important when it is noted that, in some parts of the extension area (and including all of the extension proposed for Benin) nearly half of the population is under 14 years of age.

The immediate implications of an OCP extension of operations would be the establishment of a small number of data-collection stations, followed by the subsequent aerial application of Abate to selected river sites to kill larvae carried in fast-flowing watercourses during the rainy season. The inhabitants of the extension areas would not in anyway be more affected than their neggihbors in the adjacent OCP areas to the north. There has been no adverse sociological impact reported in the first six years of the original control area. In fact the resttlement projects within oncho transmission free areas have caused a general improvement in the lives of the people.

Since the blackfly vector attacks without known distinction between male and female, it is safe to assume that women within the extension area (constituting a half or more of the population), will benefit equally with men. Beyond that, however, there is no data to indicate what other benefits may accrue to women, as the result of extended OCP operations.

A.I.D. will continue to encourage an interest on the part of other OCP members in the sociological aspects of the Program, and will carefully review material relating to this matter as additional data becomes available through OCP studies currently under way and those to be undertaken at later dates.

C. Technical Feasibility

1. Methods of Control

In the absence of any therapeutic weapon at present utilizable in a mass campaign, the only feasible method of controlling onchocerciasis is still by control of the vector. Taking into account the genetic, biological and ecological characteristics of *S. damnosum* s.l., the control of the vector can be approached, in theory, from many angles.

These are (a) ecological control, i.e., the elimination of rapids, (b) genetic control such as the introduction of sterile males, (c) biological control using parasites, (d) chemical control either against the adult fly or control of the pre-adult stages. (These methods are discussed at length in OCP/78.2 pp 17-29).

Pre-adult control of the larvae is the principle upon which this (and most) campaigns against the blackfly vector of onchocerciasis have been conducted in Africa.

Widely utilized in prior campaigns, and adopted for this Program, larval control is governed by the following principles:

- the larvicide solution must be released upstream from each breeding site, or set of breeding sites, so as to destroy the larvae of all stages; the range of action of the insecticide wave transported by the current depends essentially on the hydrological and topographical characteristics of the watercourse treated;

- applications must be made periodically, at intervals shorter than the larval lifespan of the species; the periodicity has been fixed at seven days, which satisfies both biological and logistical exigencies;

-these applications must continue, in a given area, for as long as the capacity for reproduction of the residual blackfly population poses a threat from the epidemiological viewpoint (transmission rate too high) or in entomological terms (re-establishment of local blackfly populations too rapid).

As a result of studies undertaken since 1967, investigators have been able to select several compounds belonging to the organophosphorus group, one of which, temephos (Abat R, OMS 786), combines in a specific formulation and essential properties of high effectiveness against S. damnosum larvae of all stages, and, because of its relatively specific action, its low persistence and the very small doses applied, low toxicity for the environment. This insecticide has been used since the start of operations by the Program, but investigations continue with a view of developing new compounds in different formulations.

Most of the campaigns prior to the Program, which are based on the principle of larval control by chemical means, use treatment techniques suited to the small geographical areas covered. However, the treatment appliances, both static (drums with holes to release the insecticide over a given period), or mobile (floating craft of various sizes), very soon proved unsuitable for the treatment of large areas because of the impossibility of utilizing them in all situations.

Access to the rivers in all seasons constitutes the major, often insoluble, problem that the treatment teams have to face when working on the ground, especially during the rainy season which is generally the period of high transmission in most onchocerciasis-infested valleys. The treatment rounds are therefore done incompletely, not always at regular intervals and at the cost of unremitting efforts. Moreover, for these less than ideal results the resources that have to be deployed are considerable.

After analysis of the various principles, methods and techniques the OCP uses the following criteria:

- control measures directed against the larvae of the vector, which are its most susceptible development stages;

- utilization of insecticide with little residual action, effective at low concentrations and producing little pollution under the conditions of application;

- threatment from the air, the only method at present applicable which has proved, for practically 100% effectiveness, the least costly.

The treatment flying is done with six helicopters in spraying configuration and two fixed-wing aircraft operating from Tamale and Bobo-Dioulasso.

As river levels alter, the breeding sites of S. damnosum change and aircraft circuits have to be modified accordingly. It is unlikely that a river treated with a particular quantity of insecticide one week would require the same dosage the following week, and as rivers start to flow, or dry up, they are constantly being added to or removed from a circuit. Hence, it is necessary to produce new treatment maps each week at the two bases of Bobo-Dioulasso and Tamale. Following this the pilots are briefed on the circuit to be flown that particular week. The pilots carry with them the 1:500 000 treatment maps, which indicate the rivers to be treated and the dosages required, and 1:200 000 maps which show the release points of the breeding sites to treat. Circuits normally take three to four days.

In addition to this operational role, the entomological evaluation, at this stage is designed to provide (i) a measure of the effectiveness of the Program in the period before reliable epidemiological changes can be demonstrated; (ii) statistically valid data to compare biting and transmission rates with the human parasitological and ophthalmological findings; and (iii) data for use of research into the reinvasion phenomenon.

In setting up the entomological evaluation network, 525 catching points were studied in varying degrees of detail, and the catching results stored in the headquarter's computer. Increasing knowledge has indicated that more intensive catching at fewer sites is likely to yield the most valuable results, especially when reinvasion problems are being studied.

Interpretation of the entomological data presents a number of problems. In the complete absence of the vector no further transmission will take place. However, with a vector such as S. damnosum, which under certain circumstances may migrate, this situation is unlikely to be achieved, or maintained, for long periods over wide areas. It has thus become necessary to determine the level of biting fly populations and potential transmission of O. volvulus which is considered acceptable from the medical and economic viewpoints. In order to make a judgment concerning the success or otherwise of the Program, and to provide criteria for assessing the advisability of settling populations in zones of severe onchocerciasis, OCP convened a Scientific Advisory Panel Working Group in June 1977. The group considered the available entomological data concerning the transmission situation before vector control activities, together with the known resultant degrees of the disease. The group decided that an Annual Transmission Potential (ATP) of 100 was extremely unlikely to result in any untoward medical or socioeconomic effects. Available data also suggested that an ATP of 800+ was likely to be accompanied by severe onchocerciasis. In order to cover the situation where previously uninhabited areas are to be subjected to human settlement, it was also necessary to determine what level of biting fly populations might give rise to unacceptable levels of ATP. The Panel

concluded that an Annual Biting Rate (ABR) of less than 1000 was most unlikely to give rise to an ATP of over 100 and this could be considered safe, and that with an ABR of above 8000 a hyperendemic onchocerciasis situation was likely to develop should a human population containing some onchocerciasis carriers be settled. The group clearly appreciated that with knowledge which should become available after the second or third passage of the epidemiological evaluation teams, it might be possible to safely increase the acceptable levels of ATPs and ABRs.

In many cases results in the heart of the Program area are excellent. For example, at Wayen (point 0407) situated on the White Volta river just east of Ougadougou, no vector flies have been caught since the start of the control campaign, yet in the pre-control times the ABR exceeded 8000 and the ATP exceeded 100. In most of the Black, White and Red Volta, and Sissili valleys in Upper Volta, transmission of onchocerciasis has almost certainly ceased since the start of the control campaign. Further south, in the Black Volta valley, control has improved markedly each year.

Methods of Epidemiological Evaluation

The purpose of the epidemiological evaluation is to assess the impact of the vector control operations on the incidence of the disease and to measure the evolution of the epidemiological situation resulting from the interruption or reduction of disease transmission. The collection of baseline data on zones, I, II and III was completed by the beginning of 1978, resulting in the examination of more than 80,000 patients in 273 villages.

Two types of examinations were performed: basic and detailed. The basic examination consists of taking two skin snips to determine the prevalence of the disease by age and sex, and the intensity of infection; visual acuity is measured by a simple screening procedure. The detailed examination performed on about 15% of the persons surveyed, consists of a more specific clinical examination, the recording of the number and distribution of modules, the identification and classification of skin lesions and a detailed ophthalmological examination for a precise diagnosis of ocular lesions and the ocular parasite load.

Since the beginning of the campaign, baseline date have been collected in the seven countries. On the basis of the criteria mentioned above, the following conclusions can be drawn:

Geographical dispersal: all river basins treated by the vector control unit are represented in the sample.

Relation with entomology: whenever possible the villages close to a permanent Simulium catching point were chosen in order to assess the degree of correlation with the entomological results. In certain cases the investigations were conducted upon the request of the entomologists. The different levels of transmission (ATP) are represented in the sample.

Migrants: in the AVV where there is a population of non-infected immigrants, 3200 individuals have been registered for a special study aimed at checking the persistence of any residual transmission.

Quantitative aspect: the basic sample established in the seven countries in the original Program area totals 80,000 people, out of a population of 11 million inhabitants. This represents a sample of 0.75% of the population, which is considerably greater than the number originally envisaged (0.33%). This decision was taken in consideration Of:

- the need to retain a sufficiently large sample in order to obtain significant results in the longitudinal surveys of villages over a period of 10 years or more, in view of the high absentee rate of 20% at each examination: also, the larger sample initially chosen now contains a sufficient number of villages from which valid conclusions can be drawn on the transmission resulting from infected flies imported from outside the OCP area;

-the need to ensure adequate geographical coverage as required by the entomological control;

- the need for mapping of foci and chemotherapeutic trials.

D. Environmental Analysis

An Initial Environmental Examination (IEE) was prepared for this project in 1978 and a negative determination was approved by the Assistant Administrator on September 14, 1978. The IEE was attached to Project Revision No. 1 approved the same date. The decision for negative determination was based on very extensive studies of the vector, the selection of the insecticide (Abate) which is biodegradable, and the methodology used in application of the insecticide. The negative determination was also supported by the continuing monitoring of the environmental impact which is undertaken by an Ecological Panel of specialists in hydrobiology.

The Chairman of the Ecological Panel, Professor J. H. Koeman, reported in December 1979 on the findings of the Panel which met in September 1979. The Panel found that with the use of Abate for larviciding, monitoring had so far given no indication that Abate has an adverse, irreversible long-term effect on invertebrate fauna or fish, but suggested, on the contratry, that its toxicity only affected *S. damnosum*. Nevertheless, the Panel endorsed the view of the hydrobiologists that the quality and efficiency of monitoring should be improved and, more particularly, that the quantity of pre-treatment data should be increased. The Panel had also agreed with the statisticians that a minimum of four years of such data was a prerequisite for meaningful analysis of the ecological and hydrological situation in a given year; the collection of data should thus form part of any preparations for extending blackfly control to other areas. The Panel had also recommended, more specifically, that close attention be paid to Decapod Crustacea, which were an important part of the diet of certain

species of fish and which, according to studies already made in connection with tsetse fly control, appeared to be extremely sensitive to pyrethroids and other chemicals. With regard to the study of fish population, which was important for the monitoring of long-term changes, the Panel recommended brain cholinesterase analysis as a means of determining the cumulative effect od exposure to organophosphorus compounds. As regards the difficulty of detecting the causes of harmful effects on fish population, particularly in areas where pesticides were used in agriculture or where more than one insect control program was in progress, Professor Koeman observed that the brain cholinesterase test for fish had the advantage of distinguishing between exposure to organophosphorus compounds and exposure to other chemicals. However, on-the-spot assessments of different chemical inputs into river systems, on the basis of local observation analysis, seemed the best means of identifying the causes of damage to fauna.

The JCC in their Sixth Session, December 3-5, 1979 in Geneva, agreed that the collection of data on fish populations, including baseline and pre-treatment data which already constituted an important element of OCP, should be further improved.

The budgetary implication of the recommendations of the brain cholinesterase analysis of fish would depend on the location of the laboratory work and the procedures uses; funds are available as it was not believed that the measures would impose a heavy financial burden on the Program. The above decisions strengthen the aquatic monitoring of the OCP.

The International Union for Conservation of Nature and Natural Resources (IUCN) expressed concern at the possible effect of the OCP operations on the natural fauna. In reply, the Ecological Panel sent a letter assuring IUCN of its equal concern for the preservation of the environment. On the basis of the continuous monitoring of OCP activities, the Panel, which is composed of independent scientists, was able to give the IUCN the assurance that these activities were having no measurable effect on fishes and wildlife.

Under the new Memorandum of Agreement, which took effect January 1, 1980, a permanent Ecological Group would be attached to a new Expert Advisory Committee (EAC). The Ecological Group would have the same task as the Ecological Panel of ensuring that OCP's operations in no way adversely affected the aquatic fauna. The group will submit their report as an Annex of the EAC report so it will be made available to the JRC.

There will be five members appointed to the Ecological group. For the first time an American has been appointed; he is Dr. Robert E. Lennon, Fishery Biologist (retired) from the U.S. Fish and Wildlife Service. Dr. Lennon has had an extensive career on Federal Water Projects with the U.S. Fish and Wildlife Service and served as Director of the Fish Control Laboratory of the U.S. Fish and Wildlife Service in Wisconsin from 1959-73. His research interests on the physiology of fishes and chemical control of fresh water fishes provides a background

which will assure attention to these matters by the Ecological Group. Other members of the Group will continue to be distinguished world scientists representing various disciplines required to cover the various investigations for aquatic monitoring.

The extension of the OCP by six years, to include operations in 1980-85 and the extension southwards (subject to subsequent JRC concurrence), involve new elements which were not addressed in the previous IEE. An amendment to the IEE covering these new elements and other changes is included as Annex B.

D. Administrative Feasibility:

The administrative structure described in the PROP continues to function in its original form, although there have been some minor institutional changes.

1. Executing Agency:

Under the Onchocerciasis Fund Agreement, 1979, and the Memorandum of Agreement, the role of the World Health Organization as OCP's executing agency is reconfirmed. As such, WHO will continue to provide a Program Director, assign qualified professional and support staff, and will be responsible for the implementation of the agreed Program, as defined in the annual budgets and plans of work.

The Program Director will continue to be responsible for OCP field operations. He and his technical and logistical support staff are stationed in Ouagadougou, where OCP headquarters has been situated.

The OCP has a permanently-constructed office building in Ouagadougou, and--as of April, 1980-- a total staff of 40 professionals and 717 general service staff. About 93% of the 179 vehicles owned by OCP were reported fully operational--an especially high rate for West African operating conditions, and speaking well of the procurement and maintenance facilities operating by OCP. The OCP has a contract fleet of two fixed-wing aircraft and seven helicopters, based at Bobo-Dioulasso and Tamale.

2. Role of the World Bank:

The IBRD exercises a financial role complementary to the operational responsibilities of WHO, as well as a development promotion role in parallel with that of UNDP.

The IBRD administers the Phase II Fund, consisting of residual Phase I monies together with contributions to Phase II. The Fund is maintained separate and apart from all other accounts and assets of the Bank. The IBRD remits to, and pays on behalf of WHO such funds as may be required to meet the cost of Program implementation. WHO, in turn provides to the IBRD information concerning disbursements.

WHO also submits to the Committee of Sponsoring Agencies an annual progress report and an estimated budget and plan of action for each financial period (calendar year).

The Bank has confirmed to A.I.D. that neigher it nor WHO will earn interest on the U.S. contribution or, if either does earn such interest, it will be returned to the U.S. Government.

The U.S. contribution is--like that of all other donors--an untied grant. Procurement of goods and services are through worldwide competitive bidding. (The larvicide, Abate, is manufactured in the United States, and a U.S. firm was awarded the initial aerial spraying contract).

3. UNDP and Associate Agencies:

The UNDP is one of four United Nations agencies participating in the Program, and together with IBRD, WHO and FAO constitutes the membership of the Committee of Sponsoring Agencies (formerly called the Steering Committee). The Committee reviews workplans, budgets, and other committee reports prior to transmitting them to the members of the Joint Program Committee.

4. National Onchocerciasis Committee (NOC):

Within each of the seven African participating governments, a National Onchocerciasis Committee (NOC) has been established as "the major coordinating element at government level." Each NOC, composed of representatives of the appropriate national services concerned, will be given authority to act at the highest level and to command appropriate resources for coordinating the national services involved in the Program and in the subsequent economic development projects, organizing information campaigns, preparing appropriate OCP--implementing legislation, and assuring liaison between the governments and OCP headquarters.

Under the recent Memorandum of Agreement 1979 the responsibilities of the NOC--some of which were created at the inception of the Program in 1974--were increased to include encouraging of development studies for the reclaimed areas, and:

> "taking all appropriate measures to ensure that the results achieved at the end of the Program are maintained; (and) taking appropriate action to ensure that financial commitments of the Governments are honored."

Appexdix I to the Memorandum of Agreement provides the conditions for OCP personnel and contractors within each of the seven countries covering immunities, exemption from local taxation, access to technical information, overflight and landing rights, and the immunities.

5. Joint Program Committee (JPC):

The committee is the plenary inter-governmental body in which all OCP--concerned agencies, including both donors and beneficiaries, are represented. As in the case of its predecessor, the JCC, the JPC will meet at least once yearly and will perform the following functions:

> (a) exercise general supervision over the policies to be adopted in the planning of the Program and over its execution...and consider reports submitted to it by the Committee of Sponsoring Agencies;
>
> (b) approve the proposed plan of action and the budget... prepared by WHO and the estimate prepared by the Bank of contributions and disbursements to be made...
>
> (c) approve any modification of the Program area; and
>
> (d) consider such other matters relating to the implementation and financing of the Program as may be referred to it by any member thereof.

The meetings of the JPC will continue to be serviced by the WHO Secretariat. The quality of the documentation prepared for such meetings in the past has been excellent.

6. Other OCP Committees:

The composition and functions of the technical committees of the OCP have been described earlier in this amendment under the headings, "Institutional Arrangments".

7. A.I.D. Administrative Arrangements:

The project will continue to be administered by AFR/RA in collaboration with AFR/DR/H, DS/HEA, and other appropriate technical offices of the Bureau. AFR/RA responsibilities will include monitoring Program performance, representing A.I.D. at periodic meetings of the JPC, and maintaining liaison with OCP headquarters (through USAID/Ouagadougou), WHO headquarters (through USOM/Geneva), and the IBRD. With respect to liaison functions involving Ouagadougou and Geneva, it is anticipated that the project will not impose any more workload on the appropriate U.S. missions than during Phase I, when such workload was limited to a small number of message transmittals.

E. Financial Plan

1. Phase I

Total receipts from donors for Phase I plus interest earned amounted to $63.9 million, of which some $10 million was carried over to Phase II of the Program. The reason for this carryover is partly attributable

to significant pledges made by a number of donors late in Phase I, and partly to the international competitive bidding practices followed by WHO and the Bank, which resulted in substantial procurement savings.

In Phase I the United States contribution of $7.7 million amounted to 12.2% in relation to total receipts. Other major contributors to Phase I, in terms of total receipts, were the Netherlands (10.3%), Kuwait (9.6%), World Bank Group (9.5%), France (9.1%), United Kingdom (8.4%), Germany (8.3%), and Japan (7.9%).

During Phase I of the Program it was agreed that the seven African participating states would reimburse to WHO the local currency costs incurred in OCP local hire of their respective nationals. These expenses totalled $640,000 and were borne in the following shares: Benin ($46,000), Ghana ($174,000), Ivory Coast (139,000), Maili ($77,000), Niger ($2,000), Togo ($148,000), and Upper Volta ($54,000).

A table indicating receipts in the Onchocerciasis Fund 1974-79 is attached as Annex D.

2. Budget for Phase II (1980-85)

The estimate of annual expenditure from 1980 through 1985 is $106,749,200. A breakdown by year and by category is on the next pages as Table I and II. A pie chart of 1980 expenditures is on the following page as Table III.

In addition to the figure of $106.7 million for estimated Phase II costs within the current OCP area, it is estimated that an additional $15 million may be required over the period 1982-85 to meet the costs of combatting re-invasion within the proposed southerly extension into Benin, Ghana and Togo. These latter estimates are not included within the above-mentioned tables and are subject to revision in the light of the ongoing feasibility study and future determination of the JPC.

3. Financing of Phase II:

It is proposed that the U.S. input be retained at approximately the same percentage as during Phase I, in a total amount of $15.4 million and in accordance with the following schedule of annual contributrions and in relation to the currently estimated OCP budget figures (excluding any southerly extension costs) over the next six-year period:

	1980	1981	1982	1983	1984	1985	Total
OCP Budget (millions)	$15	$15.6	$16.6	$18.3	$19.8	$21.5	$106.8
AID contrb. (millions)	$2	$2.2	$2.4	$2.6	$2.8	$3.1	$15.1
AID misc.	.05	.05	.05	.05	.05	.05	.3
Total AID	$2.05	$2.25	$2.45	$2.65	$2.85	$3.15	15.4

SUMMARY TABLE I. OCP 1974-1985 BY PROGRAMME ACTIVITY

	Total revised (May 1979) 1974-1979	Revised (May 1979) 1980	Revised (May 1979) 1981	Revised (May 1979) 1982	Revised (May 1979) 1983	Revised (May 1979) 1984	Revised (May 1979) 1985	Revised (May 1979) Total 1980-1985
Vector control	34 022 055	10 341 900	10 484 100	11 216 300	12 352 600	13 284 100	14 358 200	72 037 200
Epidemiological evaluation	2 689 812	807 300	891 400	983 400	1 086 100	1 201 400	1 308 700	6 278 300
Economic development	419 725	-	-	-	-	-	-	-
Applied research,[a] Commission, Environmental surveillance, Data processing and Training	4 587 066	1 363 500	1 490 100	1 385 600	1 496 200	1 616 000	1 745 200	9 096 600
Programme Director and Administrative support, Ouagadougou	8 248 258	2 039 500	2 218 500	2 447 900	2 703 400	2 988 300	3 273 400	15 671 000
Meetings	707 164	198 300	214 100	231 200	249 700	269 700	291 300	1 454 300
Administrative support, Geneva	2 287 626	209 700	233 600	260 200	289 800	322 800	359 600	1 675 700
Technical support, Rome	93 748	-	-	-	-	-	-	-
Liaison Office, Brazzaville	135 355	66 900	74 600	83 200	92 700	103 400	115 300	536 100
Joint Coordinating Committee[b]	381 812	-	-	-	-	-	-	-
TOTAL	53 572 621	15 027 100	15 606 400	16 607 800	18 270 500	19 785 700	21 451 700	106 749 200

[a] Including economic development. Also, funds for economic development could be made available by FAO, UNDP and the Bank should specific requests be received from Participating Governments.

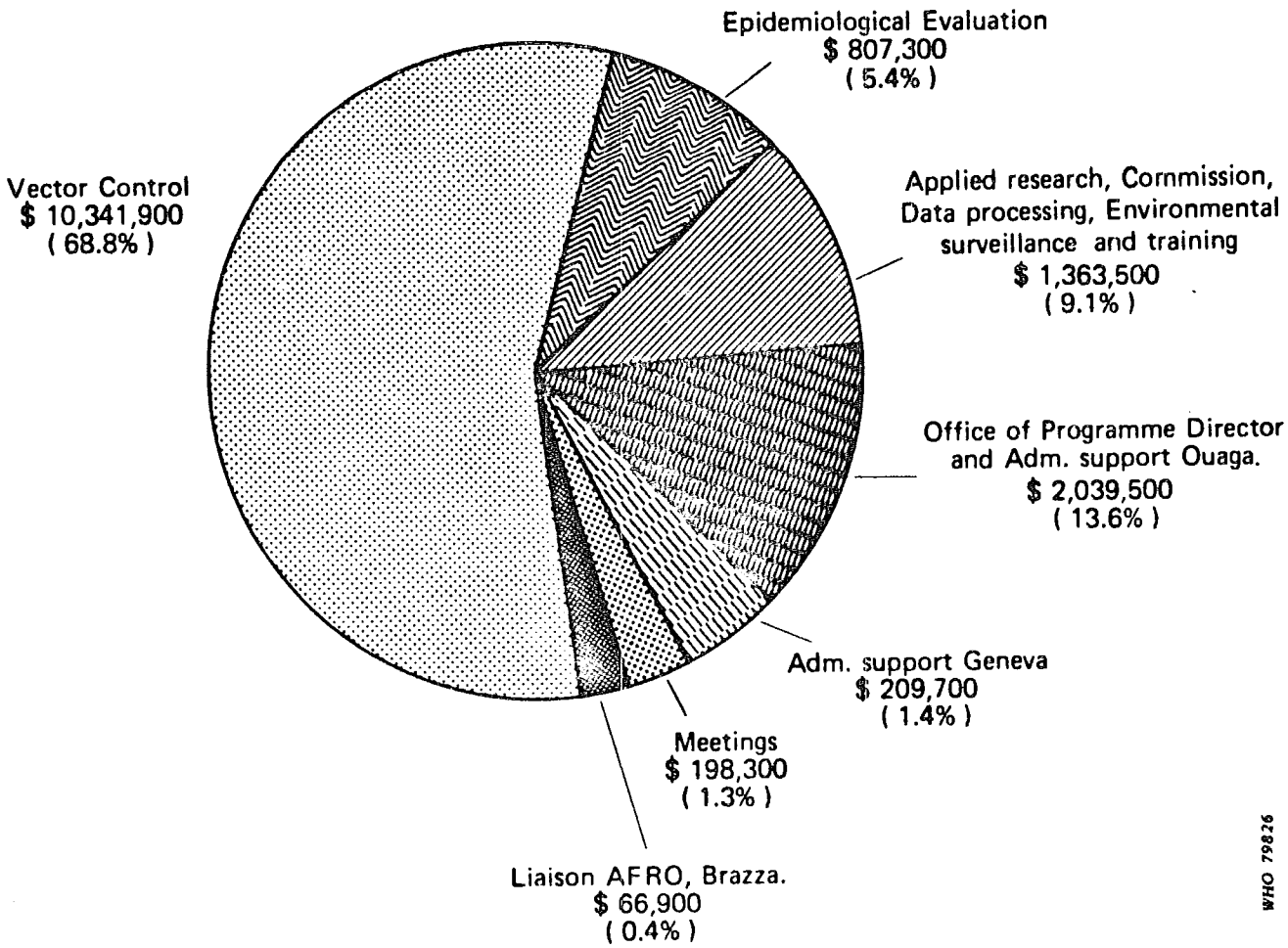
[b] Joint Programme Committee: exclusive of meetings which have been incorporated in "MEETINGS".

SUMMARY TABLE II. OCP 1974-1985 BY CATEGORY OF EXPENDITURE

	Total revised 1974-1979	Revised 1980	Revised 1981	Revised 1982	Revised 1983	Revised 1984	Revised 1985	Total revised 1980-1985
ANNUAL COSTS								
Personal services	19 826 865	6 046 000	6 741 300	7 458 600	8 316 300	9 272 700	10 339 200	48 174 100
Aerial operations	10 564 799	2 582 400	2 593 700	2 571 800	2 882 800	2 908 900	2 941 600	16 481 200
Insecticide	5 748 700	2 655 400	2 276 100	2 458 200	2 654 900	2 867 300	2 096 700	16 008 600
Research	2 682 816	229 300	247 600	590 900	618 100	645 800	672 600	3 004 300
Supplies	871 862	120 900	130 500	140 900	152 300	164 400	177 600	886 600
Training	233 230	59 400	64 200	94 500	102 000	110 000	118 900	549 000
Accommodation and utilities (Data processing)	879 033	197 200	213 000	230 100	248 500	268 300	289 700	1 446 800
Operational travel	2 292 859	528 300	570 500	585 200	632 000	682 500	737 100	3 735 600
Consultants	989 683	323 700	349 600	170 100	183 600	198 400	214 200	1 439 600
Meetings	833 135	451 700	487 700	231 200	249 700	269 700	291 300	1 981 300
Operation and maintenance	4 088 950	897 800	969 600	1 047 300	1 131 000	1 221 400	1 319 100	6 586 200
TOTAL	49 011 932	14 092 100	14 643 800	15 578 800	17 171 200	18 609 400	20 198 000	100 293 300
CAPITAL ITEMS								
Buildings	1 227 032	80 000	50 000	50 000	50 000	50 000	50 000	330 000
Furniture	168 757	5 000	5 000	5 000	5 000	5 000	5 000	30 000
Vehicles	2 099 085	775 000	832 600	899 000	969 300	1 046 300	1 123 700	5 645 900
Technical equipment	1 065 815	75 000	75 000	75 000	75 000	75 000	75 000	450 000
TOTAL	4 560 689	935 000	962 600	1 029 000	1 099 300	1 176 300	1 253 700	6 455 900
GRAND TOTAL	53 572 621	15 027 100	15 606 400	16 607 800	18 270 500	19 785 700	21 451 700	106 749 200

TABLE III

ONCHOCERCIASIS CONTROL PROGRAMME BY PROGRAMME ACTIVITY, 1980. PIE CHART



Included in the above A.I.D. estimates are miscellaneous expenses to be incurred directly by A.I.D. over the LOP, totally $300,000. It is proposed that these be made available at the rate of $50,000 annually to cover employment by A.I.D. of U.S. experts for the purpose of ecological monitoring, project evaluation, and other program related needs as may from time-to-time arise.

In relation to other donors to Phase II, the U.S. Government will remain a major contributor. However, other donor governments have already made significant long-term commitments for a six-year period. These include the Netherlands, which had pledged a total of $13.7 million of which $3.43 million are scheduled for FY 1980. Other long-term pledges for 1980-85 include those of Switzerland ($7.19 million), France (7.14 million), Kuwait ($6 million), and the World Bank Group (up to $12 million). Other donors who have made pledges for 1980 or beyond are listed on Table IV.

The formula for determining contributions from the seven African participating countries has been modified for Phase II. The 1% formula has been adopted for Phase II, with individual assessments to be determined by multiplying each country's GNP by the number of OCP beneficiaries within that country. This formula was accepted in principle by the seven African countries at the meeting of National Onchocerciasis Committees in April, 1980, on the basis of which the following Phase II apportionments were calculated: Benin ($120,000), Ghana ($250,000), Ivory Coast ($430,000), Mali ($120,000), Niger ($80,000), Togo ($170,000), and Upper Volta ($270,000).

F. Implementation Plan

A.I.D. has no direct involvement in Program implementation. The latter continues to be implemented by the World Health Organization. Consequently no A.I.D. implementation plan is required, and readers are referred to the Project Description for Phase II.

G. Evaluation Plan

A. Regular OCP Reporting

The OCP provides monthly progress reports to supplement the more detailed end-of-year reports presented to the December meetings of the JPC. Such reporting is of excellent quality.

B. Periodic Evaluations:

The first WHO evaluation, covering the first five years of the Program, was presented in December 1978. It was accompanied by a separate assessment of the economic development aspects of the Program, prepared by an Economic Review Mission organized under IBRD auspices. These evaluations, like the regular OCP reports, are of excellent quality.

Table IV

PLEDGES TO OCP FOR PHASE TWO AS OF JUNE, 1980

Donor	1980	Other Years
World Bank (IBRD)	$1.5 million	Up to $12 million for entire Phase II
Netherlands**	$3,426,000	$13.7 million pledged for entire Phase II
Canada**	$ 680,000	
Kuwait	*	$6 million pledged for Phase II
Al Sabah Fund (private NGO, Kuwait)	$ 20,000	$100,000 pledged for entire Phase II
OPEC Special Fund	*	$2 million pledged for 1980-83
United States	$2,000,000	
France**	$1,190,000	$7.14 million pledged for entire Phase II
Germany, Fed. Republic**	$1,117,000	$2,234,000 pledged for 1981
Japan	$1,600,000	
Belgium**	$ 865,000	
United Kingdom**	$ 458,000	
AFDB**	*	$2,160,000 (1.8 million units/account) pledged for Phase II
UNDP	*	$1,400,000 pledged for 1980-81
Norway**	$ 560,000	$2,240,000 pledged for 1980-83
Saudi Arabia	$1,670,000	
Switzerland**	*	$7,190,000 pledged for entire Phase II
Total Pledged for 1980 (as of December, 1979)	$15,086,000	
Total Pledged for 1980-85 (as of December, 1979)	$64,554,000	(excluding any U.S. input beyond 1980)
Carryover	$10,000,000	
Total	$74,554,800	

* Denotes no portion of long-term pledge yet designated for 1980.

** Pledges announced in national currency and converted into U.S. dollars on the basis of rates prevailing on 19 May 1980.

C. Expert Advisory Committee (EAC):

The Committee replaces the former Scientific and Technical Advisory Committee and will furnish independent advice on program matters. EAC reviews the scientific, technical, ecological, and economic development aspects of OCP activities, and recommends:

> "such measures as may be necessary to maintain or improve the efficiency of operations."

Membership does not exceed twelve in number and reflects the broad range of disciplines connected with the Program.

EAC will have attached to it a permanent Ecological Group of five members, which will study the ecological impact on the environment of the use of insecticides, recommend any measures needed to supplement ecological studies undertaken by OCP, and which will make recommendations to ensure effective protection of the environment.

EAC may also recommend the creation of ad hoc working groups to deal with specific subjects. EAC reports, containing findings and recommendations, will go initially to the WHO which will in turn transmit it with comments to the JPC.

D. Independent Commission on Long-Term Future of the Program

Another evaluation function is vested in the Commission, established by the WHO in May, 1979. The role of the Commission is explained in the Plan of Action for Phase II. The Commission will evaluate key elements of the program and submit an interim report in late 1980 and a final report the following year.

E. A.I.D. Evaluation Arrangements

It is believed that the internal OCP procedures provide adequate evaluations of the program. However A.I.D. may finance special studies from time to time such as the On-Site Inspection of Aquatic Monitoring by Robert E. Lennon, Fishery Biologist in July 1980.

Entomological Criteria

A. Annual Transmission Potential (ATP)

This is the annual total of the estimated individual monthly transmission potentials obtained from the formula:

$$\frac{\text{No. of days in month} \times \text{No. of infective larvae}}{\text{No. of days worked}} \times \frac{\text{No. of flies caught}}{\text{No. of flies dissected}}$$

Calculations for the ATP in the Program area are based solely on the numbers of infective larvae indistinguishable from *O. volvulus* in the flies' heads. Where *Simulium* biting densities are low, as in the Program area, ATPs calculated in this way are liable to wide fluctuation resulting from the numbers of infective larvae in single flies.

B. Annual Biting Rate (ABR)

This is the annual total of the estimated individual monthly biting rates that have been obtained from the formula:

$$\frac{\text{No. of flies caught} \times \text{No. of days in month}}{\text{No. of days worked}}$$

INITIAL ENVIRONMENTAL EXAMINATION
(Amendment No. 1)

Project Location: Portions of Upper Volta, Benin, Togo, Ghana, Niger, Mali and Ivory Coast (including proposed southern extension)

Project Title: Onchocerciasis Control - Volta River Basin

Funding: Previously approved: FY 74 to 79 - $7,700,000
This Amendment: FY 80 to 85 - $15,400,000

Life of Project: 1974 to 1985

IEE Amendment Prepared By: E. Dennis Conroy E. Dennis Conroy

Date: July 28, 1980

Environmental Action Recommended: We recommend a continuation of a negative determination as a threshold decision. The decision is based on the extensive studies of the vector which continue as described in the original IEE, the use of the larvicide Abate which has not changed from the previous IEE, and the method in which it is used. It is also supported by continuation and strengthening of aquatic monitoring of the effects of the larvicide which has been strengthened since the previous IEE and the continued existence of an independent group of scientists to review the results of the monitoring. Approval to extend the control area southwards will depend on satisfaction of criteria included herein.

Concurrence: W. Haven North _____ Date _____

Assistant Administrator's Decision: Date _____

Approved: _____

Disapproved: _____

Clearance:
AFR/DR:JHester _____
AFR/DR:JLStockard,M.D. _____
DS/AGR:FWhittemore _____
GC/AFR:EADr[illegible]on _____

I. Examination of Nature, Scope, and Magnitude of Environmental Impacts

A. Summary of Project Activities

This amendment covers a continuation of the project as described in the IEE dated August 23, 1978 with the exception that a) control activities in the original control area will be continued for six additional years from 1980 to 1985 and b) the control area will probably be extended southwards to cover the central portions of Ghana, Togo and Benin.

The Onchocerciasis Control Program has been successful in interrupting transmission of the disease in 80% of the original control area by reducing the blackfly vector. The vector is reduced through periodic aerial applications of a non-persistent larvicide, temephos (Abate R, OMS 786). This insecticide is registered by the Environmental Protection Agency for similar use in the United States. The methodology employed is expected to continue during the six year period of Phase II since the blackfly larvae (the target organism) has not shown resistance to the larvicide to date, and the carefully controlled application has been effective in killing the larvae. Larvicide is applied using helicopters or low flying aircraft, and the dosage is carefully controlled in relation to river flow. Abate is applied above turbulent sections of the rivers and stays largely near the surface of the water where the larvae rest; thus it does not come in extensive contact with other river organisms.

In the northern and central portions of the original control area the existence of the blackfly vector has been reduced so completely that it is virtually eliminated. As a result of this favorable development, experiments are underway in certain areas to reduce the frequency of the application of Abate in the rivers and streams or to stop it all together. Results of these experiments to date indicate it may be possible to reduce the frequency of larviciding in these areas, but continued studies over time are necessary before this can be assured.

An unfavorable development is the continued reinvasion of parous blackflies from the southwest, apparently carried by wind for distances up to 300 kilometers. Reinvasion of the vector in southern Upper Volta has been reduced greatly by the extension of the program area southwards in the Ivory Coast in 1978.

There has been a noted decrease in the incidence of onchocerciasis as a result of the control program. Epidemiological surveys indicate that children under five in the portion of the area treated for five years do not have onchocerciasis and the disease has not progressed in persons who already have the illness.

Progress in settling the fertile river valleys has been less impressive. The Volta Valley Authority in Upper Volta are resettling the areas on a planned basis around the White Volta and Red Volta. Resettlement of 13,000 people has been completed involving community infrastructures, roads, water points, land surveys and social services. Settlement of 560,000 people on 3,000,000 hectares is planned eventually.

The other areas in the control area were not as empty of people as Upper Volta. Thus, there is not a major requirement for resettlement in other countries. In Niger and Mali, for instance, the control area had existing population. Further development of the oncho transmission free area will come gradually through development activities and not on a crash resettlement basis. The Ivory Coast is making a major effort in developing the northern portion of the country. Sugar and rice is being grown on a large scale and other food crops are being promoted in integrated development areas. The Government of Niger has established a special program to develop the Say arrondissement over a ten year period. Benin has completed a natural resources inventory of the north and is about to begin socioeconomic studies of the two northern provinces. Mali has accorded the oncho zone priority in development with over 50 pilot village programs underway or planned. Togo has studies underway to develop the river valleys in the northern portion of the country.

A new Onchocerciasis Fund Agreement has been signed by over sixteen donors and approved by the seven participating countries which will continue the control program through 1985. The estimated budget for the second phase is $106.7 million. The initial administrative structures will be continued in a somewhat simplified form. A permanent Ecological Group will be part of an Expert Advisory Committee.

B. Extension Southwards

A detailed study of a further extension southwards in Ghana, Togo and Benin has been underway for two years. Epidemiological, entomological and and sociological studies have been completed. Detailed hydrological studies have not been completed, particularly in Benin and Ghana, and until these are finished the Project Review Committee will not consider an extension. Based on data to date, however, approval is expected for control operations in the southern extension area beginning in 1981 or 1982.

The extension zones requested cover a total of 90,000 km^2 divided as follows:

Benin: 25,000 km^2 covering the upper Oueme and Okpara river basins north of about 8° 30' N.

Ghana: 42,000 km^2 on both sides of the Volta Lake and includes the river systems of the Volta and Brong-Ahafo regions.

Togo: 23,000 km^2 including most of the Mono River basin and the watercourses of the Plateau region.

The overall length of the portions of the river containing S. damnosum s.l. breeding sites in the study areas in Benin, Ghana and Togo is estimated at 5000 km during the wet season and at 1000 km during the dry season.

A hydrobiological surveillance network of aquatic ecosystems in the extension zones still has to be established. However, some monitoring has already begun on the initiative of OCP or by the States themselves. Two sites have been subject to regular surveillance in Ghana since 1978: the on the Pru and Asukawkaw-Ferry on the Asukawkaw. Consultants working on behalf of OCP carried out surveillance activities in 1977 in Ghana (Volta Region), Togo and Benin on the following watercourses: Oueme and the Okpara (Benin); the Mono and the Anie (Togo); the Dayi, Menu, Wawa, Asukawkaw and the Pru (Ghana). Research by a University team of hydrobiologists is in progress on the Sio in southern Togo. This latter team is studying zonation problems and of qualitative and quantitative seasonal variations of the aquatic fauna as a whole. These studies are concerned with the entire hydrological system and have now been underway for a year and a half. On-going efforts will continue and be intensified as hydrobiological studies are absolutely necessary in order to determine the number of existing species and their seasonal dynamics.

A July, 1980 report by an A.I.D. Fishery Biologist, Dr. Lennon, indicated that the Institute of Aquatic Biology does much fish collecting over and above that required by the OCP monitoring protocol. This data, he states, satisfies research needs in fish identification, fish distribution, population structures, and life histories and are highly beneficial as pre-control data.

Development of the actual river valleys in the proposed extension area for agricultural production is not an aspect of this project and will be reviewed in connection with investment decisions on agricultural project investments when they occur. These areas are more heavily settled and re-settlement programs are not an aspect of the southerly extension, only vector control.

Approval of a southern extension will depend upon the Ecological Group indicating that:

1) Adequate environmental data has been collected in the new area so that, when the larvicide is applied, a comparison can be made to determine adverse impacts.

2) A system for meaningful monitoring in the new areas has been designed and can be implemented.

C. Environmental Monitoring

The original IEE describes the concern for the environment which was of paramount importance in the design and review of the project. The Ecological Panel established in 1973 continues to exist (now called Ecological Group). Membership in the group a/ has been strengthened by the addition of an American

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a/ Members are as follows:
Dr. A. Hopson, specialist on ichthyology, United Kingdom
Dr. H. B. N. Hynes, specialist on invertebrates, Canada
Dr. J. H. Koeman, specialist on toxicology, Netherlands
Dr. R. Lennon, specialist on ichthyology, United States
Dr. T. Waters, specialist on invertebrates, United States

fishery biologist, Dr. Robert Lennon, formerly of the U.S. Fish and Wildlife Service and an American specialist on invertebrates. The functions of the new group are the same as the previous Panel.

The ninth meeting of the Ecological Panel was held at the University of Salford in September, 1979. A report of that Panel is attached as Appendix I to this IEE Revision.

Monitoring has so far given no indication that Abate had an adverse, irreversible long-term effect on invertebrate fauna or fish; nevertheless the Ecological Panel recommended that the quality and efficiency of monitoring be improved and that the quantity of pre-treatment data be increased. This report was presented to the December, 1979 meeting of the JCC who took action on the various issues as follows:

a) The Ecological Panel recommended that wide and diverse forest galleries be retained on each side of water-courses. The JCC discussed this recommendation and concurred that such forest galleries were essential to the entire ecosystem, especially in arid areas.

b) The Panel endorsed the view of the hydrobiologists for reorganization of the sampling program to assure acquisition of pre-treatment data from rivers that will probably be brought under control by the extension southwards, and the continued sampling of those for which pre-treatment data are already available. The JCC agreed that collection of data on fish populations including baseline and pre-treatment data, which already constituted an important element of OCP, should be further improved. The new sampling program, as indicated in Appendix I, includes the Pru and Asukawkaw rivers which are in the proposed extension zone. Pru river fish samples will be taken every two months in order to obtain pre-treatment data.

c) The Panel recommended that brain cholinesterase analysis of fish be undertaken as a separate study to clearly separate exposure of fish to organo-phosphorous compounds, such as Abate, from that of other chemical compounds. The JCC endorsed the addition of this test as part of the monitoring program.

d) The JCC welcomed the review of toxicological data prepared by Dr. Koeman and recommended the document be further developed to provide correct information to interested parties.

The number of Africans trained in aquatic monitoring is limited. There was concern, consequently, when the French-run ORSTOM Hydrobiological Unit in Bouake, Ivory Coast announced in early 1979 that they were disbanding in June, 1979. ORSTOM has agreed subsequently to maintain its Bouake group for another two years, and thus the danger of an interruption in the collection of hydrobiological data in the west of the program area has been averted.

Since continuity in monitoring is essential and monitoring should be reinforced to cover investigation of alternative larvicides or methods of adult fly control, if needed, the Ecological Panel meeting in September, 1979 endorsed the suggestion that a hydrobiologist be hired by OCP. His functions will involve coordination of monitoring, promotion of training of Africans in this area, and toxicological work.

In order to develop African capability in hydrobiology, OCP arranged for officials of national services, universities and institutes in Abidjan, Cotonou, Dakar, and Lome to meet in October, 1979 to discuss cooperation with OCP in monitoring work. As a result African candidates will be supplied for training and the ORSTOM unit will give priority during the next two years to training African research workers. The meeting of representatives from the institutes carrying out aquatic monitoring and representatives of the participating African countries in October, 1979 also considered the present monitoring structures and their possible development to meet OCP requirements. Discussions will continue and it appears that progress is being made in developing an African capability in aquatic monitoring.

Aquatic monitoring has produced an extensive amount of data. An agreement has been signed by the OCP with the University of Salford, United Kingdom, for the analysis of aquatic monitoring data assembled by the program over the last four years. Data analyzed as of October, 1979 indicates a very satisfactory situation in rivers which have been subjected to treatment for four years. There are no signs of deterioration from year to year.

Aquatic monitoring has already commenced in the possible extension area in the central part of Ghana, Togo and Benin to obtain baseline data. The Institute of Aquatic Biology, in collaboration with OCP, is collecting data on the Asukawkaw river system in Ghana. In Togo a team from the University has been carrying out monitoring studies on the river Sio in southern Togo since early 1978.

D. Risk-Benefit Analysis on Pesticide Use

The original IEE continues valid. Analysis of the data by the University of Salford, mentioned previously, had not resulted in any significant variation from previous findings. Control measures continue to be directed against the larvae with the same insecticide, Abate, and the same dosage and treatment schedule. In fact, experiments are being conducted in some areas to reduce the treatment schedule or eliminate it entirely.

The Ecological Panel has recommended additional tests, particularly related to fish, and these have been adopted. The methodology and controls employed in the application of the insecticide are fully adequate to mitigate potential effects of the insecticide. The Ecological Panel recently gave the International Union for the Conservation of Nature the assurance that these activities were having no measurable effect on fishes and wildlife, and this statement was accepted by that organization.

E. Recommendation for Threshold Decision

It is believed that the attention given to environmental factors prior to approval of the program, the continued monitoring by experts, the additional tests on fish which have been accepted, and the continuing review by the Ecological Group meet environmental concerns. It is clear that the monitoring indicates there is no significant environmental impact. Therefore, we believe a further assessment is still not necessary under Regulation 16 to determine that the project will not have a significant effect on the environment, and therefore a Negative Determination is appropriate.

Attachments: Appendix I - Report of Ecological Panel
Annex I - Aquatic Surveillance Sites
Annex II - Aquatic Monitoring

REPORT OF THE ECOLOGICAL PANEL

ONCHOCERCIASIS CONTROL PROGRAMME IN THE VOLTA RIVER BASIN AREA

A. OPENING OF THE SESSION

1. The ninth session of the Panel was held in Joule Hall, University of Salford, from 27 to 28 September 1979. The meeting followed immediately upon that of the hydrobiologist teams with the Salford University team which was in the process of assembling and analysing the aquatic monitoring data generated by OCP field operations.

2. The meeting was held under the Chairmanship of Professor Dr J.H. Koeman, who opened it with a welcome to members of the Panel, independent consultants and technical officers of OCP and the Sponsoring Agencies.

B. ADOPTION OF THE AGENDA

3. The following Agenda was adopted:

1. Opening of the session
2. Adoption of the Agenda
3. Progress of OCP vector control operations
4. Hydrobiological monitoring - data collection, processing and analysis
   - (i) report of the Hydrobiologists' meeting
   - (ii) processing and analysis of data
5. Insecticides - larvicides - Abate
   - Chlorphoxim
   - Other candidate larvicides
   - adulticides
6. Future scale of monitoring and related structures
7. Other matters - Veterinary aspects of resettlement
   - IUCN Resolution No. 5, 1978
   - Future OCP structures
   - Independent OCP Commission
8. Adoption of the Report
9. Close of the Meeting.

C. PROGRESS OF OCP VECTOR CONTROL OPERATIONS

4. The Panel was informed that vector control operations had been continued throughout the OCP area including the extension area in southern Ivory Coast. The control to the west of the line of the River Oti was very satisfactory with the annual transmission potential and annual biting rate generally meeting the criteria adopted in 1977. At the height of the wet season 18 000 km of river were being treated each week diminishing to about 4 000 km in the dry season. It had been possible to stop treatment on several stretches of the Black and White Volta, in Upper Volta, between October 1978 and May 1979 without any build-up in blackfly populations. Detailed studies in central Togo and Benin had shown that this area was being reinvaded by S.damnosum although penetration of the controlled area may be more limited than it was in the southwest.

5. It was noted with satisfaction that in areas reaching the prescribed entomological criteria, epidemiological studies had provided no indication of disease transmission. The Panel shared the view of the Scientific and Technical Advisory Committee that OCP should not be complacent about the apparent success as the environmental and climatic conditions in 1979 could have been unusually favourable.

6. Riverine Woodlands

The Panel recognized that the success of the Programme could soon lead to an increase in the development of the river valleys. Concern was expressed that, with the movement of the population back into these riverine areas, there was the real danger of the forest gallery alongside the water courses being removed to make more land available for cultivation. The Panel drew attention to the disastrous ecological effect this could have particularly on soil erosion, water flow, nutrient status of the rivers, water temperatures (affecting the breeding conditions of some economic fish species) and the leaching of soil nutrients. The Panel, recalling what had happened in many parts of Africa with the destruction of riverine woodland, strongly recommended that wide and diverse forest galleries be retained on each side of water-courses.

7. The Panel recognized that the forest gallery harboured disease vectors such as tsetse, as well as predators and felt this aspect urgently required investigation.

D. HYDROBIOLOGICAL MONITORING - Data collection, processing and analysis.

8. In considering the report of the Hydrobiologists' meeting, the Panel took note that the aquatic monitoring, in accordance with the established protocol, had continued throughout the year. The monitoring data, collected since the beginning of the Programme activities from a wide representative sample of rivers throughout the operational area had now been stored in the computer at Salford University. Discussion was proceeding on methods of analysis; it was clear, however, from preliminary study that the effect of Abate had been minimal. Surprisingly there had been no evidence that any organism, apart from Simulium damnosum had been adversely affected.

9. The Panel endorsed the view of the Hydrobiologists that at most sites there were insufficient "pre-treatment" data. It therefore supported their proposal that the sampling programme should be reorganized as described in Appendix I. This would ensure the acquisition of pre-treatment data from rivers that will probably be brought into the control programme and the continued sampling of those for which pre-treatment data are already available.

10. For any future onchocerciasis control programme the importance of collecting pre-treatment data cannot be over-emphasized. The Panel felt that the view of the statisticians that at least four years of such data be collected should not be ignored, especially if blackfly control is to be extended to other areas in Africa.

11. The Panel supported suggestions for cooperative study, between the hydrobiologists and the Salford team, to collect additional calibration data that could enhance the value of the existing data set.

12. Whilst casual evidence suggested that Decapod Crustacea (shrimps) were unaffected by Abate, the Panel recommended that they be kept under surveillance as this group might become important if other larvicides should be introduced.

13. Processing and Analysis of Data

The Panel was informed of the formidable task which faced the Salford Team, in collaboration with the statistical and computing units at WHO Headquarters in Geneva, in ensuring the compatibility and accuracy of the stored monitoring data. It underlined the importance of this work in order to enable the timely analysis of the data and recommended that the data handling system as presently developed be adopted.

14. The Panel noted that the analysis of the fish data had shown no apparent effect of the programme on fish diversity or numbers. However, it was noted that some of the fish data had not yet been incorporated in the data set because of changes in the recording methods. It therefore urged that these data be included as far as possible because fishes are important for the monitoring of long-term changes.

15. The Panel recommended that brain cholinesterase analysis of fish be undertaken as a separate study to give further support to the overall evaluation resulting from the monitoring programme. The advantage of the cholinesterase test is that it clearly separates exposure of fish to organo-phosphorus compounds from that to other chemical compounds.

E. INSECTICIDES

16. Larvicides

The Panel was informed of the present arrangements for evaluating candidate larvicides. CDC Laboratories, Atlanta carried out both physical and chemical evaluations of the properties of such insecticides. The New York Museum was carrying out tests on new formulations using a fixed trough system. Riverside Laboratories, on the other hand, evaluated insecticides in a jar system and undertook field tests in small rivers. A fourth laboratory, ORSTOM at Bouaké, using a floating trough system were testing new formulations *in situ*, and then promising compounds were tested on large-scale in rivers. A number of compounds were promising, e.g. chlorphoxim, methoxychlor, dimilin, chlorpyriphos-methyl, pirimiphosmethyl and *Bacillus thuringiensis* var. *israelensis*.

17. The Bouaké laboratory has also evaluated the effect on non-target organisms of most of these compounds. It appeared that chlorphoxim was somewhat more toxic than Abate, but *Bacillus thuringiensis* was apparently innocuous to non-target fauna. Methoxychlor was promising but in its present formulation failed to kill the last stage larvae of *S.damnosum*. As ambient temperatures influence the efficiency of certain compounds (negative correlation with some organo-chlorine compounds and pyrethroids, and positive correlation with organo-phosphorus compounds) results from temperate climates were frequently inapplicable in the tropics.

18. The Panel was asked by WHO to propose criteria for the acceptance of a candidate insecticide for field trials. Attention was drawn by the Panel to the work of the OECD Ecotoxicological group, and the FAO Expert Panel on pesticides and the environment. The latter group is presently preparing pre- and post- registration requirements for new pesticides and formulations. This work could be useful to OCP in future.

19. The Panel suggested that the basic criteria for acceptance were a compound's specificity to *Simulium damnosum*, its low effect on non-target organisms and its low potential hazard to man, fish and birds. When the risks involved in the use of a compound had been clearly

identified, it was up to the Governments to decide in consultation with OCP whether to approve its use.

20. Abate

The draft review of the toxicological data related to Abate prepared by the Chairman was welcomed by the Panel. It recommended that the document should be further developed to make the title and content more specific to "Abate as used in the vector control operations in West Africa". Additional paragraphs should be added to describe assessment methods, application techniques and frequencies of application. Such a document updated from time to time, as necessary, would be useful to provide correct information to parties interested in the use of Abate for blackfly larviciding.

21. The Panel was satisfied that Abate presently met the basic criteria expressed in paragraph 19 above, and as such can be used as a measure for comparing other pesticides.

22. Adulticides

Although it was doubtful that larviciding could ever be replaced by adult control in the Programme, it could be a useful complementary method. However, more information concerning the resting places of the flies was still required. The Panel recognized that pre- and post-treatment terrestrial monitoring would be required in the event of launching an adulticide programme.

F. FUTURE SCALE OF MONITORING AND RELATED STRUCTURES

23. The Panel noted that the danger of a break in the collection of hydrobiological data in the west of the Programme area had been temporarily averted by the agreement of ORSTOM to retain their Bouaké group for two years. In the meantime, efforts were being made to train local people to take over the main routine monitoring work. In this respect the Panel was informed of a meeting of representatives from those concerned hydrological institutions in West Africa to be held in Ouagadougou on 9 and 10 October 1979. There were already several local hydrobiologists and technicians who could be engaged in such a new structure. Further technicians would be necessary and should be selected and trained from amongst secondary school leavers. The OCP might need to consider employing a hydrobiologist to be responsible for coordination among the monitoring groups and for promoting training courses.

G. OTHER MATTERS

24. The Panel examined the Resolution No. 5 of the 14th Session of the General Assembly of the International Union for the Conservation of Nature (Appendix II) which addressed itself to the eradication of disease transmitting vectors. The Panel felt that the IUCN was insufficiently informed on the extent to which the Onchocerciasis Control Programme was monitoring the hydrobiological change. The Panel, therefore, addressed a letter of explanation to IUCN (Appendix III) and would encourage OCP to better inform the outside world through appropriate press releases and articles in the scientific press, of the special emphasis already being placed on the monitoring activities.

APPENDIX I

SAMPLING PROGRAMME RECOMMENDED AT
HYDROBIOLOGISTS MEETING IN SALFORD,
24 - 26 SEPTEMBER 1979

Sampling should be carried out either monthly, every three months or only once per year as follows, site numbers being given in brackets:

Monthly samples	Every 3 months	Once per year
Marahoué (8 & 16)	Bagoué (7)	Black Volta (12)
Sassandra (17)	White Volta (9)	Leraba (1)
Oti (11)	Red Volta (13)	Comoé (2)
Pru		Nzi (5)
Asukawkaw		Bandama (3)

At all the following sites fish will be sampled twice per year (viz. beginning and end of rainy season):

Marahoué (18)	Black Volta (12)
Sassandra (17)	Leraba (1)
Oti (11)	Comoé (2)
Bagoué (7)	Nzi (5)
White Volta (9)	Bandama (3)

With regard to the Pru river fish samples will be taken every two months in order to obtain pre-treatment data.

Every effort should be made to maintain the monitoring programme on the Red Volta during 1979.

APPENDIX II

INTERNATIONAL UNION FOR CONSERVATION OF NATURE AND NATURAL RESOURCES

14TH SESSION OF THE GENERAL ASSEMBLY OF IUCN
ASHKHABAD, USSR, 26 SEPTEMBER - 5 OCTOBER 1978

RESOLUTIONS

...

Resolutions on major issues

...

5. Eradication of disease-transmitting vectors

RECOGNIZING that the presence of disease-transmitting vectors, especially those of trypanosomiasis and onchocerciasis has severely restricted man's occupation and use of large areas of Africa, and that those areas are of great value to the peoples of the countries concerned, particularly because of the natural fauna and flora preserved within them;

CONCERNED that proposals for blanket eradication of disease vectors over very large areas of African savanna include national parks and reserves; that operations have already begun to affect the Okavango swamps, Botswana, and the national parks of Upper Volta, Niger and Benin and pose direct threats to the future of these parks,

The General Assembly of IUCN, at its 14th Session, Ashkhabad, USSR, 26 September - 5 October 1978

RECOMMENDS to the governments and multilateral and bilateral aid organizations of all countries concerned, that the attempted eradication of disease vectors, such as tsetse flies, should not be carried out in marginal lands, and elsewhere only as part of an integrated development programme, planned in accord with recognized conservation principles in precisely circumscribed areas;

RECOMMENDS further that, where attempts at eradication take place close to protected areas and areas of comparable ecological value, the strictest measures be taken to ensure that the effects do not damage the characteristics of protected areas.

...

APPENDIX III

c/o OCP
World Health Organization
1211 Geneva 27
Switzerland

28 September 1979

The Director General
International Union for Conservation of Nature
Morges
Switzerland

Dear Sir,

We, members of the Ecological Panel of the Onchocerciasis Control Programme of the World Health Organization were disturbed by Resolution No. 5 passed by your organization, as we feel that it is founded upon misunderstanding of the situation in West Africa.

Our Panel, which is an independent body of scientists who owe no allegiance to WHO, was set up to oversee the environmental effects of OCP. We therefore are fully aware of all that has been done and of the extensive monitoring being undertaken.

We can assure you that the control of blackflies in the area is not resulting in any measurable effect upon fishes and wildlife, despite over four years of treatment in some rivers. We would also point out that, as *Simulium damnosum* the vector of onchocerciasis, can fly hundreds of kilometres, it is essential to treat entire areas to control the disease. It is not therefore possible to leave any length of river untreated.

You are no doubt aware that at present the only effective way of controlling onchocerciasis is by attacking the vector fly and that the prevalence of blindness in adults in affected areas varies from 10% up to 40%.

We have not responded before because we meet only at yearly intervals, but we hope that this letter will clear up what clearly is a misunderstanding. We also are deeply concerned with preservation of the environment.

Yours truly,

J.H. Koeman (Chairman)
Agricultural University
Wageningen, The Netherlands.

H. Gilles
Liverpool School of Tropical Medicine
UK

H.B.N. Hynes
University of Waterloo
Canada

Copy to Steering Committee OCP-WHO

APPENDIX IV

LIST OF PARTICIPANTS

Members of the Ecological Panel

Professor C.H.M. Gilles, Professor of Tropical Medicine, Liverpool School of Tropical Medicine, Pembroke Place, Liverpool L35 QA, United Kingdom of Great Britain and Northern Ireland

Dr H.B.N. Hynes, Department of Biology, University of Waterloo, Waterloo, Ontario, Canada N2L 3G1

Professor Dr J.H. Koeman, Head, Department of Toxicology, Agricultural University, De Dreyen 12, Wageningen, The Netherlands (Chairman)

Temporary Advisers

Dr C. Déjoux, Director, ORSTOM Hydrobiological Laboratory, B.P. 1454, Bouaké, Ivory Coast

Dr F.J.H. Fredeen, Entomology Division, Canada Agricultural Research Station, 17 Science Crescent, Saskatoon, Saskatchewan S7N OX2, Canada

Dr Robert E. Lennon, P.O. Box 74, Lincoln, Maine 04457, United States of America

Professor S. Ulfstrand, Department of Zoology, Uppsala University, Box 561, S-751 22 Uppsala, Sweden

University of Salford

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Technical Secretariat to Ecological Panel

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Dr F. Henderson, Food and Agriculture Organization of the United Nations, Via delle Terme di Caracalla, 00100 Rome, Italy

Mr J.D.M. Marr, OCP Liaison Officer, World Health Organization, 1211 Geneva 27, Switzerland

Dr J. Odetoyinbo, World Health Organization, Regional Office for Africa, P.O. Box No. 6, Brazzaville, Congo

Dr G. Quélennec, Pesticides Development and Safe Use, Division of Vector Biology and Control, World Health Organization, Avenue Appia, 1211 Geneva 27, Switzerland

APPENDIX IV
continued

Mr J.F. Walsh, Chief, Vector Control Unit, Onchocerciasis Control Programme, B.P. 549, Ouagadougou, Upper Volta

Dr G. Zerbo, Vector Control Unit, Onchocerciasis Control Programme, B.P. 549, Ouagadougou, Upper Volta

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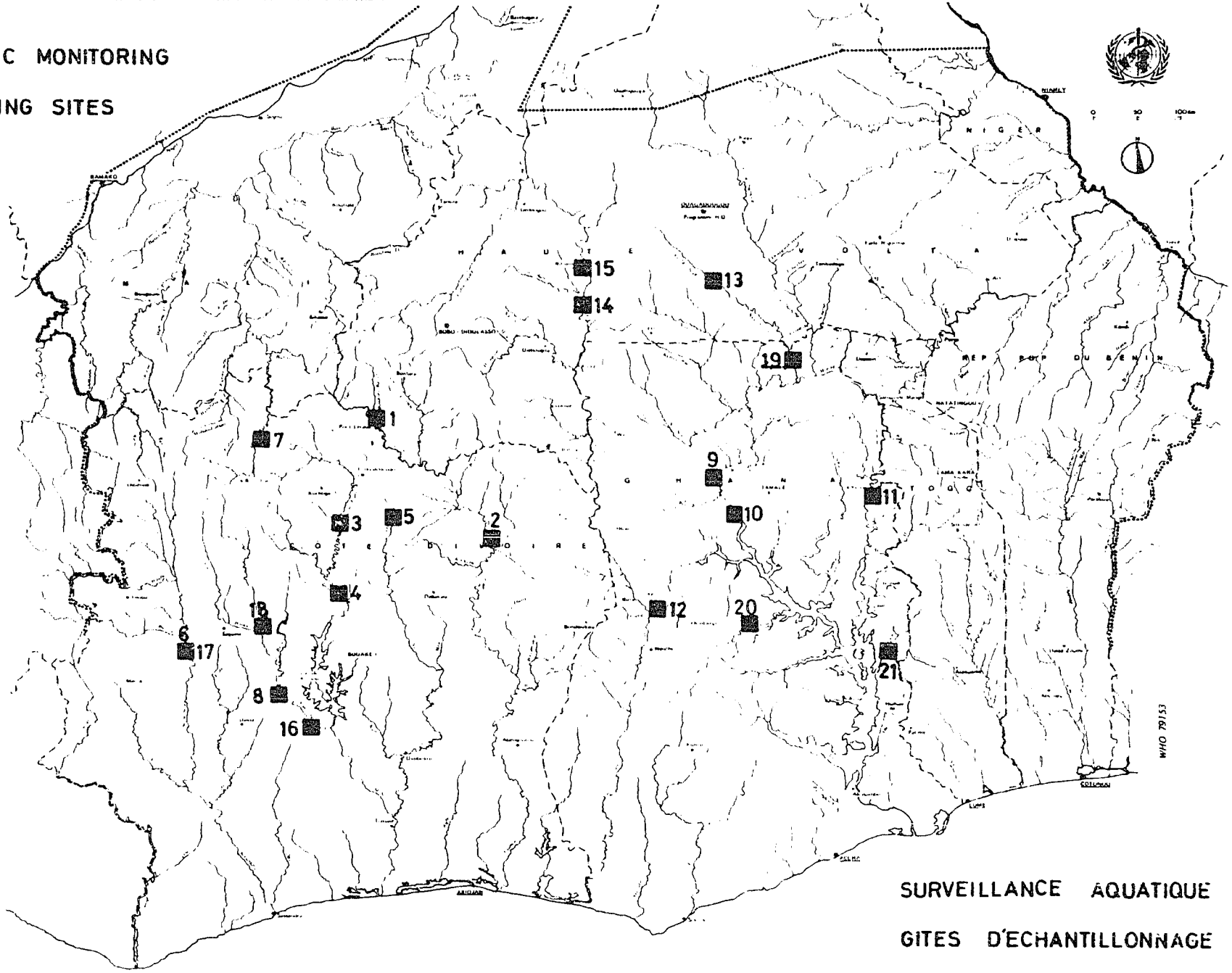
ONCHOCERCIASIS CONTROL PROGRAMME IN THE VOLTA RIVER BASIN AREA

PROGRAMME DE LUTTE CONTRE L'ONCHOCERCOSE DANS LA RÉGION DU BASSIN DE LA VOLTA



ANNEX I

AQUATIC MONITORING

Country	Site code No.	River	Site	Treatment phase	Date of first Abate treatment	Date aquatic monitoring began
Ivory Coast	1	Léraba	Pont Frontière	I	End of 1974	4.75
Ivory Coast	2	Comoé	Bac de Gansé	I	End of 1974	5.75
Ivory Coast	3	Bandama	Niaka	I	End of 1974	4.75
Ivory Coast	4	Bandama	Marabadiassa	I	End of 1974	March 1975 (fish)
Ivory Coast	5	Nzi	Pont route de Dabakala	I	End of 1974	5.75
Ivory Coast	6=17	Sassandra	Pont de Sémien	IV	7.6.78	12.1.78
Ivory Coast	7	Bagoué	Kouto	III W	29.3.77	8.7.75
Ivory Coast	8	Marahoué	Danangoro	IV	6.3.79	4.75
Ghana	9	White Volta	Daboya	II	Before 10.77	3.12.74
Ghana	10	White Volta	Yapei	II	Before 10.77	1.8.75
Ghana	11	Oti	Sabari	III E	3.78	15.5.75
Ghana	12	Black Volta	Bamboi	I	12.74	8.12.74
Upper Volta	13	Red Volta	Pont de Pô	II	Before 10.77	30.6.74
Upper Volta	14	Black Volta	Poura	I	End 1974	None (invert.)
Upper Volta	15	Black Volta	Boromo	I	End 1974	1.6.75
Ivory Coast	16	Marahoué	Entomokro	IV	7.3.78	27.1.78
Ivory Coast	17=6	Sassandra	Sémien	IV	7.6.78	12.1.78
Ivory Coast	18	Marahoué (above 8/16)	Mankono	IV	25.4.78	Fish only June 1977
Ghana	19	Red Volta	Nangodi	II	Before 10.77	21.11.78
Ghana	20	Pru	Asubende	Extension study		2.78
Ghana	21	Asukawkaw	Bridge	Extension study		12.78

Annex II

AID 1025-1 (7-71) (FACE SHEET)

NONCAPITAL PROJECT PAPER (PROP)

I. PROJECT IDENTIFICATION

1. PROJECT TITLE: Onchocerciasis Control in the Volta River Basin

APPENDIX ATTACHED: [x] YES [ ] NO

2. PROJECT NO. (M.O. 1095.2)

3. RECIPIENT (specify): [ ] COUNTRY [x] REGIONAL [ ] INTERREGIONAL

4. LIFE OF PROJECT: BEGINS FY 1974 ENDS FY 1979

5. SUBMISSION: [x] ORIGINAL Jan. 10, 1975 DATE [ ] REV. NO. DATE CONTR. PASA NO.

II. FUNDING ($000) AND MAN MONTHS (MM) REQUIREMENTS

A. FUNDING BY FISCAL YEAR	B. TOTAL $	C. PERSONNEL (1) $	C. PERSONNEL (2) MM	D. PARTICIPANTS (1) $	D. PARTICIPANTS (2) MM	E. COMMODITIES $	F. OTHER COSTS $	G. PASA/CONTR. (1) $	G. PASA/CONTR. (2) MM	H. LOCAL EXCHANGE CURRENCY RATE $ US = (U.S. OWNED) (1) U.S. GRANT LOAN	(2) COOP COUNTRY (A) JOINT	(B) BUDGET
1. PRIOR THRU ACTUAL FY	2000						2000					
2. OPRN FY 75	0						0					
3. BUDGET FY 76	1500						1500					
4. BUDGET FY 77	1000						1000					
5. BUDGET FY 78	1000						1000					
6. BUDGET FY 79	500						500					
7. ALL SUBS. FY												
8. GRAND TOTAL	6000						6000					

9. OTHER DONOR CONTRIBUTIONS

(A) NAME OF DONOR	(B) KIND OF GOODS/SERVICES	(C) AMOUNT
Canada, France, Germany, Netherlands, UK, World Bank Group, FED, Iraq, et al.	Untied contributions for operational and capital costs (See budget P. 2)	$47.67 mil

III. ORIGINATING OFFICE CLEARANCE

1. PREPARED TA/H:JStockard (draft) AFR/DS:JPielemeier/AFR/CWR:HMarshall	TITLE Communicable Disease Specialist Project Design Officer	DATE 1/10/75 1/10/75
2. CLEARANCE OFFICER AFR/CWR, David Shear	TITLE Director	DATE 1/10/75

IV. PROJECT AUTHORIZATION

1. CONDITIONS OF APPROVAL

A.I.D. contributions to the program are subject to: (1) annual Congressional approval, and (2) evaluation at the end of the third year of program operation. A shortfall, if any, incurred by the program is subject to negotiation among the donors, including A.I.D., and the program.

2. CLEARANCES

BUR. OFF.	SIGNATURE	DATE	BUR. OFF.	SIGNATURE	DATE
AFR/DS	Princeton Lyman	1/29/75	GC/AFR	Edward Dragon	1/29/75
AFR/DP	Robert Huesmann	1/29/75	AA/AFR	Donald Brown	1/29/75
PPC/DPR	Arthur Handly	1/29/75	GC	Arthur Gardiner	1/29/75

3. APPROVAL AA/AFR OFFICE DIRECTORS

SIGNATURE: Sam C. Adams, Jr. DATE: 1/29/75

TITLE: Assistant Administrator for Africa

4. APPROVAL AA/AID (M.O. 1025.1 V.C.)

SIGNATURE: John E. Murphy DAA/AID DATE: 2/11/75

TITLE: Deputy Administrator (Director for International Development)

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Title: Onchocerciasis Control in the Volta River Basin

Part I. Summary and Recommendations

Project Development Team

Edward Donoughue: Deputy Director, AFR/DP
Herman Marshall: Health Officer, AFR/CWR
Joe Stockard : Communicable Disease Specialist, TA/H
John Pielemeier: Project Design Officer, AFR/DS
Bob Gee : Desk Officer, AFR/CWR
Timothy Bork : Lawyer, AFR/GC
John Welty : Project Review Officer, PPC/DPR

1. Grantee: Onchocerciasis Trust Fund to be administered by the World Bank. The executing agency for the program will be the World Health Organization.

2. Grant

a. Total Program Cost

The total cost of the twenty year Onchocerciasis control program is estimated at $120 million. Costs of the first operational phase of the program (1974-1979), revised in 1974, are estimated at $53,673,142. Table I indicates the projected expenditure schedule for the 6-year program (see Table I).

An advance Fund for financing the first-year costs of the program has already been established under the Onchocerciasis 1974 Fund Agreement. Several donor governments, including the United States (March 1, 1974) have signed this document and provided monies to the Fund. Grant commitments to the Fund, totaling $7.5 million, have been received from eight donors (Canada, France, Germany, the Netherlands, U.K., U.S., UNDP and IBRD).

At the June 1974 meeting of parties interested in the Onchocerciasis program, the IBRD circulated the following rough estimate of possible donor contributions for the first 6-year phase of the program. The Bank breakdown did not lead to any specific objections and can be considered a reliable estimate of planned donor contributions.

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TABLE 1: ONCHOCERCIASIS CONTROL PROGRAMME : SUMMARY
1974/1979 BUDGET
(In Current US $) *

	1974	Revised 1974 excluding long-term commitments and liabilities	1975	1976	1977	1978	1979	Total
Annual Costs								
Programme Headquarters Staff	546 950	546 950	559 310	594 025	622 755	657 695	700 410	3 681 145
Vector Control Operations	1 211 462	1 211 462	2 763 470	4 401 440	6 023 520	6 648 015	7 080 195	28 128 102
Epidemiological Evaluation	150 000	150 000	415 525	523 510	531 295	514 845	523 165	2 658 460
Technical Support and Liaison:								
WHO HQ and Regional Office	510 610	510 610	508 220	541 290	581 590	619 395	664 775	3 425 880
FAO HQ and Regional Office	45 460	45 460	67 800	74 100	80 600	87 100	93 600	448 660
Research Contracts	863 103	907 500	1 095 700	1 074 800	829 500	795 000	699 000	5 401 500
Training	74 880							
Total Annual Costs	3 402 555	3 372 072	5 410 025	7 209 195	8 669 260	9 322 050	9 761 145	43 743 747
Capital Items								
Buildings	586 970	586 970	355 600	337 500	-	-	-	1 280 070
Furniture	55 280	55 280	-	-	20 000	-	20 000	95 280
Vehicles	353 430	353 430	139 150	297 270	428 070	147 460	353 720	1 719 100
Technical Equipment	222 390	222 390	85 720	267 660	33 330	69 760	115 430	794 290
Total Capital Items	1 218 070	1 218 070	580 470	902 430	481 400	217 220	489 150	3 888 740
Contingency		-	844 205	1 136 675	1 249 340	1 360 730	1 449 705	6 040 655
Commitments								
Staff Termination Liabilities	275 730							
Aerial Treatment Contract	1 696 747							
Insecticides	319 000							
Buildings	372 380							
Furniture	14 700							
Vehicles	136 500							
Technical Equipment	94 500							
Total Commitments	2 909 557	-	-	-	-	-	-	-
TOTAL	7 530 182	4 590 142	6 834 700	9 248 300	10 400 000	10 900 000	11 700 000	53 673 142

*Inflation contingency included at 9-10%/yr.

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	U.S. $ Million
Canada	3.00
France (10 percent)	5.40
Germany (DM 13 million)	5.40
Netherlands	6.00
U.K. (10 percent)	5.40
U.S.A.	6.00
World Bank Group (10 percent)	5.40
F.E.D. (10 percent)	5.40
Iraq	0.05
	42.05

It is also anticipated that UNDP will provide $2.4 million for training and research costs, of which $1.2 million is already firmly programmed for 1974-77.

Japan, Belgium, Iraq and the African Development Bank indicated their intent to seek authorization for further pledges this calendar year. Some $8-$9 million of external assistance remains to be mobilized by the IBRD from these and other possible sources, for a Phase I total of $53.67 million.

b. Amount of AID Assistance

In FY 74, AID obligated $2.0 million in grant funds to support the Onchocerciasis program. In March and June 1974, two installments of $500,000 each were transferred to the Onchocerciasis Fund. This document authorizes an addtional $4.0 million in grant funds to the program.**These monies will released to the Onchocerciasis Fund according to the following tentative schedule; the amount of funding in FYs 1977-1979 will depend on the outcome of A.I.D.'s evaluation of the program at the end of the third year of operation.

FY 74	FY 75	FY 76	FY 77	FY 78	FY 79	Total
$2.0	Pipeline	$1.5	$1.0	1.0	$0.5	$6.0

The timing of the release of AID funds will be modified if delays occur in disbursements from the Onchocerciasis Fund or if program evaluation reveals that project implementation is not proceeding as projected.

**It is anticipated that an Onchocerciasis Fund Agreement for the full 6-years of the initial phase of the control program will be presented for donor endorsement at the meeting of the project's Joint Committee in Abidjan, February, 1975.

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AID funds will be comingled with contributions from other donors. All contributions will be untied and procurement of goods and services for the program will be accomplished through worldwide bidding.

c. Host country contribution

As a multi-lateral program, a 25% recipient country contribution is not required by AID legislation. All participating governments have, however, pledged substantial local cost contributions as well as personnel and buildings, etc. to the program. Due to important dissimilarities in financial availabilities in each country, program management will establish separate protocols on local cost contributions with each participating African government.

3. Description and Justification of Project

a. INTRODUCTION

Onchocerciasis is an infection by a parasitic filarial (threadlike) worm transmitted by the bite of an infected female blackfly of the species Simulium damnosum. The fly becomes infected by biting an infected human host. The larvae of the insect vector develop in fast-flowing rivers, hence the common name "river blindness" for the disease.

The clinical manifestations of onchocerciasis include intensely itching rashes, wrinkling, thickening and depigmentation of the skin , skin nodules in which adult worms are to be found, and eye lesions leading to blindness. Those heavily infected often lose weight and suffer from debilitation. In the Volta River Basin approximately one million of ten million inhabitants over 700,000km^2 are infected by onchocerciasis and of these at least 70,000 are totally or partially blind.

The Onchocerciasis Control program in the Volta River Basin area (hereinafter referred to as "the program"), is planned as a collaborative undertaking among the participating Governments (of Dahomey, Ghana, Ivory Coast, Mali, Niger, Togo, and Upper Volta) to be carried out with agencies of the United Nations system and the support of the international community.

The program will be executed through management structures proposed by the United Nations Development Programme (UNDP), the Food and Agriculture Organization of the United Nations (FAO), the World Health Organization (WHO), and the International Bank for Reconstruction and Development (IBRD), hereinafter referred to collectively as "the sponsoring agencies."

The overall strategy for the program is set out in the Report of the Preparatory Assistance Mission to Governments (PAG).

b. PROGRAM OBJECTIVES

The general objective of the Onchocerciasis Control Program is to eliminate the disease as an obstacle to socio-economic development in the region concerned. More specifically, the objectives of the program will be as follows:

i. Immediate objectives

The immediate objectives of the program will be to interrupt transmission of the disease by eliminating the vector through periodic aerial applications of larvicides involving no risk of lasting contamination of the environment, to implement the applied research and training programs required for pursuing the long-term objectives, and to help the participating Governments in preparing requests to multilateral and bilateral sources for the

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subsequent socio-economic development of the fertile areas freed from the disease. The interruption of transmission of the disease will involve:

(a) organization of aerial larvicide operations

(b) entomological surveillance of the treated areas

(c) epidemiological evaluation of the results of the program

(d) permanent monitoring of the long-term safety of the operations relative to the environment

(e) preparation of treatment schedules for onchocerciasis patients, so that the parasite Onchocerca volvulus can be eliminated from subjects already infected and threatened with blindness

(f) mass treatment campaigns if suitable new chemotherapeutic agents become available

ii. Long-term objectives

In the progressive elimination of the endemic conditions of the disease and the development of the reclaimed areas, the program will comprise applied research and manpower training components guaranteeing a high level of operational effectiveness and the training of the national personnel necessary for the proper execution of the program and subsequent maintenance operations.

While covering the continuation of control operations against the vector, the program will provide for substantial research and development in the field of onchocerciasis chemotherapy, and, hopefully, the development of suitable new drugs for mass treatment of the afflicted. The interruption of transmission of the disease, combined with the systematic treatment of inhabitants infested by the parasite, will thus permit the development of the reclaimed fertile valleys while decreasing the recurrent cost of disease control to be borne by the participating Governments.

The program will provide training for personnel at all levels in vector control, in the epidemiology and chemotherapy of the disease, in aerial treatment, and in environmental protection.

iii. Anticipated socio-economic benefits in the areas freed from onchocerciasis

The damaging effects of onchocerciasis on the social and economic life of the program area are as follows:

(a) the effects on the population due to the reduction of its productive capacity and the direct cost of supporting the sick (over a million people are affected by onchocerciasis in the program area, of whom 70,000 are blind).

(b) the loss of agricultural production resulting from the desertion of fertile valleys and the reduction of crop yields because of overcropping in the uplands where people have settled; the total area of the deserted valleys is estimated to be 65,000 km^2.

The socio-economic benefits of the program will follow both directly through effects on existing projects and the feasibility of starting new rural development projects.

(a) Direct effects: an improvement in the cost-effectiveness of the development projects prepared independently of the program; the implementation of new projects, made possible by onchocerciasis control in the valleys that are at present deserted; the repopulation and/or settlement of these valleys will have the effect of improving the land:man ratio in the overpopulated regions.

(b) Indirect effects: dependent on the achievement of the direct effects; improvement in the productive capacity of the population;

induced effects on the various sectors of the economy. The PAG Report (No. OCP/73.1 and Annexes VI/1-5) describes the anticipated socio-economic benefits and proposals for the economic development of the areas freed from onchocerciasis.

While the overall program is described in terms of immediate, long-term and ultimate socio-economic objectives in a straight line continuum over time, the operational objective is to work towards achieving progress via the "oil slick" approach, whereby economic development projects will be introduced as pockets of areas are cleared; this is both practical and realistic for a program as comprehensive and long in duration as the vector control program. In addition, flexibility must be provided to take into account new developments in research and the actual operations during the early years.

The actual economic and social development of the cleared areas will be the primary responsibility of the African host governments. Apart from the coordinating and advisory mechanisms, the international bodies charged with control operations have no financial responsibilities for post-clearance activities. Rather, the development of these areas will be a separate but related activity for which additional support will be provided on a bilateral basis or through other regional arrangements.

Planning for the development of onchocerciasis-cleared areas is scheduled to begin at the same time as the vector control operations themselves. Implementation of the development programs can commence 18 months after the start of spraying, and international donor interest in the development effort is considerable. To facilitate information exchange between donors and host governments, an Economic Development Unit is

included in the structure being established in Ouagadougou. An Economic Development Advisory Committee will serve as the key advisory group to the Joint Coordinating Committee of the vector control program and will establish general guidelines for the development of the sanitized areas. The World Bank and FAO will work closely with these bodies. The UNDP, meanwhile, is providing $500,000 to each of the seven host countries to assist in project development. A.I.D. is prepared to respond to their requests for assistance in economic and social development of cleared areas. Separate project papers will be prepared to provide selected technical and capital assistance towards project planning and implementation.

LOGICAL FRAMEWORK (See Logframe for "Means of Verification")

A.1 Goal

The goal of the program is "the socio-economic development of a 655,000 km^2 area in the Volta River Basin" of which approximately 65,000 km^2 are abandoned valley: The area has an estimated total population of 10 million people.

A.2 Goal Indicators

FAO studies indicate that population pressures can be greatly relieved in the densely populated areas by the transfer of 300,000 people into the deserted valleys of ten major economic development project areas, approximately 12,000 km^2. (See Annexes IV/1-5.) Potential agricultural production from new farms in these ten major project areas is estimated annually at 355,000 tons of sorghum, millet, maize, rice, cotton, groundnuts and sesame, valued at $30 million. The combined internal rate of return for economic development of these ten project areas is estimated at 10% by FAO. While ten major project zones have been identified based on criteria including fertile soils, proximity to large population clusters, higher prevalence of onchocerciasis, etc., it is likely that settlement will occur in additional areas cleared of onchocerciasis and additional benefits will result. With donor assistance, the participating African governments are presently engaged in planning development programs, including integrated rural development programs for some areas.

A.3 Goal Assumption

a. Onchocerciasis is the relevant factor in abandonment of fertile river valleys in the Volta Basin.

b. Families can be induced to occupy the fertile river valleys and tribal conflicts, which could significantly deter agricultural development efforts, would not develop.

c. Climate conditions which have been used in calculating the agricultural production levels will continue to be equally favorable in the future.

d. Sufficient donor and participant government monies will be available to fund development projects.

B.1 Project Purpose

The project purpose is "to interrupt the transmission of onchocerciasis for a sufficiently long period (twenty years) to permit the disappearance of the parasite from the human population in the program area and to allow for reoccupation of river valleys in the Volta Basin".

b. A secondary purpose of the project is, through applied research, to advance the state of our knowledge of onchocerciasis and to refine methodologies for controlling the disease.

B.2 End-of-Project Status

a. By the end of the twenty-year control operation there should be no active onchocerciasis infection in the program area population from which disease transmission could be reinstituted even should the area again become reinfested by Simulium Damnosum.

b. Within three to six years after the start of vector control operations (depending on when spraying begins in a particular zone), vast areas will be permanently freed from the vector.

c. Through applied research, increased knowledge will be gained of the epidemiology, transmission and chemotherapy of onchocerciasis, research on the effects of larvicides on aquatic environment, new insecticides, sensitivity of the vector to insecticides and equipment to best implement control programs.

B.3 Assumptions

a. Maturation of S. damnosum larvae in less than seven days will not invalidate the plan to larvicide on a seven-day schedule.

b. All breeding sites will have been identified at least by the end of three full years of larviciding operations.

c. A sufficiently large number of larvicides with appropriate ecological characteristics can be developed and brought to bear upon the insect as to overwhelm its capacity to develop resistance or tolerance. Virtually total destruction of larvae in the program area can be achieved within 18 months after initiation of the campaign and the area thereafter kept free of S. damnosum in order that there will be no surviving adult worms by the twentieth year.

d. Transmission cannot be maintained by migrant flies coming from beyond the program area boundaries.

e. After a successful conclusion of the planned 20-year program, the simultaneous reintroduction of S. damnosum and infected humans can be prevented.

C.1-2 Outputs and output targets

a. Treatment with larvicides of all S. damnosum breeding sites throughout the program is at sufficiently frequent intervals as to achieve the total interruption in the transmission of onchocerciasis infection.

Target

Control operations will be phased in over a period of three years from 1974 to 1976. Phase I operational area will cover the Black Volta, Gomoa-Leraba, Bandama and Banifing Basins, as well as the isolated onchocerciasis foci of Bandiagara. Phase II control operations will include the Red Volta, the White Volta and Daka Basins. Phase III which will begin in 1976 incorporates the Basin of the Oti-Pendjari, and the southern tributaries of Niger River flowing into Dahomey, Ivory Coast, Niger and Upper Volta.

b. Location of all S. damnosum sites ascertained and characteristics analyzed by entomological surveillance teams.

Target

Mapping of S. damnosum sites should be completed in each of the three operational areas by the conclusion of the 6-month pre-larviciding period. Surveillance will be carried out every 15 days by the 55 sector and sub-sector surveillance teams.

c. Periodic evaluation of the effectiveness of larvicidal treatment and modifications of larvicidal procedures as necessary.

Targets

Surveillance every 15 days by the 55 sector and sub-sector surveillance teams.

d. Epidemiological studies of the human population of the program area so as to be able to detect continued disease transmission.

Targets

Following completion of a baseline study to determine pre-project prevalence of infection and to grade clinical severity of the disease, follow-up studies in a sample population of approximately 3,000 people throughout the program area will be conducted every three years. Secondly, intensive epidemiological and clinical studies will be conducted in a small sub-sample annually beginning no later than 1976.

e. Definition of the behavioral characteristics and vector capacity of various genetic types of S. damnosum.

Target

The distribution of the various genetic types of S. damnosum, which comprise the S. Damnosum complex, will have been defined. Based upon these studies, the behavioral characteristics and vector capacity of each of the forms present in the program area will have been sufficiently well-determined that entomological surveillance can be limited to those members of the complex which actually represent a threat with respect to the transmission of onchocerciasis.

f. Additional larvicides developed to be used in case insect resistance or tolerance to Abate occurs.

Target

An adequate number of effective insecticides will be available for the operational larviciding campaign throughout the planned 20-year program, the use of which will not have produced detrimental effects upon the environment. It is not possible at this point to state how many different insecticides may be required. This depends solely upon the capacity for S. damnosum

larvae to develop tolerance or resistance to those insecticides which may be employed.

g. Development of effective drugs for treatment of onchocercal infections.

Target

Chemotherapeutic research, it is hoped, may be concluded by the demonstration of at least one new drug for the treatment of onchocercal infections which will be fully effective and so safe that it can be used in mass treatment campaigns. Failing accomplishment of this ideal objective, the end of this project may be marked by a clear definition of the value or absence of value which a number of existing drugs, that heretofore have never been used in onchocerciasis treatment, may have in the control of this disease.

h. Manufacture and field evaluation of prototypes of equipment for the accurate delivery of specified dosages of larvicides by aircraft.

Target

The number of such prototypes that are to be developed has not been specified but it would seem reasonable to expect that systems employed on fixed-wing aircraft would differ from those employed on helicopters.

i. Trained African personnel to assist in implementing the program, conducting research, and maintaining surveillance activities in the program area.

Target

A large-scale, long-term project, such as the Onchocerciasis Control Program in the Volta River Basin area, usually devotes an appreciable part of its budget to personnel training. This is not clearly apparent in the budget of the present program, although training problems are relatively

important, because some of the operations have been planned and costed on the basis of sub-contracting. The cost of the training and re-orientation of the necessary qualified staff thus becomes one of the items in the management costs of the sub-contractor, estimated to total 20% of the basic cost of the sub-contracted activity. Sub-Targets are described below.

(1) Biology, Vectorial Importance and Control of *Simulium damnosum*:

The training program for the three main categories of personnel: entomologists, technicians and laboratory assistants, should deal essentially with the biology, vectorial importance and control of *Simulium damnosum*. However, the vectors of the other major diseases in the Volta River Basin area, such as malaria, trypanosomiasis, yellow fever, etc., cannot be completely neglected.

(2) Parasitology and Clinical Features of Onchocerciasis:

Training programs can also be envisaged for the two categories of staff, physicians and nurses, who will work for the Onchocerciasis Control Program by evaluating the results and perhaps later on organizing chemo-therapeutic treatment of onchocerciasis sufferers.

(3) Operational Staff:

The training of radio operators, aircraft mechanics, engineers and pilots, could be planned along the same lines as that of specialists on the vector and the disease. If aerial treatment is carried out by a private company, the latter will certainly reserve to itself the right to recruit and possibly train its flying staff, although it might be invited to help in the training of similar staff of regional origin.

For the time being, training has been systematically planned to take place in Europe, where facilities are greater than in West Africa. Consequently, the cost of such training periods will vary more according to their duration (six months for radio operator and mechanics, two years for engineers and pilots) than to the level of recruitment. However, the WHO centre in Lome, training specialists for the maintenance of medical equipment, might be requested to extend its training activities to cover radio operators; this would considerably reduce expenses.

In the fields of vector biology and control and aerial treatment, it is proposed to train - between 1974 and 1977 - a number of specialists in proportion to the long-term requirements of the program, allowing for a replacement ratio of 5 to 10% per year for the higher grades and 10 to 12% for the junior grades.

In the medical fields, the training plans are more ambitious, so as to take into account needs closely linked with the Onchocerciasis Control Program in the Volta River basin area, but not costed, namely those required by probable mass chemotherapy and those arising from the epidemiological surveillance of population groups moving as a consequence of operations for the economic reclamation of abandoned and uninhabited land. Training can therefore be planned from 1974 onwards throughout the duration of the program, with the aim of one physician to every 20,000 onchocerciasis sufferers registered and one public health specialist to every 66,000. These estimates exceed the strict needs of the regional program, so that a zero annual replacement rate has been allowed for.

C.3 Output Assumptions

a. No major change in flow rates in the program area. Suitable conditions for the breeding of Simulium damnosum are provided by rapidly flowing turbulent water which contains rocks or vegetation to which the larvae can attach. Development of the present operational plan has relied heavily not only upon field entomological surveys but also upon the collection of hydrological data from many of the waterways throughout the rainy and dry seasons. The latter data of course are essential for the calculation of the quantities of insecticides that will be required. A number of changes therefore could alter the magnitude of the output levels. For example, the turbulence downstream of dams provides an ideal setting for Simulium breeding. The construction of such dams throughout the now abandoned fertile valleys as the agricultural development program progresses could significantly alter the level of output required. Significant changes in flow rates such as might occur during a prolonged rainy or dry season would also alter the required output levels.

b. All S. damnosum breeding sites will be identified. It is assumed that since rapids provide favorite breeding places for Simulium damnosum, it will not be possible to conduct direct inspections of all the breeding sites. Under these circumstances, the discovery of all treatment failures may prove impossible.

It is, therefore, necessary to assume that a number of indirect measures will prove suitable for the elimination of the larval stage of S. damnosum in breeding sites which are not accessible for direct inspection. Such measures employ trapping of adult flies as an indicator that some breeding may be continuing in a treated area. Another indirect measure is the recording of hydrological data and the direct aerial inspection of inaccessible stretches of water in an effort to

spot those situations which provide the appropriate conditions of water flow rates and turbulence that are the favored breeding sites of *S. damnosum*.

c. Epidemiological sample studies can be successfully implemented over time. The paramount assumption with respect to planned epidemiological studies is that the people in the sample will be prepared to submit themselves to the examinations in the proposed studies.

Since it is expected that there will be considerable movement of people from their present locations back into the fertile river valleys, it is assumed that those individuals selected for inclusion in the longitudinal study can be found each year for their scheduled follow-up examination.

D.1-2 Inputs and Implementation/Budget Schedule

In accordance with WHO program budgeting techniques, program inputs for the initial six-year phase of the project are broken down by functional category: a) Program Headquarters Staff; b) Vector Control Operations; c) Epidemiological Evaluation; d) Technical Support and Liaison; e) Research and Training.

a. Program Headquarters, Ouagadougou

Program headquarters comprises: (a) the office of the Director with a program director, information officer, an administrative services officer, a secretary and a driver; (b) an economic development liaison unit with an economist, a secretary and a driver; and (c) the supporting administrative services with a senior administrative officer, a budget and finance officer, a personnel officer, a supply officer, an assistant administrative services officer, together with 49 locally recruited staff (administrative assistance, clerks, typists, mechanics, drivers, messengers, skilled laborers) - a total staff of 62, of which 9 are professional and 53 general service staff. Consultant services have also been provided for 24 man-months each year.

Travel is foreseen not only within the area of operation, but also for visits to Geneva, Washington and the Regional WHO Office for Africa (Brazzaville).

It is envisaged that a building be constructed to house the headquarters in Ouagadougou and appropriate provision is made for this purpose in 1975 and 1976 Pending Construction; the estimates include rent for 1975 and 1976 which is expected to be required in addition to the office space acquired in 1974.

Six vehicles were purchased in 1974 and provision made for their replacement in 1977. Three motorcycles, purchased in 1974, will be replaced over two years (1976 and 1978).

The estimates also include provision for office stationery, supplies, equipment, office furniture, maintenance and running costs of vehicles and motor supplies.

b. Vector Control Operations

The vector control operations comprise the following staff:

	1974	1975	1976	1977	1978	1979
Professional	9	9	12	12	12	12
General Service	192	321	491	491	491	491
	201	330	503	503	503	503

The operation and staff under this heading are subdivided into vector control operations and entomological surveillance operations. The latter will extend into the Bobo Dioulasso, Korhogo, Tamale, Sikasso, Sokode, Natitingou and Niamey sectors.

The teams operating in the sectors will usually be composed of an entomologist, internationally recruited, and of locally recruited assistant entomologists, technicians, senior clerks, mechanics, drivers, laboratory auxiliaries, storemen, skilled and unskilled laborers, as well as radio operators.

Provision has been made for travel of the various teams within the area.

The estimates include the rental and operation of aircraft service for the aerial treatment in the following estimated number of hours:

	1975	1976	1977	1978	1979
Hours	2000	3230	4940	6120	6120

It is envisaged that for the operation an initial 80,000 liters of insecticides will be required in 1975, increasing to 150,000 for 1976 and 200,000 for each of the years 1977 through 1979.

It is expected that by 1975 and 1976 office construction will be required in three sectors and construction for storage in four sectors.

For purposes of the vector control operation, provision has been made for the following vehicles:

	1974	1975	1976	1977	1978	1979
Land rover station wagons	4	1	5	6	1	3
Land rover pick ups	27	19	33	27	19	33
Trucks	4	1	3	-	-	4
Boats	11	7	13	-	-	-
Outboard motors	16	9	18	-	-	16
Bicycles	48	36	66	48	36	66
Minibus Camping Volkswagen	2	-	-	2	-	-
Minibus Ordinaire Volkswagen	11	-	-	11	-	-
Break Peugeot 504	2	-	-	2	-	-

The estimate includes provision for rent of storage space in some ten sub-sectors, as well as for the cost of utilities in some 19 where operations will take place.

The technical equipment provision will cover the cost of optical equipment, generating sets, vacuum flasks, equipment for camping and tools of inspection, isothermic containers, fixed radio station and mobile radio station.

c. Epidemiological Evaluation.

The epidemiological evaluation consisted in 1974 of: (a) an epidemiology and public health unit comprising an internationally recruited epidemiologist, an operations officer, and locally recruited secretary, clerk-stenographer, clerk-typist and driver and (b) an epidemiological evaluation unit with an ophthalmologist, parasitologist and sociologist, internationally recruited, and a statistician, a nurse and a census officer, a laboratory assistant, two drivers and an unskilled laborer, locally recruited.

The personnel establishment for the period 1975-1979 is as follows:

	1975	1976	1977	1978	1979
Professional posts	9	9	9	8	7
General Service	17	17	17	17	17
	26	26	26	25	24

Travel to the various sectors has been foreseen for the epidemiological evaluation personnel.

Nine vehicles were purchased in 1974 and provision has been made for their replacement in 1977.

In addition to the provision made for running costs under Operations and Maintenance, the estimates include the purchase of various supplies (laboratory supplies, drugs for treatment, office supplies) and for technical equipment (field camping equipment, microscopes, ophthalmoscopes etc).

d. Technical Support and Liaison.

WHO HEADQUARTERS AND REGIONAL OFFICE

Strengthening of certain supporting services will be required at WHO Headquarters in Geneva and in the Regional Office for Africa in Brazzaville, as follows:

(a) at Headquarters

Onchocerciasis Control Program

Senior officer

Epidemiologist/Biologist

Administrative assistant

2 Secretaries

Personnel

3 Clerk-stenographers

Supply

1 Administrative assistant

Conference and Office Services

1 Administrative assistant

Finance and Accounts

3 Clerks

(b) at Brazzaville

Public health advisor
Clerk

In addition to the support personnel, provision is made in each year for 24 consultant man-months.

Travel is provided for visits from Geneva to Ouagadougou and Brazzaville and from Brazzaville to Ouagadougou.

Under this heading are also provided the estimates for two meetings, site visits for twelve members of the Technical Advisory Committee, and participation in other meetings.

FAO HEADQUARTERS AND REGIONAL OFFICE

The provision under this heading consists of 21 consultant man-months for each of the years 1975 through 1979, for travel in an amount of approximately $4,000 per annum and for minor items of supplies in an amount of $1,000 per annum.

e. Research and Training

It is envisaged that research will be undertaken in vector ecology, vector control, environment protection, chemotherapy and epidemiology, particularly with regard to research for new drugs.

Training will be mostly in vector ecology and control and to a minor extent in epidemiology and chemotherapy.

Input Assumptions

The most significant assumptions applicable to these inputs are:

1. The required professional and technical personnel can be recruited and begin their work in accordance with the total program schedule.
2. Construction of necessary facilities can be completed on schedule.
3. Once the field work begins, essential supplies, especially of vehicle fuel, lubricants, and spare parts, will be available continuously and equipment maintenance will be performed satisfactorily.
4. The technical equipment required for this project will be received in good condition and be ready for use of the teams.
5. The WHO headquarters, which has the responsibility for data processing, will be able to receive and analyze material from the field in a timely fashion.
6. It will be possible to maintain the planned larviciding operations despite mechanical failures of equipment, inclement weather, etc.

Part II.

1. Project Background

The first steps

In 1968 the World Health Organization (WHO) in joint sponsorship with the United States Agency for International Development (USAID) and the Organisation de Coordination et de Cooperation pour la Lutte Contre les Grandes Endemies (OCCGE) convened a technical conference in Tunis to consider the problem of onchocerciasis due to increased awareness of the extent of the problem, particularly in the minds of the national authorities concerned. The Tunis meeting brought together the world's leading experts on onchocerciasis and its insect vectors, and its major objective was to assess whether the control of onchocerciasis is possible with currently available methods.[1]

The conference concluded that control is technically feasible, and that the chances of obtaining successful and lasting effects would be greatest if the control were carried out in ecological zones sufficiently large to obviate the need for continuous protection of the whole area against reinvasion by the blackfly vector.

The possibility of launching a large-scale control program led the meeting to recommend that priority should be accorded to onchocerciasis in Africa, and specifically to an initial campaign in the severely affected area of the Volta River Basin involving adjoining parts of Dahomey, Ghana, Ivory Coast, Mali, Niger, Togo and Upper Volta. The delineation of the area was dictated not only by the high prevalence of onchocercal infection there but also by reason of the severity of the disease and the manifestly high rates of blindness. Moreover, certain field operations were already underway in the area,

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[1]World Health Organization (1969) Report of a joint USAID/OCCGE/WHO technical meeting on the feasibility of onchocerciasis control, Tunis, 1-8 July 1968, WHO/ONCHO/69.75, 60 pp., 4 maps.

some success had already been achieved, and significant entomological, epidemiological and economic data had been accumulated. Above all, the recommendation regarding the area reflected the determination of the interested Governments, supported by public opinion, to cooperate in a control program that was recognized to be a prerequisite for economic development, as well as for the health of future generations.

In April 1969 a further meeting was organized in Brazzaville by the WHO Regional Office for Africa to further refine the approach needed to secure technical assistance for the proposed campaign.[2] Experts from the Government of Ghana, OCCGE and USAID, in addition to WHO representatives, attended these discussions.

Requests from Governments

Shortly thereafter, in 1969 and 1970, several of the interested countries submitted formal requests - emanating from the highest authorities - to international and bilateral sources of assistance liable to be interested in supporting the undertaking which was taking practical shape. Among those organizations were the Fonds Europeen de Developpement (FED), the Food and Agricultural Organization of the United Nations (FAO), the International Bank for Reconstruction and Development (IBRD), the United States Agency for International Development (USAID) and the World Health Organization (WHO). Simultaneously the United Nations Development Program (UNDP) manifested its interest in the subject, particularly as it was already financing a WHO onchocerciasis project in West Africa.[3]

2World Health Organization (1969) Report of a preliminary meeting on the extended onchocerciasis control project in the Volta River Basin, Brazzaville, 30 April - 2 May 1969, AFR/ONCH/13, 36 pp.

3The Onchocerciasis Advisory Team (RAF/72/188) assigned to Northern Ghana, Togo, and Upper Volta and operating from Bolgatanga, Ghana.

Preparatory Assistance to the Governments (PAG Mission)

On the basis of the requests received and at the suggestion of IBRD, WHO and UNDP sponsored a planning meeting in Geneva in July 1970 which brought together representatives of the Conseil de l'Entente[4], the Government of Ghana, and OCCCE, FAO, FED, IBRD, UNDP, USAID and WHO. At this meeting terms of reference were drawn up for a mission designed to carry forward, on behalf of the seven Governments concerned, the essential preparatory work required for the definition of an overall strategy for the proposed onchocerciasis control program. The Mission was scheduled to start in mid-1971 and initially programmed for one year - this was later extended to cover the whole of the year 1972. The Administrator of UNDP agreed to provide the necessary funds and accordingly nearly US $0.2 million was allocated to WHO as the Executing Agency in association with FAO, which accepted responsibility for certain aspects of the work.

The PAG Mission received as its mandate a major two-fold objective. In the health sector, it was requested to prepare a plan of work to achieve control of onchocerciasis over the entire recommended project zone, taking into account economic development of reclaimed areas; to work out the expected costs and benefits of the scheme; and to analyze the possible financial resources available. In the economic sector, the Mission was later called upon to identify areas within the project zone which, owing to their economic potential and location in relation to centers of population density, offered development possibilities; it was requested also to draft preliminary terms of reference for feasibility studies to be conducted later in these areas.

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4 A consultative body in which the Governments of Dahomey, Ivory Coast, Niger, Togo and Upper Volta participate.

The Government of Upper Volta agreed to act as host to the PAG Mission and to place at its disposal premises at Ouagadougou for its headquarters which were set up in August 1971. Operating from Ouagadougou, the Mission has benefited from the full collaboration and encouragement of the Government of Upper Volta and the Governments of the other six countries in which it has carried out its activities.

The staff of the Mission was comprised of a Chief of Mission, an entomologist, a general economist and an administrative officer, supplemented by short-term consultants on aerial larviciding operations, a project planning (costing) expert, a statistician, two human geographers, an agricultural production economist, an agricultural (costing) economist, an agriculturalist, a sociologist, a veterinarian and two development economists. In addition, the Mission received considerable support from the WHO regular research programs, including operational research conducted with funds provided by the Governments of the Federal Republic of Germany and the United States of America.

Research undertaken by the Onchocerciasis Unit of the Ministry of Health of Ghana, by the Centre Muraz and Ophthalmological Institute of OCCGE, and by ORSTOM[5] proved helpful in the study of the disease and its vector and in the development of an appropriate methodology for epidemiological evaluation. The collection of data was made possible through the cooperation of the departments of health, agriculture, economics and planning and their related bodies in all the countries concerned. During its assignment the PAG Mission reinforced its affiliations with ancillary work in progress, such as the entomological studies being performed in northern Ghana, the FED campaign

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[5]Office de la Recherche Scientifique et Technique Outre Mer supported by by the Government of France.

in the Comoe-Leraba region, OCCGE's Onchocerciasis Section, and hydro-biological work on Lake Volta.

Apart from the continuous technical contacts maintained by the PAG Mission with local and international bodies, a series of meetings took place during the PAG Mission's assignment to review the progress and advise on future work. Discussions of current problems, particularly in logistics, took place in Ouagadougou in September 1971 between the Upper Volta authorities and representatives of WHO and FAO, with the participation of an IBRD representative. A review meeting was held at WHO headquarters in Geneva in February 1972, and this was followed by a full project review meeting in Geneva in July 1972. In October of the same year a planning meeting between the regional and field representatives of UNDP, FAO, IBRD, and WHO was organized in Accra, Ghana.

The Steering Committee

Meanwhile, in April 1972, the Director-General of FAO, the President of IBRD, the Administrator of UNDP and the Director-General of WHO decided, in view of the importance and complexity of the scheme envisaged, to set up a Steering Committee for Onchocerciasis Control comprising a representative from each of the four agencies. The Steering Committee had a general mandate to ensure coordination of the action taken by the four agencies in the planning and implementation of the program.

The Committee held its first session in July 1972 in Geneva and has held seven subsequent meetings to date. The Steering Committee has thus been able to monitor the progress of work during the various preparatory phases, discuss technical, administrative, financial and logistic matters and review the form and content of the present report.

Extension of the work in 1973

Among the major recommendations made by the Steering Committee at its first session was that the preparatory work phase should extend through 1973. Accordingly, an interim project was formulated to allow operational research to proceed in the form of field trials in a pilot zone, to adjust the aerial spraying technique and refine its costing; the interim project also included the initiation of field trials with established drugs. Another important part of the work was establishing firm baseline data to enable progress to be continuously checked during the proposed Onchocerciasis Control Program. In addition the interim project was requested to review the possible ecological changes that might ensue and suggest precautions that should be taken; and also to plan and launch the training program for national staff.

On August 20, 1973 the Report of the PAG Mission was released accompanied by technical annexes.* Shortly thereafter a joint IBRD/WHO mission discussed the proposed program strategy in detail with the seven participating African governments. The PAG Mission Report was endorsed by the African governments at the Accra Inter-governmental Meeting held October 30-November 1, 1973 and an agreement governing the operations of the program was signed by the seven countries and WHO. Concurrently the sponsoring agencies (WHO, IBRD, FAO, UNDP) met in Paris with perspective donor countries and organizations and with participating African governments to discuss the PAG Report, a proposed management structure for the program and donor contributions to a Special Fund to be

*Technical Annexes listed in Annex II.

established to cover costs of the first year's operation of the program. At this meeting AID representatives, while indicating general support of the proposed management structure, recommended the establishment of additional management units - an independent technical advisory group on vector control evaluation, and an economic advisory panel. These and other concerns were satisfactorily complied with in the management structure proposed by the Steering Committee at the June 1974 Paris meeting. (The Program management structure will be more fully discussed in Section III of this document.)

Following the June 1973 Paris meeting, the Steering Committee drafted the Onchocerciasis 1974 Fund Agreement which was signed by the participating UN agencies and several donors and which became effective March 1, 1974. The Fund Agreement describes the operations of the Onchocerciasis Special Account and the undertakings of the members of the Steering Committee during the first year of the program. Donor contributions of $7.5 million were pledged to cover the first-year operations of the projected six-year initial phase of the onchocerciasis control program.

The program director, Dr. Ziegler, formally assumed his functions in Ouagadougou as of January 1, 1974. Additional staff has been and is being recruited for program headquarters in Ouagadougou and other assignments. Aerial spraying operations began October 15, 1974 in the Zone I project area (See Annex III for detailed progress report on program operations.)

AID and Other Donor Experience in Similar Programs

Although instrumental in sponsoring the 1968 technical meeting in Tunis which first focused donor and African attention on the problem of onchocerciasis

in Africa as a major regional restraint to economic development, AID participation in onchocerciasis control activities in the past has been limited to a grant of $80,000 to WHO to fund aerial insecticide field trials under the PAG Mission's feasibility studies. Extensive onchocerciasis research activities have been carried out in West Africa by the Office de Recherche Scientifique de Territoires d'Outre Mer (ORSTOM) and Organisation de Coordination et de Cooperation pour la Lutte Contre les Grandes Endemies (OCCGE). FED/WHO-supported programs in the Comoe-Leraba region of Upper Volta, Togo, and Ghana, which tested the various means of controlling onchocerciasis as well as some other projects in East Africa and Nigeria which had different epidemiological characteristics, did not achieve lasting success. This was due in part to the small areas of the programs and the difficulties in protecting against reinfestation from untreated infested neighboring regions. However, the Comoe-Leraba experience led interested parties to consider onchocerciasis control programs on a much larger scale, such as the Volta Basin program, covering total geographic areas where S. damnosum are found.

2. Project analysis

I. Technical analysis

The technical feasibility of the proposed onchocerciasis control program was investigated by the PAG (Preparatory Assistance to Governments) team. Their findings have been made available in exhaustive detail in the following annexes to the PAG Report:

Annex II - 1	:	Chemotherapy of onchocerciasis: practice, prospects, and needs.
Annex III - 1	:	The distribution and biology of the vector and transmission of onchocerciasis.
Annex III - 2	:	Principles and methods of Simulium damnosum control in the Volta River basin area.
Annex III - 3	:	The control of Simulium damnosum and the prevention of environment contamination; technical criteria for the selection of insecticide.

Annex III-4	:	Recent and ongoing evaluations of insecticides and equipment for controlling *Simulium damnosum* in the Volta River basin area.
Annex IV-1	:	Epidemiological aspects of onchocerciasis in the Volta River basin area.
Annex IV-2	:	Prevalence of onchocerciasis and blindness in the Program area, baseline data and data sources.
Annex IV-3	:	Atlas of onchocerciasis(prevalence and blindness) in the Volta River basin area.
Annex V-2	:	Plan of operation and estimated cost of *Simulium damnosum* control campaign in the Volta River basin area.

The findings of the PAG team have been reviewed by TA/H specialists and by health specialists from other participating donor agencies. The findings have been discussed by these specialists on at least two occasions and have been accepted by the health specialists with reservations. Although certain difficulties do exist in the technical formulation and planned implementation of the program - such as the potential for development of insect resistance to Abate; difficulties in locating all *S. damnosum* breeding areas in the program area; difficulties in preventing *S. damnosum* reinfestation of treated areas - these problems have been recognized by the PAG team and donor experts and extensive efforts have been incorporated into control program operations to guard against technical failure.

In this document we will limit the analysis of technical considerations to certain basic considerations. We refer the reader to the above-mentioned annexes for more detailed technical explanations of the program.

Onchocerciasis is an infection by a parasitic filarial (threadlike) worm, Onchocerca volvulus, transmitted in the program area by the bite of an infected female blackfly of the species Simulium damnosum. The fly itself becomes infected by biting an infected human host. Both man and fly are therefore essential elements in the life cycle of the parasite.

The clinical manifestations of onchocerciasis include intensely itching rashes, wrinkling, thickening and depigmentation of the skin, the characteristic skin nodules in which the adult worms are to be found, and eye lesions leading to blindness as the most serious consequences of the disease. Heavily-infected patients often lose weight and suffer from debilitation.

The larvae of the insect vector S. damnosum, develop in the fast-flowing turbulent water of rivers and below the spillways of dams. Onchocerciasis is therefore a disease of the fertile areas flanking the rapids of rivers, hence its common name "river blindness". Moreover, apart from its role as a vector of disease, the blackfly constitutes an intolerable nuisance; the average number of bites per man per day sometimes amounts to several thousand, although only a small proportion of these result in infections.

The savanna area of the Volta River basin is one of the worst endemic onchocerciasis zones in the world. On the basis of surveys carried out by the national health services, it is estimated that over one million of the ten million inhabitants of the area covered by the program (nearly 700,000 km^2) are infected by onchocerciasis, and that of these at least 70,000 are blind or have a serious impairment of sight.

Control Procedures

Among the measures to control onchocerciasis that have been considered are:

(a) Mass chemotherapy. Unfortunately, the two available drugs of proved value - suramin and diethylcarbamazine - may have dangerous side effects, and can therefore be administered only under close medical supervision. This precludes their use for mass chemotherapy in populations whose access to medical care is minimal. Research to find safer onchocercicidal drugs is underway, but has not yet resulted in a definite solution.

(b) Biological control of the vector, using known predators, parasites, and pathogens of S. damnosum. This method is under study, but as yet is far from being of practical significance.

(c) Protection of the potential human host by chemical or physical barriers. The vector usually bites below the knee, and in theory the use of an effective insect repellent or protective clothing would interrupt the transmission of onchocerciasis. While such measures have a limited value in special circumstances, their mass application in the program area would be quite impracticable.

Elimination of the insect vector by chemicals offers the sole means at present available for preventing the disease. This cannot be achieved by an attack on the adult fly because an immense area would have to be treated with insecticides - the flight-range of the fly may, in favorable circumstances, extend to as much as 150 km.

Only one line of attack remains: namely, to destroy the blackfly larvae in the circumscribed sites in which they mature. Fortunately, the physiological requirements of the larvae are such as to make such a method of control eminently feasible. Attached to their submerged supports, they depend on the fast-flowing water to bring them oxygen for their respiration and particulate matter, for their nutrition. Particles suspended in the water are ingested indiscriminately, whether or not they are of nutritive value, and ingestion of

a chemical larvicide in adequate concentration results in the destruction of the larvae.

The desiderata for a chemical compound lethal to the larvae are: (a) that it should not unduly affect other forms of life ("non-target fauna"), especially fish that are of economic importance; (b) that it should soon be decomposed in the biological environment (biodegradability); and (c) that it should be possible to apply it to rivers in such formulations as will result in its ingestion by the larvae together with other suspended particulate matter. The two compounds that best meet these requirements are Abate[6] and methoxychlor. Although DDT is also effective against the Simulium larvae, its chemical stability and consequent persistence preclude its use.

Because of the inaccessibility by land of many of the breeding sites of Simulium, the only feasible method of applying the larvicide is from the air. In the case of large rivers that are sufficiently straight, light planes can be used, but narrow twisting waterways and those overhung by forest require the use of helicopters. In the rainy season, when the rivers flow swiftly, a single application may eliminate the Simulium larvae for up to 50 km downstream. In the dry season, relatively fast-flowing stretches of river may be interrupted by areas of still water, in which case each of these stretches must be treated separately.

Because of the long life of the adult worm in the human host, sufferers from onchocerciasis may remain infective for as long as 15-18 years even if not re-infected. The duration of a campaign to prevent the disease by eliminating its insect vector must therefore be not less than this length of time after the last new case in the program area.

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[6]This is a proprietary name. "Temephos" is under consideration by the International Organization for Standardization as a non-proprietary name for this compound.

The objective of the Simulium damnosum control campaign in the Volta River Basin is to interrupt the transmission of onchocerciasis for a sufficiently long period to permit the disappearance of the parasite from the human population in the program area. Since onchocercal worms survive up to approximately 18 years, a 20 year control campaign has been planned. This campaign will need to be highly effective, since in this area low densities of S. damnosum are sufficient to insure the persistence of onchocerciasis transmission. It is proposed that the point of attack for interrupting transmission of this disease is the larval stage of the vector fly, S. damnosum, which it is generally believed matures only in rapidly flowing turbulent water in the Volta River basin area. The aim of the larvicide [illegible] is to control S. damnosum, by treating breeding places of the species at intervals of time less than that required for larval development, since both eggs and the pupas show very little susceptibility to insecticides. Under the average conditions encountered in the Volta River Basin, this implies weekly treatment.

It is intended that all S. damnosum breeding sites will be subjected to larvicide treatments at weekly intervals during an initial phase of several weeks.

Program Area

The 700,000 km^2 control program area has been selected because in the past campaigns that were conducted in much more limited areas, reinfestation quickly occurred with the consequence that disease transmission was rapidly reinstituted. Lack of permanent surface access routes prevented treatment of all breeding sites over a large area such as the one proposed in this program. The present program will solve the problem of access routes

through the use of helicopters and fixed-wing aircraft and, by covering all of the Volta River Basin, will reduce the risks of reinfestation to which smaller project areas would be susceptible.

Insecticide

Applied research on insecticides is a continuing effort, and it should be noted that this subject has received considerable attention during the project planning period. This large preliminary effort included a review of the characteristics of 1400 insecticides that previously had been studied by WHO with respect to safety for mammals, toxicity to mosquito larvae, residual larviciding action in polluted water, and commercial availability. From this large number of insecticides, five that have been selected are considered to possess the most suitable attributes for the S. damnosum control campaign. These are methoxychlorf, Abate®, methyl-Dursban®, phoxim and chlorphoxim. Some of these previously had been evaluated against S. damnosum. Samples of those which have not yet been so evaluated were requested from the producers in the form of emulsion concentrates and were submitted to the WHO International Reference Center at Bobo-Dioulasso, Upper Volta for field study, and to hydro-biological laboratories for evaluation against non-target fauna. At the outset, a DDT emulsion concentrate used for many years against S. damnosum served as reference substance; it was replaced later by the best substitute formulation available. Most of the evaluations were made following ground application from planes and helicopters, both in the rainy season and at the beginning of the dry season. During the final planning stage, the evaluation of emulsion concentrates of those insecticides, whose performance in the field seemed sufficiently satisfactory, was undertaken by a team of hydro-biologists from the ORSTOM Center at N'Djamena, Chad. These studies comprised

on the one hand, laboratory determination of the effects of a whole range of concentrations of each compound on characteristic West African fresh water zoological groups and on the other, field observation of the action on non-target fauna of applications to water courses of operational doses (0.05 and 0.1 ppm during 10 minutes) as well as of the highest dose liable used accidentally in large-scale operations following an unexpected drop in the flow rate of the river treated (0.5 ppm during 10 minutes). During simultaneous laboratory studies a known quantity of labeled molecules of several promising insecticides were introduced into model ecosystems, in an enclosed space, so as to determine their degree of biodegradability according to a method developed by the WHO International Reference Center in Urbana, Illinois, for the study of compounds of the DDT family. These studies have been supplemented by an analysis of all accessible published documents concerning the persistence on nature and the action upon non-target fauna of the insecticides being investigated, so as better to determine the conditions under which they might be used.

Based upon all of these observations, Abate® has been selected for use in the operational control effort.

Techniques for application of insecticides

Field trials which were completed earlier in the program area revealed that fixed-wing aircraft, which always travel at a considerable speed, are not able to apply insecticide accurately in water courses that are winding, narrow, or covered partially by a forest canopy. On the other hand, the helicopter can carry out these applications much more efficiently and, if necessary, it is always possible to land near the treatment site and apply the insecticide by hand. Moreover, with the helicopter it is easier to adjust

the way in which the insecticide is applied; it may either be sprayed in a dense mass to obtain long-range larval kills downstream when the river is in spate or it may be sprayed over a wide area to live effective coverage, at low water, to the downstream breeding sites that are the closest to the treatment point. The earlier comparative study of the characteristics of these types of aircraft and of the corresponding plans of operation in actual field trials have been supplemented by a large number of simulation exercises on charts supported by cost-effectiveness studies. As previously described, the solution which has been adopted up to this point is based upon the simultaneous use of medium-sized airplanes and helicopters, the fixed-wing planes being used for large, strong flowing rivers that are open to the air, while the helicopter will be used for smaller water courses that are frequently concealed by vegetation and require only small or moderate amounts of insecticide. It should be noted however that simulation exercises and economic analyses are continuing in an effort to find out whether it would be possible to work out a plan of operations at the same cost, using only one type of aircraft. This would have considerable advantage with regard to the maintenance of the machines and the subcontracting of treatment.

HF radio communication network, if possible using a frequency especially assigned to the program, will permit the rapid exchange of information between air crews, the entomological surveillance sectors, and the program headquarters. It is planned that fixed radio stations will be established at the headquarters of each sector and in surveillance centers of strategic importance that are a long way from the headquarters of the corresponding sector. The fixed network would be supplemented by Landrovers equipped with both HF and VHF transmitter-receivers which will make it possible to maintain contact with the aircraft whenever the situation requires, particularly during geographical reconnaissance

and the evaluations of equipment and formulations.

Entomological surveillance

The multiple objectives of the entomological surveillance component of the total program vary at different stages in the campaign to eliminate S. damnosum by means of larviciding. Before larviciding operations actually begin, it is the responsibility of the entomological surveillance teams to ensure that all potential S. damnosum breeding sites have been located, and that their characteristics have been analyzed. Throughout the remainder of the twenty-year control program, the entomology teams will have responsibility for evaluating the effectiveness of larvicidal treatment and of instituting any changes which may be required in the application of insecticides to insure that complete interruption of onchocerciasis transmission is achieved as planned. In discharging these responsibilities, the teams will undertake the collection of hydrological data to determine those points which need to be treated and the doses of insecticide which are to be applied. Under special conditions, they will also undertake the ground application of insecticides to those breeding sites which cannot be treated by aircraft.

Special efforts are to be made to identify those routes by which migrant flies most frequently reinfest the area and to identify specific sectors in which breeding is most likely to be renewed by migrant flies. If reinfestation occurs only by means of a limited number of routes and if breeding can be shown to become reestablished only in limited areas, then it may be possible to reduce the surveillance network an appreciable degree after completion of the initial attack phase.

Measurement of the intensity of onchocerciasis transmission at selected points will be undertaken by the entomology teams during the initial years of the program in order to collect baseline information for the epidemiology component which is not scheduled for activation until three to six years after the control program has started.

Provision has been made in the design of this component of the program to employ two methods for verifying the efficacy of entomological surveillance in guiding a successful larvicide operational campaign. The two verification methods incorporated in the design are supervision of entomological surveillance by project personnel and epidemiological field studies to determine whether or not interruption of disease transmission has in fact been achieved.

Epidemiological surveillance

Epidemiological field studies that are incorporated in the program will be conducted for the purpose of identifying continuing disease transmission. This component of the project is described in more detail in the Outputs section of the Project Paper. It is sufficient here to point out that any time the epidemiologist finds a continuing transmission of disease such a result will signal the high probability that some active *Simulium damnosum* breeding sites either have not been found or have not been treated. This activity then serves as a very important double check upon the field supervisory staff of the entomology surveillance component.

The appearance of new infections among individuals who no longer should be at risk of infection as a consequence of the operational control program will signify a failure that demands an explanation and very probably a change in operational larviciding procedures or schedules. In assessing the operational program, therefore, concurrent examinations should be conducted of the epidemiological reports, entomological surveillance records and the

operational larviciding flight schedules.

II. Social Analysis

The socio-cultural factors relevant to the program are largely limited to the correlation between the incidence of onchocerciasis and out-migration from relatively fertile valleys in Volta basin, resultant over-population and over-cropping of highland regions in the program area and the potential for re-population and settlement in the valleys once onchocerciasis is controlled.

These factors are fully discussed in the following annexes to the PAG report: I-1 Physical, human and economic geography of the Volta River basin area.

VI-1 Rural development repopulation and settlement in areas of West Africa cleared by onchocerciasis.

The major ethnic groups in the program area belong to the Mande and Voltaic families, while Fulani are scattered through the program area and representatives of the Hausa family are found in the NE part of the area. Among the main Mande family groups are the Bambara of Mali, the Malinke of Mali and the Ivory Coast, the Bwaba of Upper Volta and Mali, the Dioula of the Ivory Coast, Mali and Upper Volta. To the Voltaic family belong the Mossi of Mali, Ivory Coast, Upper Volta, among others. Traders of the Mande and Hausa families and nomadic Fulani have always been widely scattered over the whole area.

Agricultural crops follow the familiar north-south pattern of millet and sorghum in the north to root crops in wetter areas. The area west of Bobo-Dioulasso is better watered and has a denser network of permanent water courses allowing for crops with a longer marketing chain such as cotton, rice groundnuts, etc. East of Bobo-Dioulasso, the land has lower inherent fertility,

water is less frequently available and crops are generally food crops, although some islands of relative fertility exist (such as NE Dahomey).

Livestock raising is discouraged in much of the area by the presence of trypanosomiasis, rinderpest and pleuropneumonia.

Fishing is an important occupation along some of the major water courses.

What little industry exists in the area is concentrated in Mali, Bobo-Dioulosso, Korhogo, Ivory Coast and in N. Ghana.

The road infrastructure includes major international routes such as the Abidjan-Bobo-Ouaga-Niamey route, the Cotonou-Malanville route and major N-S trunk lines in Ghana and Togo. A new route linking Mali to the new port of San Pedro in the Ivory Coast via Odienne is being developed. The local road system serving onchocerciasis areas in Togo, Dahomey and Ghana are particularly weak.

Major facilities for provision of health, education, social services, governmental administration, extension, communication, etc. are inadequate throughout the region, with urban facilities much more common than rural facilities.

Soils are generally good to average quality in the river valleys. In the plateau areas where population pressure is intense, soils are rather poor lateritic soils mixed with some more fertile soils, both of which are rapidly being degraded through over-use and erosion.

Population Distribution

Population is unevenly distributed with almost uninhabited river valleys contrasting with overpopulated plateau areas, such as the Mossi Plateau, located often quite near the river valleys.

In Upper Volta, the high population densities of the central and northern parts of the Mossi plateau are explained in part by the political stability of the Mossi empire over centuries. However, in recent decades population has increased in certain areas such as around Ouagadougou and the combination of overpopulation, low soil fertility, erratic rainfall, and the impossibility of allowing adequate fallow periods in the agricultural pattern have resulted in serious food deficits. Crop production has fallen well below the minimum subsistence needs of the population. Consequently, temporary and permanent emigration are now increasing. In the valleys of the Boubouriba and the Black, Red, and White Voltas, entirely uninhabited fertile valleys are situated in the immediate vicinity of overpopulated eroded plateaus.

The pattern is repeated elsewhere. Densely populated areas of Northern Ghana are juxtaposed with almost uninhabited valleys along the Red and White Volta rivers. In the Ivory Coast, a large population cluster exists at Korhogo while the valleys of the Bandama, Bou and other rivers are almost uninhabited.

In Togo and Dahomey again very densely populated areas are intermingled with almost empty ones. In southern Mali the overpopulated areas are not as conspicuous as in the other countries but the abandonment of large valleys such as the Baoule, Bagoe and Banifing rivers, is nevertheless noticeable while relatively dense populations occur further north in areas with lower and very uneven rainfall.

In southern Niger, the population is relatively dense but some areas are so sparsely inhabited that they have been transformed into a national game park.

PAC studies have examined the correlations between the size of village and prevalence of blindness, patterns of population movements within the project area, and age/sex ratios in areas with different prevalence levels of onchocerciasis.

They have found an exponential association between village population and prevalence of blindness (correlation coefficient r = -0.523).

In one analysis, a total of 1,757 communities were grouped according to population as follows: group one - 40 to 199 inhabitants, group two - 200 to 699 persons and the remainder having 700 or more residents. Onchocerciasis prevalence rates in excess of 50% were found in 22% of the smallest communities as compared with 10% of those in group two and only 2% in the group-three towns. Although this striking association supports the hypothesis of a causal relationship between onchocerciasis and emigration, it is also compatible with an hypothesis that villages with high frequencies of onchocerciasis are located "at the end of the road" where difficult subsistence is coincidental with high exposure to infected black flies with a consequent high prevalence of blindness.

The retreat from the river valleys has placed on the plateau lands a burden of human occupation that cannot be supported. Due in part to disease (onchocerciasis) there is now a marked contrast between the plateau and valley areas across the program area. Severe population pressure in the plateau areas - those with poor lateritic soils as well as those with more fertile soils- has, as a result of overcropping, led to serious degradation of the upland soils. In many densely populated areas there is abundant evidence of sheet wash and even gully erosion and with the loss of nutrients, crop yields in crowded watershed areas have declined markedly. This is in contrast in many cases to the situation in neighboring valleys where the soils have a much higher inherent fertility level and therefore a much greater yield potential, given proper management.

One result is increased emigration to the coastal states of Ivory Coast and Ghana. Age/sex ratio calculations suggest that young males in the economically active age group of 15-44 years are tending to leave the project area because insufficient land is available even to support a family at subsistence levels. In the hyperendemic and densely populated area of northeast Ghana, for example, the ratio averages 65 males per 100 females and falls to 55-60 males per 100 females in some districts in comparison with the ratio of 93 males per 100 females for the whole of Ghana.

Potential for re-population and settlement in onchocerciasis-freed areas

As part of the PAG studies, sociological investigations were carried out to explore, in a preliminary fashion, the possibilities, problems and limitations of human settlement in selected areas to be cleared of onchocerciasis. Studies were carried out in five proposed pilot zones and three densely populated areas which were presumed to be departure zones for potential settlers. The studies were carried out in Ghana, Upper Volta, Ivory Coast, and Togo. In general the studies revealed that the local population was very receptive to re-population of the river valleys - that is, groups that had once inhabited the valleys would be willing to return to those areas once the threat of onchocerciasis had been eliminated. Because of the failure of past settlement schemes, especially in Northern Ghana (in areas other than onchocerciasis infected zones), attitudes toward settlement - locating groups in areas that they had not previously inhabited and which in some cases have never been inhabited - were generally negative.

Major problems which must be dealt with in the economic development phase of the program (to be funded through other mechanisms) include the overall compatibility of different ethnic groups which might move into river valley areas, the rights of "strangers" to land and land tenure, and the fear of

contracting onchocerciasis when returning to the river valleys. However, in general, the prospects for the planned migration of approximately 800,000 people from the crowded plateaux to the fertile river valleys look bright.

III. Economic Analysis

Due to the broad geographical nature of the onchocerciasis control program an analysis of the economic ramifications of the program was carried out under the assumption that follow-on economic development projects would take place in areas freed from onchocerciasis. Ten major project zones were identified by the PAG team for priority development with the recognition that additional zones could be settled and developed as well.

I. Recommended Project Zones

	Area	Spraying Phase	Country
1.	Red Volta: north and east of Po	II	Upper Volta
	White Volta: north and NW of Bawku	II	"
2.	Diebougou-Gaoua:west bank of Black Volta	I	Upper Volta
3.	Bandama-Bou:west of Niakaramandougou	I	Ivory Coast
4.	Bolgatanga-Bawku:south of #1 above	II	Ghana
5.	Sansanne-Mango:along Oti River	III	Togo

II. Suggested Project Zones

6.	Dedougou:Black Volta north of Bobo-Dioulasso	I	Upper Volta
7.	Boromo: Black Volta north of #2 above	I	"
8.	Sissili:between Po and Leo	II	Upper Volta
9.	Pama:south of Fada, Eastern O.R.D.	III	"
10.	Comoe-Leraba:just north of Ivory Coast border	I	Upper Volta

The criteria for selection of priority project zones included: 1) heavy infestation of onchocerciasis;2) proximity to densely populated areas; 3)soils of good to average quality. Based upon the benefits which could be generated in

these ten project zones (at an additional cost of $120 million for economic development projects), plus certain area-wide benefits such as decreased cost of maintaining the blind, the combined IRR for the program over a 35-year life was estimated roughly at 10%. Details on the methodology used for economic analysis can be found in Annex VI-5 to the PAG report, "The Methodology of the Economic Analysis".

Factors considered in ascertaining the present socioeconomic effects of onchocerciasis include: 1)the decrease in productive capacity due to onchocerciasis (lost working days, etc.) ; 2) loss of revenue due to: a) the cost of maintaining the blind; b)underemployment; c) decrease in the active population (out-migration); 3) the loss of productive potential: a) non-exploitation of the valleys; b)falls in yield in densely populated areas; 4) the cost of onchocerciasis in national budgets. Additional information on proposed economic development of the program area can be found in the following annexes:

VI - 1	Rural development, repopulation and settlement in areas of West Africa cleared of onchocerciasis
VI- 2.A	Background data and proposed integrated rural development projects in Upper Volta
VI-2.B	Background data and proposed integrated rural development project in north eastern Ghana
VI-2.C	Background data and rural development project in northeastern Ghana
VI-2.D	Background data and proposed integrated rural development project in Togo
VI-2.E	Background data and socio-economic development aspects of onchocerciasis control in Dahomey
VI-2.F	Background data and socio-economic development aspects of onchocerciasis control in Mali

VI-2.G	Background data and socio-economic development aspects of onchocerciasis control in Niger
VI-3	Concise study of supplementary economic development projects
VI-4	The establishment of handicrafts and commerce and the provision of credit in the repopulation zones

Briefly summarizing the economic analysis, it is estimated that 65,000 km^2 of now-deserted land can be occupied after clearance of the vector. Potential annual agricultural production from the land is placed at $30 million. It is further estimated that 800,000 people can be transferred onto 12,000 km^2 of deserted valleys in the ten major project zones with an increased annual agricultural production of 355,000 tons of sorghum, millet, maize, rice, cotton, groundnuts and sesame.

With the concurrence of the participating African governments, the PAG team assumed that the now-deserted valleys would be developed as small family holdings and not as large farm or ranch schemes. Under these circumstances, one can reasonably assume that between 1-1.5 million people will re-locate in the total project area. Other project beneficiaries will include thousands of people who, without the onchocerciasis program, might have been rendered partially or totally blind by the disease as well as those already stricken who may benefit from breakthroughs in chemotherapy research.

The development of presently uninhabited fertile valleys should lead to major increases in food and cash crop production in countries where cereal production has faltered in recent years and where prices to consumers have risen correspondingly.

IV. Administrative Analysis

A rather elaborate administrative structure has been created to supervise and administer this large, multination, multidonor program. Although certain elements within the structure are yet to be finalized, the following description of the administrative structure of the program, based upon the results of the June 1974 Onchocerciasis meeting in Paris, will most likely mirror the final structure. Where differences of opinion exist among agencies re elements of the administrative structure, these differences are described below.

1. Executing Agency

WHO, as the Executing Agency, will, in consultation with the participating Governments, appoint a Program Director and assign other international staff and other personnel to the program as specified in the plans of work. It will provide the program with permanent technical and administrative assistance, and will be responsible for the implementation of the program as approved by the Steering Committee.

2. UNDP and Associate Agencies

The UNDP, through FAO as Associate Agency or through other agencies or directly, will consider financing, with resources available in UNDP regional or national country programs, complementary activities as may be requested by the participating Governments in the field of economic development. Within these arrangements and in close liaison with the National Committees, UNDP and the Associate Agencies will study the technical problems presented by the economic development of the areas that have been or are to be freed from the disease and will also give technical assistance to the program's Economic Development Unit.

3. Office of the Program Director

The Program Director will be responsible for field operations. He will be stationed at the headquarters of the program, which will be situated at Ouagadougou, Upper Volta. He will receive permanent technical and administrative assistance from WHO (Regional Office for Africa and Headquarters) as Executing Agency, and from FAO, as Associate Agency. Operational problems submitted to the Executing Agency by the National Committees will be channelled through the office of the Program Director. Within his own office there will be a unit responsible for external relations and information and he will be assisted by the following specialized sections as well as an Economic Development Unit.

a. Simulium Control Operations Section

This section will plan, carry out and supervise the control operations against the vectors of onchocerciasis and will be responsible for studies on the protection of the environment. It will define the associated applied research and personnel training activities that are necessary for the effective implementation of these operations.

b. Epidemiology Section

The Onchocerciasis Epidemiology and Public Health Section will plan, carry out and supervise the epidemiological evaluation of the program and define the associated applied research and personnel training activities in connection with the chemotherapy of onchocerciasis and the parasitological and clinical evaluation of the control operations. At the request of national authorities, this section will define the specific heath problems of the areas to be reclaimed and provide technical advice on the measures to be taken to provide effective medical protection for the populations to be settled there.

c. Economic Development Unit

The Economic Development Unit will serve as the focal point for the exchange of information with respect to national actions in the development aspects of the program, for which purpose it will maintain close liaison with the National Committees. This unit will assist the Program Director in identifying economic development projects which might be the object of further study and consideration by the Governments and institutions responsible for the financing and carrying out of the necessary pre-investment studies.

d. Administrative Section

The Administrative Support Services Section will provide the necessary administrative support for the implementation of the program in the field and will manage the joint technical and logistic services. In liaison with the appropriate services of the agencies sponsoring the program, this section will prepare the documents concerning the recruitment, supplies, and contractual services for the program or will provide the basic data so that these documents can be prepared.

4. National Onchocerciasis Committees

As the major coordinating element at government level, a National Onchocerciasis Committee was set up in each country by summer 1974, when the first entomological surveillance networks were due to start operating. Each Committee, comprising qualified representatives of the main national service concerned, is invested with authority enabling it to act at the highest level and to command appropriate resources for:

a. coordinating the action of all national services involved in the program and in the subsequent economic development projects

b. ensuring liaison with program headquarters and with other

National Committees

c. preparing and organizing a large-scale campaign to inform the population of the existence, methods and aims of the program

d. preparing the legislation and regulations required for the smooth running of the program, settlement, plans and economic development projects in reclaimed areas.

Consultations between the participating Governments, the sponsoring agencies and other parties may be held as appropriate at the request of the Steering Committee .

5. Steering Committee

The Steering Committee set up in April 1972 by the executive heads of UNDP, FAO, IBRD and WHO, and composed of representatives of the executives of these sponsoring agencies, will continue to act as the organ for the guidance and coordination of action by the sponsoring agencies with respect to the program. Its duties will be, *inter alia*, to study and approve the work plans and budgets prepared by the Executing Agency. It will supervise the implementation of the program and provide advice on its execution. The Steering Committee will meet at least three times a year in the initial phase of the program.

6. Joint Coordinating Committee (JCC)

This body will exercise general supervision over the program and the executing agent (WHO). It will be informal in nature and will consist of representatives of the seven participating Governments, all external donors (whether countries or organizations) and the four sponsoring agencies (IBRD, WHO, FAO, UNDP). This Committee will have an independent chairman of international stature who would be assisted by a secretariat provided jointly

by IBRD and WHO. This secretariat will function in close collaboration with the Steering Committee, which will continue to act as the organ for the guidance and coordination of action by the sponsoring agencies with respect to program. The Joint Coordinating Committee will determine its own rules of procedure, and will normally meet once a year to consider reports from the Steering Committee (and the Ecological, Economic Development and Technical Advisory Panels) on the progress of the program, to review the budget for the coming year, and to discuss matters relating to the conduct of the program. WHO, as executing agency, will retain full responsibility for the management of the program subject to the general guidance of the Joint Coordinating Committee.

7. Ecological Panel, Economic Development Advisory Panel, Technical Advisory Committee

While all parties agree that these organizations are necessary to ensure proper evaluation of program implementation, there is some disagreement over whether they will report directly to the JCC or to the JCC through the Steering Committee.

a. Ecological Panel

The Ecological Panel will comprise a small group of experts with wide experience in river basin ecology, the effects of development processes on river basins, in the epidemiology of diseases in river basins and the ecological effects of pesticides; e.g. biodegradable insecticides have been developed which have no residual effect and cause no harm to non-target aquatic fauna. Periodic hydro-biological studies will be made throughout the program.

The Panel will study and provide surveillance assistance on ecological problems connected with the program and with the associated

economic development projects. It will propose to the JCC and the Steering Committee such measures as may be needed to supplement the ecological studies undertaken under the program and will make recommendations to ensure effective protection of the environment.

b. Technical Advisory Committee

To provide for the continuous evaluation of the program by experts who are not directly engaged in its implementation, a Technical Advisory Committee composed of 6-12 individuals recognized as authorities in their particular fields and representing a broad range of nationalities will be appointed. Members of the Committee will be chosen for a period of two years and would appoint their own chairman. A secretariat will be provided by WHO; costs will be covered from the Special Fund. The Committee will meet twice a year and arrangements will be made for members to visit the program area as necessary. The Committee will examine all technical and scientific aspects of the program and submit an annual report to the JCC and the Steering Committee. WHO will then make comments on the report for the consideration of the Steering Committee and the JCC.

c. Economic Development Advisory Panel

This panel will be established to advise and report on the economic development aspects of the program. It will be organized under the general guidance of the World Bank and will consist of economists and specialists in agriculture and rural development. The Panel will be appointed by the sponsoring agencies and be headed by an independent economist of international repute. Its principal task in the initial

stages of the program will be to evaluate and assist in coordinating the identification and preparatory work for specific projects being done at the national level, with the assistance of the external donors. The Panel will make an annual report to the Steering Committee and JCC.

III. Project Implementation

The first phase, 1974-1979:

The first year will focus on (1) establishment of the organizational infrastructure, and (2) assuring the continuity of control operations, and making use of the knowledge of the terrain already available, primarily in the area covered by the FED/OCCGE (European Development Fund/Organization for Coordination and Cooperation in the Control of the Major Endemic Diseases) onchocerciasis control campaign. The vector control operations will have begun in all program areas by the third year and will include aerial treatments and insecticiding. The first phase will see the establishment of radio communications and hydrological stations and expanded recruitment of staff. In addition, there will be simultaneously, entomological surveillance, epidemiological evaluations, and research and training.

Economic development activities per se, associated with the program, will not be financed during Phase I. Funding arrangements for specific development projects will be the responsibility of the participating Governments under bilateral or multilateral arrangements with various donors. A necessary pre-condition for any such initiation will be the successful carrying out of control operations in the proposed project areas.

Institutional Framework

FAO, IBRD, UNDP and WHO comprise the Steering Committee for Onchocerciasis Control in the Volta River Basin Area. The Committee comprises the personal

representatives of the heads of these four organizations and has the general mandate of ensuring coordination of action, mobilizing support, and advising on and endorsing forward planning for the work.

The project's headquarters is located in Ouagadougou (Upper Volta) from where operations in the various sectors foreseen will be managed by a Project Manager assisted by experts and consultants in entomology, parasitology, ophthalmology, hydrobiology, medical statistics, economics, etc; the project will also have an administrative officer and sufficient support personnel.

In order to effect the progressive integration of other elements and projects engaged in the area on onchocerciasis control work, the Steering Committee has called for the merging into the major project of the UNDP-assisted Onchocerciasis Advisory Team (RAF/68/758) assigned as a regional project, to Ghana, Togo and Upper Volta and operating from Bolgatanga, Ghana.

The present regional project therefore integrates the functions of the former Onchocerciasis Advisory Team whose work henceforward will be directed from the operational headquarters at Ouagadougou. Bolgatanga will thus act as one of the project's sub-centers for operational research.

At the field level, the regional project will maintain close working relations with OCCGE and the WHO International Reference Center on Insecticides at Bobo-Dioulasso, Upper Volta. Links will also be continued, as during the PAG Mission's operations, with the offices of the seven UNDP Resident Representatives, and the FAO Regional Office, senior agricultural advisors and country representatives.

At the country level, the government cooperating agencies primarily concerned with the 1974 work are the Ministries of Health of the seven countries. During the year, however, the other Ministries and government departments which will be involved in the campaign itself, the resettlement program and the economic

development projects, will be brought into the picture.

As anticipated, the national authorities for onchocerciasis control have been established by the participating governments in accordance with the recommendations of the Steering Committee.

Provision is made under the project for technical contacts at the inter-country level to facilitate consultations between the national counterpart elements entrusted with the respective country responsibilities in preparing for the campaign.

Within the Executing Agency, a special program team is being entrusted with the overall duties of planning, implementation and monitoring of the project and of carrying forward the detailed planning of the campaign itself. This program team is located in WHO headquarters and maintains direct contact with project headquarters of the Associate Agency, FAO. In addition, the program team will serve as secretariat to the Steering Committee and maintain policy and implementation with UNDP links and IBRD.

Special arrangements have been made with the WHO network of collaborating laboratories and international and/or regional reference centers, especially those dealing with insecticide formulations and screening and with drug evaluation.

Provisions for Government follow-up

The main responsibility of each participating Government and its national authorities will of course be their full and active role in the Onchocerciasis Control Campaign which started , on a phased basis, in 1974 and will last for nearly two decades; during this period each Government will accord a major priority to the control of the vector, the development of the reclaimed areas and resettlement.

To this end, and as said above under the description of the institutional context of the scheme, each Government will be encouraged to establish appropriate

structures at the country level to contribute to the implementation of the future basin-wide campaign. Such entities should have the necessary authority to mobilize the national inputs needed and each may be headed by a National Director for Onchocerciasis Control

Medical field units and national and/or federal research institutions of the seven countries involved will contribute to the investigations and field trials as well as to the training of the national specialists required by the future campaign.

After an attack phase of three years and a surveillance phase (the duration of which has yet to be determined), each national authority will be invited to assume full responsibility for the maintenance of the control program within its borders and in unison with the progress of the general campaign. As to the development programs, it is anticipated that these may, for the most part, be run from the outset with multilateral or bilateral assistance.

The attack phase of the program commenced in October 1974 in Zone I (see page Part I 14/ for areas to be covered each year); and will commence October 1975 in Zone II, and October 1976 in Zone III.

Progress as of June 1974

The WHO program director, Dr. Ziegler, assumed his functions in Ouagadougou as of January 1, 1974. Dr. Marcus Candau will be invited to assume the chairmanship of the Joint Coordinating Committee. The JCC will hold its first meeting in Abidjan, February, 1975. The most recent Executing Agency progress report for the program is attached as Annex 3.

General financial procedures:

The grants that were made during 1974 by the six donor Governments and by the UNDP and the Bank were paid into a separate account administered by the Bank under the Onchocerciasis 1974 Fund Agreement concluded in March 1974. Financial procedures are described in the Agreement, attached as Annex 5. It is anticipated that a similar fund will be utilized for the remainder of the six-year program under guidelines established through an agreement similar to the Onchocerciasis 1974 Fund Agreement. As Executing Agent for the program, WHO will submit applications for withdrawal of funds quarterly based upon estimated payments to be made during the following quarter.

Contributions of the participating Governments

Each of the participating Governments concerned has agreed to give high priority throughout the duration of the program to onchocerciasis control and to the development and settlement of the reclaimed areas. The health services and the national and/or federal research institutes of these countries will contribute to the basic and applied research that is necessary for the proper execution of the program and will help to train the required numbers of national specialists. Each of the Governments has agreed to cooperate unreservedly with the Executing and Associate Agencies so that the program can be carried out under optimum conditions.

Protocols with each of the seven participating African governments establish regulations regarding legal arrangements, sub-contractors and their personnel, customs and tax exemption, documentation, technical information and reports, overflight and landing rights, assistance from aviation services, telecommunications network, sites and construction, water, electricity, postal services, and disposition of equipment and supplies.

Interest

The Bank has confirmed to AID that neither it nor WHO will earn interest on the U.S. contribution, or if either does earn such interest, it will be returned to the USG (IBRD, Acting Regional Vice President for Western Africa, E. Peter Wright, letter of March 1, 1974, to the AA/Africa).

Procurement

Untied grants are being made to the Onchocerciasis Trust Fund by the multi-donors. While some donors would prefer tied grants, the Steering Committee has been able to convince the donors that untied grants are imperative for a program of this size and scope. Procurement of goods and services will be through worldwide bidding. SER/Commodity Management confirms that U.S. businesses would be in a position to compete, particularly in the areas of aircraft contracts and larvicides. A substantial part of the expenditures, however, will consist of personnel costs, the acquisition of buildings and commodities, and local operational costs.

Evaluation Plan

Three panels or committees have been created within the administrative structure of the program, which will ensure timely, independent, evaluation of the total Onchocerciasis Control Program (See Sec. II, Administrative Analysis, Page 55). Each of these structures will submit annual reports to the Joint Coordinating Committee directly or through the Steering Committee on technical, economic development, and ecological aspects of the program. For this reason, A.I.D. and other donors will not carry out separate evaluations of the program, which would be administratively unwieldy. However, any of the donors, including the U.S., will have the opportunity to analyze these reports and to submit their comments and recommendations to the JCC. It is expected that all donors

will base their future contributions on the overall performance and direction of the program. In order to assure A.I.D.'s responsibilities to ourselves and to the Congress, we will undertake a thorough examination of the program at the end of the third year, based on the trend of annual reports to the JCC, and the informal input of our A.I.D. field staff in the control areas (the Entente States plus Mali and Ghana). It is on this basis that the Agency can fulfill its evaluative responsibilities and make recommendations to the Administrator regarding the continued participation of the Agency in the program.

The Ecological Panel has already submitted its first report to the JCC after examining the larvicide to be used in the program and considering WHO plans for monitoring the environmental and associated health consequences of the program.

The Technical Advisory Group will meet independently to evaluate technical progress at least twice a year, and more often as necessary. While the TAG will evaluate the program primarily on the basis of technical considerations, management considerations will be an important element.

The baseline data for the evaluations will be derived from FED/FAC pilot studies gathered for what has been incorporated into the program rationale. The Annexes and numerous Sub-Annexes to the PAG Report provide the baseline data for the entire program, and are the summary documents for the functional sections and/or geographical areas. The complete list is attached at Tab C. Every section will utilize this data, continuously update and expand this data, and evaluate performance and progress against program benchmarks, both vertically in terms of the functional sections, and horizontally by geographic areas (country, departments/regions, selected villages, selected population clusters, etc.).

The Economic Development Advisory Panel *inter alia* will monitor and evaluate progress concerning the planning and implementation of socio-economic development activities in the program area.

(page 65 deleted)

ANNEXES

1. Environmental Impact
2. PAG Report: List of Technical Annexes
3. June 1974 Progress Report - Onchocerciasis Control Program in the Volta River Basin Area
4. Proposed Management Structures - Organagram
5. Onchocerciasis 1974 Fund Agreement
6. Detailed Program Budget
7. Logical Framework Matrix
8. Map: Onchocerciasis Program Area

ANNEX 1 Environmental Impact Statement

In 1973 an Ecological Panel composed of internationally-known specialists was appointed by the Steering Committee to study ecological problems connected with the onchocerciasis program, monitor program results and make recommendations to ensure effective protection of the environment in the program area. The Panel, headed by Dr. James A. Lee, a noted public health expert, is composed of individuals with wide experience in river basin ecology, the epidemiology of diseases in river basins and the ecological effects of pesticides.

After the Panel meetings and an in-depth review of WHO plans for carrying out the Control Program, the Panel issued its first report (June 1974). The Panel's finding which we will report below indicates that the program should not lead to any serious untoward consequences for the environment, the biota, or human health. The Panel's continued surveillance of the program should ensure that any unforeseen environment-degrading effects of the program will be spotted quickly and necessary program modificaitons made.

Statement of the Ecological Panel (June 26, 1974)

The Panel has examined the pesticide to be used; its formulation, nature and rate of application, and toxic properties, and has indicated its approval of it on all counts. The Panel is of the opinion that, on the basis of information previously developed, including laboratory and field tests, it does not expect any serious, untoward consequences for the environment, the biota, or human health.

Realizing, however, that predictions relating to natural systems can be risky, the Panel has carefully considered the WHO program and plans for monitoring the environmental and associated health consequences of the Control Program. With few minor modifications, it has found the proposed monitoring efforts to be both

adequate and sufficient. Such efforts are designed to signal any unexpected, serious threats to the environment, acting much as an "early warning system", thus allowing time for appropriate remedial action to be taken before irreversible, unwanted effects set in. Also, by utilizing untreated control sites for monitoring purposes, changes occurring in the treated areas can be both qualitatively and quantitatively correlated - thereby providing information on the nature, scope, severity and timing of the impacts on the environment.

The Panel is pleased with the approach taken by the WHO in this regard, and it will work closely with WHO in evaluating the effectiveness of the monitoring program, and in recommending any changes or modifications believed needed.

Suffice to say, Mr. Chairman, that this large-scale program is to be carried out with a conscious regard and concern for the ecology of the treated area; that appropriate safeguards have been incorporated, and these will be systematically monitored to determine their efficacy; and the Panel serves in an overview capacity to ensure that both the nature and level of ecological changes resulting from the Control Program are acceptable, and not prejudicial to the long-term environmental and human ecological welfare of the affected nations and their peoples.

LIST OF TECHNICAL ANNEXES

ANNEXES TO INTRODUCTION

O-1 Terms of Reference of the Preparatory Assistance Mission to the Governments of Dahomey, Ghana, Ivory Coast, Mali, Niger, Togo and Upper Volta

O-2 Terms of Reference of the Steering Committee for Onchocerciasis Control in the Volta River Basin Area

O-3 Operational Research, Field Investigations and Training Programme (1973)

ANNEX TO CHAPTER I - THE PROGRAMME AREA: PHYSICAL, HUMAN AND ECONOMIC GEOGRAPHY

I-1 Physical, human and economic geography of the Volta River basin area

ANNEX TO CHAPTER II - ONCHOCERCIASIS: PARASITE AND DISEASE

II-1 Chemotherapy of onchocerciasis: practice, prospects and needs

ANNEXES TO CHAPTER III - ONCHOCERCIASIS: VECTORS AND TRANSMISSION

III-1 The distribution and biology of the vector and transmission of onchocerciasis

III-2 Principles and methods of *Simulium damnosum* control in the Volta River basin area

III-3 The control of *Simulium damnosum* and the prevention of environment contamination; technical criteria for the selection of insecticides

III-4 Recent and ongoing evaluations of insecticides and equipment for controlling *Simulium damnosum* in the Volta River basin area

ANNEXES TO CHAPTER IV - EPIDEMIOLOGY OF ONCHOCERCIASIS AND SOCIO-ECONOMIC ASPECTS OF THE DISEASE

IV-1 Epidemiological aspects of onchocerciasis in the Volta River basin area

IV-2 Prevalence of onchocerciasis and blindness in the Programme area, baseline data and data sources

IV-3 Atlas of onchocerciasis - prevalence and blindness - in the Volta River basin area

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ANNEXES TO CHAPTER V - PROGRAMME FOR THE CONTROL OF ONCHOCERCIASIS AND PLAN OF OPERATION

V-1	Report on Informal Consultation on *Simulium damnosum* Control in the Volta River basin area, West Africa
V-2	Plan of operations and estimated cost of *Simulium damnosum* control campaign in the Volta River basin area
V-3	Estimated cost of the entomological surveillance component of the Onchocerciasis Control Programme in the Volta River basin area
V-4	Estimated cost of the epidemiological evaluation component of the Onchocerciasis Control Programme in the Volta River basin area
V-5	Estimated cost of applied research component of the Onchocerciasis Control Programme in the Volta River basin area
V-6	Estimated cost of training personnel for the Onchocerciasis Control Programme in the Volta River basin area

ANNEXES TO CHAPTER VI - ANTICIPATED SOCIO-ECONOMIC BENEFITS AND PROPOSALS FOR THE ECONOMIC DEVELOPMENT OF THE AREAS FREED FROM ONCHOCERCIASIS

VI-1	Rural development, repopulation and settlement in areas of West Africa cleared of onchocerciasis
VI-2.A	Background data and proposed integrated rural development projects in Upper Volta
VI-2.B	Background data and proposed integrated rural development project in north eastern Ghana
VI-2.C	Background data and rural development project in northern Ivory Coast
VI-2.D	Background data and proposed integrated rural development project in Togo
VI-2.E	Background data and socio-economic development aspects of onchocerciasis control in Dahomey
VI-2.F	Background data and socio-economic development aspects of onchocerciasis control in Mali
VI-2.G	Background data and socio-economic development aspects of onchocerciasis control in Niger
VI-3	Concise study of supplementary economic development projects
VI-4	The establishment of handicrafts and commerce and the provision of credit in the repopulation zones
VI-5	The methodology of the economic analysis

WORLD HEALTH ORGANIZATION

ORGANISATION MONDIALE DE LA SANTÉ

ONCHOCERCIASIS CONTROL PROGRAMME IN THE VOLTA RIVER BASIN AREA

PROGRESS REPORT

Submitted by the World Health Organization as Executing Agency for the Programme

A. INTRODUCTION

1. This progress report covers the initial months of the Programme itself which started in January 1974.

2. During 1973 preparations were completed for the launching of the Programme. Among these measures was the release on 20 August 1973 of the Report of the PAG Mission together with its technical annexes. Soon after its general release, the strategy of the Programme as proposed in the Report was presented by a joint IBRD/WHO Mission to each of the seven Participating Governments and its implications were discussed, including the timing of the control operations, the future economic development, Government contributions in cash or kind, the establishment of National Onchocerciasis Committees and the Agreements for the Programme.

3. This was followed by the Accra Inter-governmental Meeting of the seven Participating Governments and the sponsoring agencies held from 30 October to 1 November 1973 which endorsed the PAG Mission Report. An Agreement governing the operations of the Programme was signed by the seven countries and WHO.

4. A further preparatory step consisted in a WHO mission to the seven countries to determine in detail the contribution of each Government to the Programme. This resulted in individual Country Protocols which constitute supplements to the Operational Agreement and which reflect contributions by the countries in staff, infrastructure, cash, etc. The Protocols relevant to the four countries (Ghana, Ivory Coast, Mali and Upper Volta) involved in Phase I of the Programme have been submitted for signature.

5. In October 1973 a WHO/UNDP mission of information officers visited the Programme area to collect background and photographic material depicting the effects of the disease and the scope of the Programme envisaged. This mission has provided valuable material, together with the IBRD film, "A Plague on the Land", for use by press, radio and TV in both a number of developed countries and the countries of the Programme area. The Executing Agency, in collaboration with the other sponsoring agencies and with the Information/Communications Officer assigned to Programme Headquarters, will continue to give close attention to the information needs of the Programme.

Towards the end of 1973, the four sponsoring agencies entered into an Administrative Agreement for the management of the Programme which specifies the role of the various component parts including the Steering Committee, the Ecological Panel, the Executing Agency, the Associate Agency, the Special Fund for Onchocerciasis and the National Onchocerciasis Committees.

7. The Steering Committee for Onchocerciasis Control in the Volta river basin area which was established by the Executive heads of UNDP, FAO, IBRD and WHO in 1972 has continued to review progress and coordinate action for the Programme as a whole. It has so far held nine sessions. The Secretariat for the Steering Committee is provided by WHO Headquarters.

8. As recommended by the Steering Committee, the Ecological Panel, consisting of experts designated by the sponsoring agencies to monitor ecological problems connected with the Programme and report thereon to the Committee, was set up and two meetings have so far taken place. The Ecological Panel will continue to meet periodically.

9. With regard to the Scientific Advisory Panel which is being set up to advise the Executing Agency on technical aspects of the Programme, WHO has contacted leading scientists working in all aspects of onchocerciasis epidemiology, vector biology and control and is analysing the 200 positive replies received.

10. From the outset the concept of National Onchocerciasis Committees has been accepted as the most positive way of providing a coordinating machinery for the Programme at the national level and a link between each Government and the Headquarters of the Programme itself. It is a matter of gratification that each of the Participating Governments has established its National Onchocerciasis Committee on which the various ministries involved in the control campaign and the future economic development of the freed areas are represented.

B. 1973 INTERIM PROJECT

11. The activities of the 1973 Interim Project form a separate report submitted by the Executing Agency. This report includes the results of the aerial spraying trials in the Comoé-Léraba river basin.

C. FINANCIAL ARRANGEMENTS

12. The Bank group undertook to provide $ 750 000 under the Interim Special Fund Agreement as its contribution to the first year (1974) operations of the Programme. In response to the Executing Agency's request for funds to enter into firm commitments for essential personnel, transport and supplies needed for the launching of the Programme, IBRD made available on 9 January 1974 an advance allocation of $ 375 000.

13. The Interim Special Fund Agreement involving $ 7.5 million for the first year became effective on 1 March 1974 making possible disbursements and commitments for the whole year 1974, estimated at $ 4.6 million and $ 2.9 million respectively. During the first four months of operations total obligations amounted to over $ 600 000 and an additional $ 400 000 approximately were under commitment against the Special Fund. It is certain that the rate of disbursement will accelerate

significantly during the second half of 1974 with the award of the contracts for insecticide and aerial operations, the increased recruitment of General Service staff needed for Programme Headquarters and for the various sectors, the start of entomological surveillance in sectors and subsectors, and the implementation of research work for which the agreements are presently in preparation.

14. Parallel with this UNDP approved in February 1974 the Applied Research (Epidemiology and Chemotherapy) and Training component of the Programme with a provision of $ 1.2 million for the years 1974-76 and an allocation of $ 317 000 for 1974. This contribution is made under UNDP's regional programme for Africa and constitutes a continuation of the support provided in 1971-73 towards the preparatory work which permitted the development of the strategy for the Programme.

D. IMPLEMENTATION OF THE PROGRAMME

15. Office of the Programme Director. The advance allocation permitted the Executing Agency, after consultation with the other sponsoring agencies, to appoint the Programme Director who, after initial secondment to the Programme in November 1973, formally assumed his functions as of 1 January 1974 in Ouagadougou.

16. The post of Director's assistant will probably be filled by the transfer of an experienced WHO staff member.

17. The post of Information/Communications Officer in the Office of the Director, the terms of reference for which were prepared in consultation with the Steering Committee at its ninth session (April-May 1974) will be filled, as planned, during the second half of 1974.

18. Simulium Control Operations Unit. The Project Manager of the 1973 Interim Project located in Ouagadougou continued his activities as a WHO consultant (pending release from ORSTOM), filling as from 1 January 1974 the post of Chief of the Simulium Control Operations Unit of the Programme. Two further posts, namely the Entomologist in charge of Aerial Operations who also participated in the 1973 Interim Project and the Entomologist responsible for Ecology were also appointed, the first from 1 January 1974 and the second from 22 April 1974. The Executing Agency is in the process of approaching possible candidates for the third Entomologist post as well as for the two Operations Officers, one for entomological surveillance and the other for the aerial operations. With the filling of these posts this key unit will have its full complement of professional staff.

19. Three of the four entomologists to act as chiefs of the sectors to become operational in 1974 have also been recruited by WHO; the fourth is completing his studies at the Onchocerciasis Entomology Centre of OCCGE at Bouaké, Ivory Coast. The incumbents of these posts are nationals of the participating countries.

20. Ancillary staff for the unit has been recruited or is under recruitment. For the Sikasso (Mali) Subsector an assistant entomologist was recruited on 1 May 1974 and the Subsector is operational.

11. Administrative Services Unit. While arrangements were being made for the recruitment of the senior administrative staff for this unit, to ensure continuity the functions were discharged by the WHO administrative officer who had served with the 1973 Interim Project. He was subsequently joined by senior administrative and financial staff detached from WHO Headquarters to organize local personnel recruitment and training; to prepare office accommodation and facilities; to make financial and budgetary control arrangements; and to establish local procurement and other facilities. In the meantime WHO recruited a Senior Administrative Officer who joined the Programme in April. The Supply Officer, the Administrative Services Officer and a Personnel Officer have also been assigned and will take up their positions in the near future. They will be supported on a temporary basis, until the unit is fully established, by the secondment of specialized staff from WHO Headquarters.

12. Junior administrative, clerical and secretarial personnel, as well as ancillary staff, are recruited as required locally and within the Programme area.

13. It should be pointed out that a certain amount of in-service training is being organized for these staff. As stipulated in the Operational Agreement, all staff including those engaged within the Programme area will have the status of WHO employees with contracts issued in accordance with the WHO Staff Regulations and Rules.

14. Onchocerciasis Epidemiology and Public Health. Recruitment for the posts of Chief Epidemiologist and the evaluation teams is under way so that they can be filled in the latter part of 1974 as planned.

15. Economic Development Unit. The terms of reference for the Economist to head this unit were agreed upon by the Steering Committee at its eighth session (February 1974) and recruitment is being undertaken by FAO against funds made available from the Special Fund by WHO.

16. Buildings. Programme Headquarters is installed in two villas that have been rented in Ouagadougou and fitted out as offices; the former offices of the PAG Mission, made available to the Programme by the Government of Upper Volta, continue also to be used to house the Simulium Control Operations Unit.

17. Negotiations are under way for the Programme to acquire a group of three villas to replace the present accommodation; these will be converted and extended so that by the end of 1974 the Headquarters services will be together at a single location.

18. Programme staff have visited the seven countries to inspect buildings that might be used as bases for sectors and subsectors. Some of these buildings, which are Government property, will be made available to the Programme free of charge; others are private buildings that will be rented by the Governments for the needs of the Programme; yet other buildings will be rented or built at the expense of the Programme. In all cases where construction is necessary, the Governments will provide the Programme with land free of charge.

19. Supplies and equipment. The equipment and furniture needed for the various units of the Programme Headquarters and for the entomological surveillance sectors and subsectors have been obtained or are on order. The transport pool is being established and vehicles of different types have been already purchased or are on order.

30. The necessary action has been taken for the procurement of the insecticide for the 1974 spraying operations and for its distribution to three operational centres by 1 October 1974.

31. Contract for aerial operations. The aerial operations will start on 15 October 1974. In preparation for this, a circular letter setting out the requirements of the Programme and inviting aerial spraying companies to provide information regarding the number and type of aircraft they operate, previous work undertaken, and details of their staff, was sent by the Executing Agency to about 700 companies. The replies were examined by a technical committee of aviation and spraying experts which drew up a short list of companies whose equipment and staff met the requirements of the Programme. These companies were then sent an invitation to tender and a draft contract. The tenders will be examined by a selection committee and the contract concluded in good time.

32. Telecommunications. Following preliminary discussions with the International Telecommunications Union (ITU) towards setting up a radio network, it was decided to hold a meeting in Abidjan of telecommunications specialists of the seven countries of the Programme ar a together with ITU and the Programme representatives. It is expected that as a result of the meeting two frequencies from among those allocated to the seven countries can be made available for technical and logistic needs of the Programme.

33. Applied research. The following research activities of the Programme are under preparation:

(a) Research on epidemiology and chemotherapy. A research programme on the epidemiology, transmission and chemotherapy of onchocerciasis has been developed and will be submitted to the Royal Commonwealth Society for the Blind so that the Society may make available to the Programme one of its ophthalmologists stationed in Ghana.

(b) Research on environmental protection. During May 1974 WHO organized a meeting of specialists in hydrology, ecology and insecticide chemistry in order to draw up a protocol for monitoring the effects of the campaign on the aquatic environment for submission to the Ecological Panel. The corresponding research will be subcontracted to specialist bodies in the Programme area or elsewhere.

(c) Research on insecticides. Research protocols on new insecticides, their formulations, and their biodegradability are being prepared.

(d) Research on the sensitivity of the vector to insecticides. Preparations have been made to study from September onwards the development of simple techniques applicable under field conditions for evaluating the sensitivity of blackfly larvae to insecticides. Systematic control of this sensitivity using currently available techniques will be undertaken throughout the Programme area before insecticide treatment begins.

(e) Research on equipment. A contract has been signed for the improvement of the "rapid release" system developed in 1973 for insecticide spraying from aircraft. The modified prototype will be made available to the company that is awarded the contract for the aerial work so that this spraying system can be fitted to its own aircraft.

.. Training. An agreement has been signed between the OCCGE, ORSTOM and WHO for the specialist training of entomologists who are to work for the Programme and the training of assistant entomologists and entomology technicians. This training - financed under UNDP - will be provided by the OCCGE Onchocorciasis Entomology Centre in Bouaké and will last up to six months for entomologists, four months for assistant entomologists and technicians. At present five technicians from Ivory Coast and two from Upper Volta, and one Ivory Coast entomologist are undergoing training at the Bouaké Entomology Centre.

E. WHO HEADQUARTERS SUPPORT UNIT

35. The special unit charged with the coordination of all activities related to the Programme has been functioning for over a year at WHO Headquarters. The staff of this unit consists of two entomologists, an administrative assistant, and secretaries. The unit maintains close contact with the Programme Director at Ouagadougou for which purpose a diplomatic pouch and telex service have recently been established. It has special working links with the WHO Regional Office at Brazzaville and collaborates closely with the other technical and specialized units and divisions at WHO Headquarters. Contacts with the headquarters of the other sponsoring agencies are also channelled through WHO Headquarters.

36. During the first quarter of 1974, most of the unit's activities were devoted to administrative backstopping of the field Programme - selection and recruitment of Programme personnel, ordering of supplies and equipment, etc.

37. In addition, this unit was responsible for the preparation, in consultation with the Governments concerned, of the Country Protocols of the four countries concerned in Phase I of the Programme; the Protocol for monitoring of the aquatic environment; the agreement for the training of entomological surveillance personnel; the invitation to bid for the aerial operations; the telecommunications meeting at Abidjan, and the document on the Programme presented to the World Health Assembly that took place in Geneva in May 1974.

38. Other work presently under way includes the setting up of the Scientific Advisory Panel and the preparation of the agreements for research on entomology, ecology, epidemiology and chemotherapy.

39. Technical assistance was given in the preparation of the 1974-79 budget and the Project Document for the UNDP component of the Programme (Applied Research and Training).

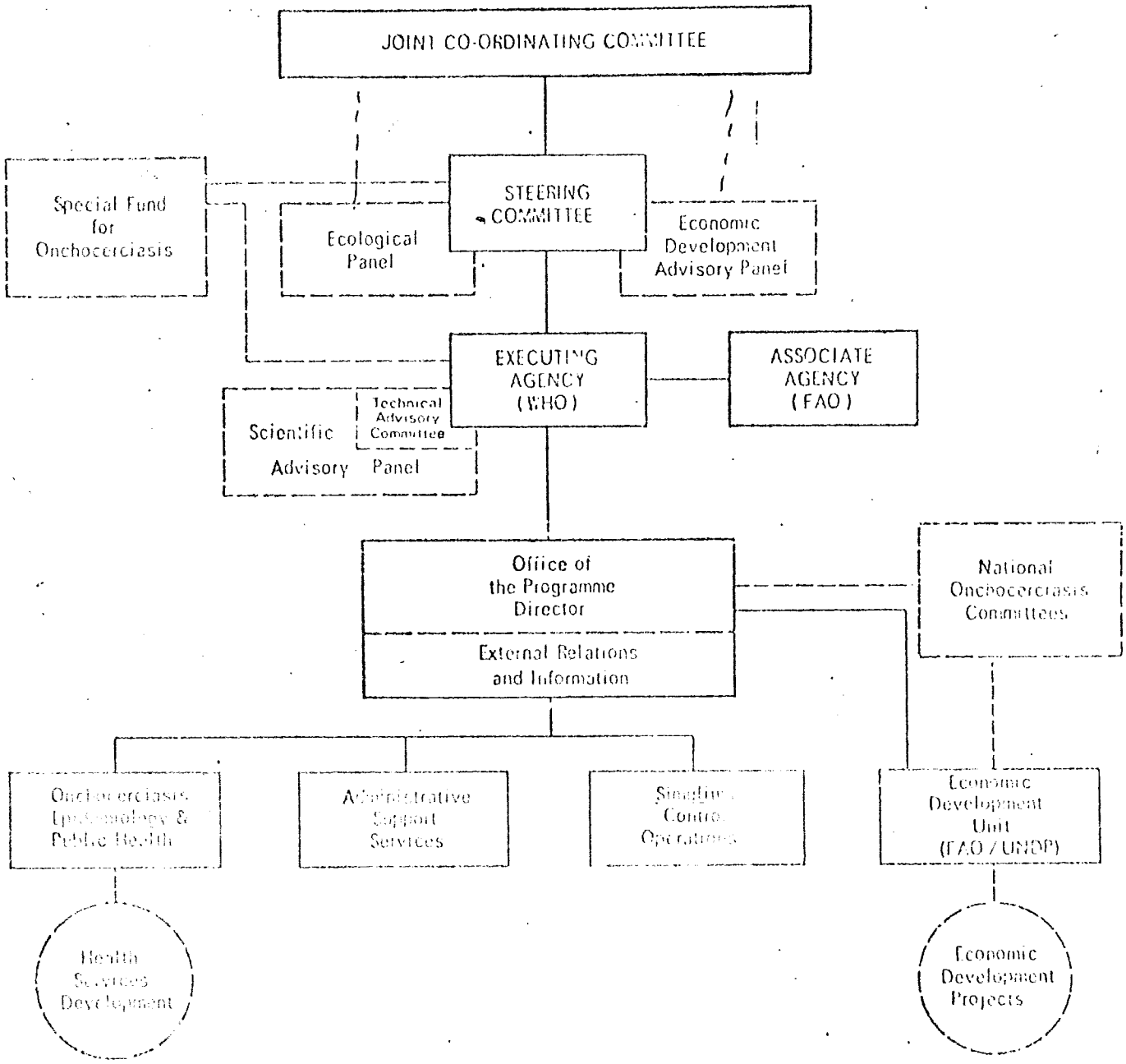
F. PROSPECTS FOR THE REST OF 1974

40. Now that the necessary funds are available the Executing Agency can accelerate all measures to ensure that the Programme is given a firm basis of operation as soon as possible. Above all, the recruitment and training of personnel will be speeded up and it is anticipated that the entire staff of the Programme Headquarters will be in place by October. All sectors and subsectors involved in Phase I of the Programme will be operational from July onwards; arrangements are under way for the preparation or construction of all buildings required for this Phase including storage facilities for fuel and insecticide.

41. Larviciding operations are scheduled to start on 1 November 1974 after a fortnight of aerial reconnaissance to finalize the entomological surveys and for the briefing of pilots on flight plans.

42. Preparations are being made to order equipment and supplies for 1975 having long delivery dates so that a smooth delivery pattern can be maintained.

ONCHOCERCIASIS CONTROL PROGRAMME IN THE VOLTA RIVER BASIN AREA: PROPOSED MANAGEMENT STRUCTURES



Onchocerciasis 1974 Fund Agreement

DATED March 1, 1974

ONCHOCERCIASIS 1974 FUND AGREEMENT

AGREEMENT between the Governments of CANADA, the REPUBLIC OF FRANCE, the KINGDOM OF THE NETHERLANDS, the UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND, the UNITED STATES OF AMERICA, the INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT (the Bank), the INTERNATIONAL DEVELOPMENT ASSOCIATION (the Association), the UNITED NATIONS DEVELOPMENT PROGRAMME (UNDP) and the WORLD HEALTH ORGANIZATION (WHO).

WHEREAS (A) the Report of the Mission for Preparatory Assistance to the Governments of Dahomey, Ghana, Ivory Coast, Mali, Niger, Togo and Upper Volta (hereinafter referred to collectively as the Participating Governments) proposes a strategy for Onchocerciasis Control in the Volta River Basin Area and for the future economic development of reclaimed areas (hereinafter called the Programme);

(B) on November 1, 1973, the Participating Governments entered into an Agreement Governing the Operations of the Onchocerciasis Control Programme in the Volta River Basin Area (attached as Annex I hereto) to which WHO is also a Party and, pursuant to such Agreement have endorsed the role of (i) the Bank to assist in finding external assistance to finance the cost of the Programme and (ii) WHO to act as the Executing Agency for the carrying out of the Programme;

(C) it is expected that certain governments and organizations will soon consider the means to contribute to the financing of the first six year phase of the Programme but that some time may lapse before arrangements to that effect will be agreed upon;

(D) it is essential that before the arrangements referred to in (C) above are concluded, work on operations forming part of the first phase of the Programme, which have so far been financed by a number of contributors, including the United Nations Development Programme, the European Development Fund, the Republic of France and the Federal Republic of Germany, be not interrupted for lack of funds;

(E) each of the Governments of Canada, the Republic of France, the Kingdom of the Netherlands, the United Kingdom of Great Britain and Northern Ireland and the United States of America, and the Bank and/or the Association have agreed to assist in the financing of the cost, at present evaluated at about seven million five hundred thousand dollars (US$7,500,000), of services, buildings and equipment relating to the operations for the calendar year 1974 (hereinafter called the Initial Stage of the Programme) described in Annex II to this Agreement, by contributing the amount specified opposite its name below:

Canada	Can$	500,000
France	F	5,000,000
Netherlands	US$	1,000,000
United Kingdom	£	425,000
United States	US$	1,000,000
The Bank	US$	375,000
The Bank and/or the Association	US$	375,000

(F) each of the Governments of the Federal Republic of Germany and the United States of America (hereinafter, collectively with the Governments listed in (E) above and any government which would accede to this Agreement, called the Donors) has indicated its intention, subject to legislative approval or other action, to contribute additional amounts for the financing of the Initial Stage of the Programme.

(G) (i) WHO has agreed to act as Executing Agency in carrying out the Programme, including its Initial Stage, and (ii) the Bank has agreed at the request of the Donors to establish and administer an Onchocerciasis Special Account (hereinafter called the Account) consisting of the contributions set forth in (E) above;

NOW THEREFORE, the parties hereto agree as follows:

ARTICLE I

The Account; Contributions to the Account; Disbursements from the Account

Section 1.01. The Bank shall open the Account on its books and shall, on the date of entry into force of this Agreement, pay and credit thereto an amount in various currencies equivalent to United States dollars three hundred and seventy five thousand (US$375,000). The Bank shall credit to the Account: (i) the amount of each Donor's contribution as the same shall from time to time be transferred to the Bank for the purposes of this Agreement, and (ii) out of its own funds and/or funds contributed by the Association such additional amounts in various currencies not to exceed in the aggregate the equivalent of United States dollars three hundred seventy-five thousand (US$375,000) between July 1 and December 1, 1971. All monies credited to the Account shall be used only for the purposes and in accordance with the provisions of this Agreement.

Section 1.02. (a) Upon the entry into force of this Agreement the Bank shall promptly notify each of the Donors referred to in paragraph (a) of Section 4.01 of this Agreement of the amounts required to be paid by it by a specified date as part of its contribution to the Account to cover the estimated payments to be made by WHO during the quarterly periods referred to in Section 1.05 of this Agreement.

(b) Upon the date on which this Agreement shall, in accordance with the provisions of paragraph (b) of Section 4.01 of this Agreement, take effect in respect of any Donor other than those referred to in the preceding paragraph of this Section, the Bank shall promptly notify each such Donor of the amount required to be paid by it by a specified date as part of its contribution to cover the estimated payments to be made by WHO during the quarterly period, or the remaining balance thereof, referred to in Section 1.05 of this Agreement.

(c) To the extent possible over the nine month period ending September 30, 1974, the Bank shall request the Donors to pay the amounts referred to in this Section substantially *pro rata* to the respective amounts of their total contributions to the Account.

Section 1.03. The Account and all monies credited thereto shall be held in trust and kept separate and apart from all other accounts and assets of the Bank.

Section 1.04. The Bank shall pay to, or on the order of, WHO out of the monies in the Account for payments to be made by WHO pursuant to this Agreement after the date of its entry into force (and payments made by WHO before that date but after January 1, 1974).

Section 1.05. When WHO shall desire to withdraw any amount from the Account, WHO shall deliver to the Bank a written application therefor. Except as the Bank and WHO shall otherwise agree, any such application shall be submitted on a quarterly basis on account of estimated payments to be made during the following quarter; provided, however, that WHO shall be entitled to include in the first application amounts paid by it between January 1, 1974 and the date of such application.

Section 1.06. The Bank shall send to each of the Donors a quarterly report containing appropriate information with respect to disbursements of, and balances in, the Account.

ARTICLE II

Undertakings of UNDP

Section 2.01. UNDP shall, subject to its internal policies and procedures and pursuant to an agreement to be concluded with the Participating Governments, provide and bear the cost of expenditures for training and chemotherapeutic research during the Initial Stage of the Programme at present evaluated at about three hundred thousand dollars (US$300,000).

ARTICLE III

Undertakings of WHO

Section 3.01. (a) Amounts disbursed from the Account shall be used by WHO exclusively to finance the cost of goods and services required to carry out the Initial Stage of the Programme.

(b) WHO shall furnish to the Bank all such information as the Bank shall reasonably request concerning the expenditure of the monies disbursed from the Account.

Section 3.02. WHO shall not incur obligations against the Account in excess of the amount of funds committed to the Account.

Section 3.03. WHO shall prepare for the Donors a semi-annual report containing appropriate information concerning the progress made in carrying out the Initial Stage of the Programme.

ARTICLE IV

Effective Date; Termination

Section 4.01. (a) This Agreement shall remain open for signature until July 1, 1974, or such other date as the Bank and/or the Association and WHO may determine and shall enter into force and effect on the date on which it shall have been signed without reservation by the Bank, the Association, UNDP, WHO and Donors indicating contributions in an amount of not less than the equivalent of United States dollars three million seven hundred fifty thousand (US$3,750,000). The Bank shall, on such date, notify all the other Parties named in the Preamble to this Agreement that it has opened the Account in accordance with the provisions of Section 1.01 of this Agreement.

(b) This Agreement shall take effect in respect of each of the Donors other than those referred to in paragraph (a) of this Section on: (i) the date on which each such Donor shall sign it without reservation, or (ii) if such Donor has signed it with reservation as to acceptance, on the date on which such Donor shall have notified the Bank of its acceptance. The Bank shall promptly after such date notify each of the other Parties to this Agreement.

Section 4.02. (a) This Agreement may be terminated by the Bank and/or WHO, after consultation with the Donors, by at least 90 days' notice in writing to the other Parties to this Agreement.

(b) Without any limitation upon the provisions of paragraph (a) of this Section, this Agreement shall terminate: (i) upon the completion of the Initial Stage of the

Programme or (ii) upon disbursement from the Account of all amounts due to be disbursed from it under the provisions of this Agreement or (iii) upon the entry into force of new arrangements satisfactory to the Parties hereto for the financing of the Programme, whichever is earlier.

Section 4.03. Any monies remaining in the Account upon the completion of the Initial State of the Programme shall, to the extent that new arrangements shall have been made for the financing of the Programme and the Donors are in agreement therewith, be disposed of in accordance with the provisions of such arrangements. Failing such agreement by any Donor or termination of this Agreement pursuant to Section 4.02(a) of this Agreement, the Parties shall consult together as to the disposal of any monies remaining in the Account or goods purchased with the proceeds thereof.

IN WITNESS WHEREOF, the parties hereto, acting through their representatives thereunto duly authorized, have caused this Agreement to be signed in their respective names upon the dates below indicated.

CANADA

By

Authorized Representative

Date February 17

REPUBLIC OF FRANCE

By

Authorized Representative

Date Le 8 Mars 19

KINGDOM OF THE NETHERLANDS

By

Authorized Representative

Date 1 February

UNITED KINGDOM OF GREAT BRITAIN
AND NORTHERN IRELAND

By Anthony Keith Lawrinson
Authorized Representative

Date March 1, 1977

UNITED STATES OF AMERICA

By Samuel C. Hope
Authorized Representative

Date March 1, 1977

INTERNATIONAL BANK FOR
RECONSTRUCTION AND DEVELOPMENT

By E. Peter Wright

Date February 14, 1977

INTERNATIONAL DEVELOPMENT ASSOCIATION

By E. Peter Wright

Date February 14, 1977

UNITED NATIONS DEVELOPMENT PROGRAMME

By

Date 1 March 19

WORLD HEALTH ORGANIZATION

By

Date February 15, 1

MT/ST #L-792
Legal Department
~~CONFIDENTIAL~~ DRAFT
(Subject to Change)
GRDelaume
December 5, 1973

NOT A USG CLASSIFICATION

ONCHOCERCIASIS 1974 FUND
AGREEMENT

NOT A USG CLASSIFICATION

11/30/73

ONCHOCERCIASIS 1974 FUND
AGREEMENT

AGREEMENT between /list the Donor Governments/, the INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT (the Bank), the INTERNATIONAL DEVELOPMENT ASSOCIATION (the Association), the UNITED NATIONS DEVELOPMENT PROGRAMME (UNDP) and the WORLD HEALTH ORGANIZATION (WHO).

WHEREAS (A) the Report of the Mission for Preparatory Assistance to the Governments of Dahomey, Ghana, Ivory Coast, Mali, Niger, Togo and Upper Volta (hereinafter referred to collectively as the Participating Governments) proposes a strategy for Onchocerciasis Control in the Volta River Basin Area and for the future economic development of reclaimed areas (hereinafter called the Programme);

(B) on November 1, 1973, the Participating Governments have entered into an Agreement Governing the Operations of the Onchocerciasis Control Programme in the Volta River Basin Area (attached as Annex I hereto) to which WHO is also a Party and, pursuant to such Agreement have endorsed the role of (i) the Bank to assist in finding external assistance to finance the cost of the Programme and (ii) WHO to act as the Executing Agency for the carrying out of the Programme;

(C) it is expected that a consultative group on Onchocerciasis Control composed of certain governments and organizations will soon consider the means to contribute to the financing of the first six years phase of the Programme but that some time may lapse before arrangements to that effect will be agreed upon;

(D) it is essential that before the arrangements referred to in (C) above are concluded, work on operations forming part of the first phase of the Programme, which have so far been financed by a number of contributors,

including the United Nations Development Programme, the European Development Fund, the Republic of France and the Federal Republic of Germany, be not interrupted for lack of funds;

(E) the Governments Parties to this Agreement (hereinafter called the Donors) and the Bank, and/or the Association have agreed to assist in the financing of the cost, at present evaluated at about seven million five hundred thousand dollars (US$7,500,000), of the operations to be carried out during the year 1974 (hereinafter called the Initial Stage of the Programme) described in Annex II to this Agreement;

(F) each of the Donors and the Bank, and/or the Association have agreed to contribute for the carrying out of the Initial Stage of the Programme the amount specified opposite its name below:

	US$ equivalent
A	_____
B	_____
.....	.....
The Bank	375,000
The Bank and/or the Association	375,000

(G) (i) WHO has agreed to act as Executing Agency in carrying out the Programme, including its Initial Stage, and (ii) the Bank has agreed at the request of the Donors to establish and administer an Onchocerciasis Special Account (hereinafter called the Account) consisting of the contributions set forth in (F) above;

NOW THEREFORE, the parties hereto agree as follows:

ARTICLE I

The Account; Contributions to the Account; Disbursements from the Account

Section 1.01. The Bank shall open the Account on its books and shall, on the date of entry into force of this Agreement, pay and credit thereto an amount in various currencies equivalent to United States dollars three hundred and seventy five thousand (US$375,000). The Bank shall credit to the Account: (i) the amount of each Donor's contribution as the same shall from time to time be transferred to the Bank for the purposes of this Agreement, and (ii) out of its own funds and/or funds contributed by the Association an amount in various currencies equivalent to United States dollars three hundred and seventy five thousand (US$375,000) between July 1 and December 1, 1974. All monies credited to the Account shall be used only for the purposes and in accordance with the provisions of this Agreement.

Section 1.02. (a) Each of the Donors referred to in paragraph (a) of Section 4.01 of this Agreement shall transfer to the Bank the amount of its contribution within /90/ days from the date of entry into force of this Agreement or such other date as may be agreed upon by the Bank and each such Donor.

(b) Each of the Donors other than those referred to in the preceding paragraph of this Section shall transfer to the Bank the amount of its contribution within /90/ days from the date on which this Agreement shall, in accordance with the provisions of paragraph (b) of Section 4.01 of this Agreement, take effect in respect of such Donor or such other date as may be agreed by the Bank and each such Donor.

Section 1.03. The Account and all monies credited thereto shall be held in trust and kept separate and apart from all other accounts and assets of the Bank.

Section 1.04. The Bank shall pay to, or on the order of, WHO out of the monies in the Account for payments to be made by WHO pursuant to this Agreement after the date of its entry into force (and payments made by WHO before that date but after January 1, 1974).

Section 1.05. When WHO shall desire to withdraw any amount from the Account, WHO shall deliver to the Bank a written application therefor. Except as the Bank and WHO shall otherwise agree, any such application shall be submitted on a quarterly basis on account of payments to be made during the following quarter; provided, however, that WHO shall be entitled to include in the first application amounts paid by it between January 1, 1974 and the date of such application.

Section 1.06. The Bank shall send to each of the Donors a quarterly report containing appropriate information with respect to disbursements of, and balances in, the Account.

ARTICLE II

Undertakings of UNDP

Section 2.01. UNDP shall, pursuant to an agreement to be concluded with the Participating Governments, provide and bear the cost of expenditures for training and research during the Initial Stage of the Programme [at present evaluated at about _____ dollars ($_____)].

ARTICLE III

Undertakings of WHO

Section 3.01. (a) Amounts disbursed from the Account shall be used by WHO exclusively to finance the cost of goods and services required to carry out the Initial Stage of the Programme.

(b) WHO shall furnish to the Bank all such information as the Bank shall reasonably request concerning the expenditure of the monies disbursed from the Account.

Section 3.02. WHO shall not incur obligations against the Account in excess of the amount of funds committed to the Account.

Section 3.03. WHO shall send to the Bank for transmittal to the Donors a semi-annual report containing appropriate information concerning the progress made in carrying out the Initial Stage of the Programme.

ARTICLE IV

Effective Date: Termination

Section 4.01. (a) This Agreement shall remain open for signature until _____ 1974 or such other date as the Bank and/or the Association and WHO may determine and shall enter into force and effect on the date on which it shall have been signed without reservation by the Bank, the Association, UNDP, WHO and Donors contributing an amount of not less than the equivalent of United States dollars _____ _____ (US$_____). The Bank shall, on such date, notify all the other Parties named in the Preamble to this Agreement that it has opened the Account in accordance with the provisions of Section 1.01 of this Agreement.

(b) This Agreement shall take effect in respect of each of the Donors other than those referred to in paragraph (a) of this Section on: (i) the date on which each such Donor shall sign it without reservation, or (ii) if such Donor has signed it with reservation as to acceptance, on the date on which such Donor shall have notified the Bank of its acceptance. The Bank shall promptly after such date notify each of the other Parties to this Agreement.

Section 4.02. (a) This Agreement may be terminated by the Bank and/or WHO, after consultation with the Donors, by at least 90 days' notice in writing to the other Parties to this Agreement.

(b). Without any limitation upon the provisions of paragraph (a) of this Section, this Agreement shall terminate: (i) upon the completion of the Initial Stage of the Programme or (ii) upon disbursement from the Account of all amounts due to be disbursed from it under the provisions of this Agreement or (iii) upon the

entry into force of new arrangements satisfactory to the Parties hereto for the financing of the Programme, whichever is earlier.

Section 4.03. Any monies remaining in the Account upon the completion of the Initial State of the Programme shall, to the extent that new arrangements shall have been made for the financing of the Programme and the Donors are in agreement therewith, be disposed of in accordance with the provisions of such arrangements. Failing such agreement by any Donor or termination of this Agreement pursuant to Section 4.02(a) of this Agreement, the Parties shall consult together as to the disposal of any monies remaining in the Account /or goods purchased with the proceeds thereof/.

IN WITNESS WHEREOF, the parties hereto, acting through their representatives thereunto duly authorized, have caused this Agreement to be signed in their respective names upon the dates below indicated.

FOR /DONOR GOVERNMENTS/

By _____
Authorized Representative

_____
Date

INTERNATIONAL BANK FOR
RECONSTRUCTION AND DEVELOPMENT

By _____

_____
Date

INTERNATIONAL DEVELOPMENT ASSOCIATION

By _____

_____
Date

UNITED NATIONAL DEVELOPMENT PROGRAMME

By _____

_____
Date

WORLD HEALTH ORGANIZATION

By _____

_____
Date

ANNEX I

/Reproduction of the Agreement Governing the Operations of the Onchocerciasis Control Programme in the Volta River Basin Area dated November 1, 1973 between the Participating Governments and WHO/

Annex 6

ANNEX VI

TABLE 1: ONCHOCERCIASIS CONTROL PROGRAMME
1974/1979 BUDGET

(In Current US $)

	1974	Revised 1974 excluding long-term commitments and liabilities	1975	1976	1977	1978	1979	Total
Annual Costs								
Programme Headquarters Staff	546 950	546 950	559 310	594 025	622 755	657 695	700 410	3 681 145
Vector Control Operations	1 211 462	1 211 462	2 763 470	4 401 440	6 023 520	6 648 015	7 080 195	28 128 102
Epidemiological Evaluation	150 090	150 090	415 525	523 540	531 295	514 845	523 165	2 658 460
Technical Support and Liaison:								
WHO HQ and Regional Office	510 610	510 610	508 220	541 290	581 580	619 395	664 775	3 425 880
FAO HQ and Regional Office	45 460	45 460	67 600	74 100	80 600	87 100	93 600	448 660
Research Contracts	863 103	807 500	1 095 700	1 074 800	829 500	795 000	699 000	5 401 500
Training	74 880							
Total Annual Costs	3 402 555	3 372 072	5 410 02[illegible]	7 209 195	8 669 260	9 322 050	9 761 145	43 743 747
Capital Items								
Buildings	586 970	586 970	355 600	337 500	-	-	-	1 280 070
Furniture	55 280	55 280	-	-	20 000	-	20 000	95 280
Vehicles	353 430	353 430	139 150	297 270	428 070	147 460	353 720	1 719 1[illegible]
Technical Equipment	222 390	222 390	85 720	267 660	53 330	69 760	115 430	7[illegible]
Total Capital Items	1 218 070	1 218 070	580 470	902 430	481 400	217 220	489 150	3 688 740
Contingency		-	844 205	1 136 675	1 248 340	1 360 730	1 449 705	6 040 655
Commitments		-						
Staff Termination Liabilities	275 730							
Aerial Treatment Contract	1 696 747							
Insecticides	319 000							
Buildings	372 380							
Furniture	14 700							
Vehicles	136 500							
Technical Equipment	94 500							
Total Commitments	2 909 557	-	-	-	-	-	-	-
TOTAL	7 530 182	4 590 142	6 831 700	9 248 300	10 400 000	10 900 000	11 700 000	53 673 142

TABLE 2: PROGRAMME HEADQUARTERS STAFF - OUAGADOUGOU

1974/1979 Budget
(in current US$)

	1974	Revised 1974 excluding long-term commitments and liabilities	1975	1976	1977	1978	1979	TOTAL
Annual Costs								
Personal Services	345 260	345 260	366 440	388 935	417 840	441 075	471 870	2 431 420
Operational Travel	66 910 1)	66 910	64 880	65 780	66 380	67 280	68 180	399 [illegible]
Consultants	62 400	62 400	72 000	79 200	86 400	93 600	100 800	494 400
Office rent	14 420	14 420	22 800	25 100	13 100	14 500	15 900	105 520
Supplies	23 520	23 520	15 000	15 000	17 000	17 000	17 000	104 520
Operations and Maintenance	34 440	34 440	18 190	20 010	22 035	24 240	26 660	145 575
Total Annual Costs	546 950	546 950	559 310	594 025	622 755	657 695	700 410	3 681 145
Capital Items								
Buildings	159 000	159 000	250 000	250 000	-	-	-	659 000
Furniture	17 010	17 010	-	-	20 000 2)	-	20 000 2)	57 010
Vehicles	38 850	38 850	-	630	29 000	1 170	2 370	72 020
Technical Equipment	31 080	31 080	5 000	5 000	5 000	5 000	5 000	56 080
Total Capital Items	245 940	245 940	255 000	255 630	54 000	6 170	27 370	844 110
Contingency	-	-	126 005	127 695	97 740	99 935	108 210	559 585
Commitments								
Staff Termination Liabilities	68 190							
Buildings	159 000							
Total Commitments	227 190	-	-	-	-	-	-	-
TOTAL	1 020 080	792 890	940 315	977 350	774 495	763 800	835 990	5 034 840

1) Includes travel to technical meetings ($ 39 350) previously shown under Contractual Services

2) Global provision of furniture for: Programme HQ (Ouagadougou), Vector Control Operations, and Epidemiological Evaluation.

TABLE 3: VECTOR CONTROL OPERATIONS

1974/1979 Budget
(in Current US$)

	1974	Revised 1974 excluding long-term commitments and liabilities	1975	1976	1977	1978	1979	TOTAL
Annual Costs								
Personal Services	464 660	464 660	828 090	1 212 330	1 470 485	1 573 310	1 694 415	7 213
Operational Travel	148 200	148 200	292 810	460 210	528 345	528 545	528 745	2 446
Aerial Treatment Services	221 602	221 602	757 240	1 219 790	1 961 630	2 428 250	2 549 690	9 138
Office Rent	19 880	19 880	79 600	54 400	66 900	73 600	81 000	375
Operations and Maintenance	198 660	198 660	293 520	494 710	619 930	678 150	746 930	3 031
Supplies (including insecticides) a)	158 460	158 460	512 210	960 000	1 376 230	1 366 160	1 479 415	5 852
Total Annual Costs	1 211 462	1 211 462	2 763 470	4 401 440	6 023 520	6 648 015	7 080 195	28 124
Capital Items								
Buildings	388 220	388 220	105 600	87 500	-	-	-	581
Furniture	29 500	29 500	-	-	-	-	-	29
Vehicles	253 680	253 680	139 150	296 640	317 440	146 290	251 230	1 604
Technical Equipment	156 140	156 140	64 620	246 360	11 830	48 060	93 430	620
Total Capital Items	827 540	827 540	309 370	630 500	329 270	194 350	444 780	2 735
Contingency	-	-	460 005	741 210	903 035	1 014 965	1 103 970	4 223
Commitments								
Staff Liabilities	112 270							
Aerial Treatment Contract	1 696 747							
Insecticides	319 000							
Buildings	173 630							
Furniture	14 700							
Vehicles	136 500							
Technical Equipment	94 500							
Total Commitments	2 547 347	-	-	-	-	-	-	-
TOTAL:	4 586 349	2 039 002	3 532 815	5 773 150	7 255 825	7 857 330	8 625 945	[illegible]

a) Includes for insecticides: $ 132 000 in 1974; $ 484 000 in 1975; $ 907 500 in 1976; $ 1 320 000 in 1977 and 1978, and $ 1 430 000 in 1979.

TABLE 4: EPIDEMIOLOGICAL EVALUATION

1974/1979 Budget
(in current US$)

	1974	Revised 1974 excluding long-term commitments and liabilities	1975	1976	1977	1978	1979
Annual Costs							
Personal Services	102 500	102 500	257 560	340 970	348 400	327 475	327 955
Operational Travel	13 950 1)	13 950	65 785	82 460	80 535	76 230	74 320
Office Rent	3 710	3 710	10 900	11 900	6 600	7 200	8 000
Operations and Maintenance	25 940	25 940	39 480	43 410	47 760	52 540	57 790
Supplies	3 990	3 990	41 800	44 800	48 000	51 400	55 100
Total Annual Costs	150 090	150 090	415 525	523 540	531 295	514 845	523 165
Capital Items							
Buildings	39 750	39 750	-	-	-	-	-
Furniture	8 770	8 770	-	-	-	-	-
Vehicles	60 900	60 900	-	-	81 630	-	-
Technical Equipment	22 570	22 570	11 100	11 300	11 500	11 700	12 000
Total Capital Items	131 990	131 990	11 100	11 300	93 130	11 700	12 000
Contingency	-	-	66 015	80 380	90 180	70 265	79 570
Commitments							
Staff Termination Liabilities	36 460						
Buildings	39 750						
Total Commitments	76 210	-	-	-	-	-	-
TOTAL:	358 290	282 080	492 640	615 220	714 605	666 810	614 755

1) including Flight Hours ($ 1 050) previously included under contractual services.

(In Current US $)

.Q AND REGIONAL OFFICE

	1974	Revised 1974 excluding long-term commitments and liabilities	1975	1976	1977	1978	1979	Total
Annual Costs								
Personal services	356 070	356 070	292 380	316 850	343 520	372 535	404 095	2 065 [illegible]
Consultants and advisors	83 620	83 620	72 000	79 200	86 400	93 600	100 800	515 [illegible]
Operational travel	50 130	50 130	27 840	29 240	30 670	32 260	33 880	20[illegible]
Supplies and services	20 790	20 790	16 000	16 000	16 000	16 000	16 000	10[illegible]
Meetings		-	100 000	100 000	105 000	105 000	110 000	[illegible]
Total Annual Costs	510 610	510 610	508 220	541 290	581 590	619 395	664 775	3 [illegible]
Capital Items								
Technical equipment	12 600	12 600	5 000	5 000	5 000	5 000	5 000	37 [illegible]
Total Capital Items	12 600	12 600	5 000	5 000	5 000	5 000	5 000	37 [illegible]
Contingency		-	79 410	82 100	84 715	93 995	99 565	439 [illegible]
Commitments								
Staff Termination Liabilities	58 810							
Total Commitments	58 810	-	-	-	-	-	-	-
TOTAL	582 020	523 210	592 630	628 390	671 305	718 390	769 340	3 [illegible]

FAO HQ AND REGIONAL OFFICE

	1974	Revised 1974 excluding long-term commitments and liabilities	1975	1976	1977	1978	1979	Total
Annual Costs								
Consultants/Advisors	41 290	41 290	63 000	69 300	75 600	81 900	88 200	[illegible]
Operational travel	3 120	3 120	3 800	3 800	4 000	4 200	4 400	23 [illegible]
Supplies and services	1 050	1 050	1 000	1 000	1 000	1 000	1 000	[illegible]
Total Annual Costs	45 460	45 460	67 800	74 100	80 600	87 100	93 600	[illegible]
Contingency		-	10 490	11 135	11 640	13 110	13 915	[illegible]
TOTAL	45 460	45 460	78 290	85 235	92 240	100 210	107 515	[illegible]

TABLE 6: RESEARCH AND TRAINING
1974/1979 BUDGET

(In Current US $)

	1974	Revised 1974 excluding long-term commitments and liabilities	1975	1976	1977	1978	1979	Total
RESEARCH								
Vector Ecology								
S. Damnosum Complex	95 928	91 360	102 000	102 000	102 000	102 000	51 000	530 360
S. Damnosum Sampling	83 380	79 410	89 000	89 000	89 000	89 000	44 000	479 410
Sub-total	179 308	170 770	191 000	191 000	191 000	191 000	95 000	1 029 770
Vector Control								
S. Damnosum susceptibility to insecticides	38 724	36 880	41 000	41 000	8 000	8 000	8 000	142 880
Biodegradability of insecticides	41 422	39 450	44 000	44 000	11 000	11 000	11 000	160 450
Insecticide safety for mammals	6 489	6 180	7 000	7 000	7 000	7 000	7 000	41 180
Insecticide evaluation	132 801	126 480	141 000	141 000	35 000	35 000	35 000	513 180
Equipment for insecticide application	63 808	60 770	69 000	34 500	34 500	-	-	198 770
Sub-total	283 247	269 760	302 000	267 500	95 500	61 000	61 000	1 056 760
Environment Protection								
Acute effects of insecticide formulations on non-target species	30 502	29 050	33 000	33 000	8 000	8 000	8 000	119 050
Long-term effects of insecticides	126 966	120 920	135 000	135 000	135 000	135 000	135 000	795 920
Sub-total	157 468	149 970	168 000	168 000	143 000	143 000	143 000	914 970
Contingency			102 280	94 155	62 030	59 460	44 455	362 380
Chemotherapy and Epidemiology								
Dynamics of Onchocerciasis transmission	61 800							
Drug trials	53 560							
Search for new drugs	127 720							
Sub-total	243 080	317 000	434 700	448 300	400 000	400 000	400 000	2 400 000
TRAINING								
Vector ecology and control	61 800							
Epidemiology and chemotherapy	13 080							
Sub-total	74 880							
TOTAL	937 983	907 500	1 197 980	1 168 955	891 530	854 460	743 455	5 753 [illegible]

ANNEX 7

AID 1020-29 (1-79)
SUPPLEMENT 1

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

(INSTRUCTION: THIS IS AN OPTIONAL FORM WHICH CAN BE USED AS AN AID TO ORGANIZING DATA FOR THE PAR REPORT. IT NEED NOT BE RETAINED OR SUBMITTED.)

Life of Project: From FY 74 to FY 79
Total U.S. Funding $8.0 million
Date Prepared: October 15, 1974

Project Title & Number: Onchocerciasis Control in the Volta River Basin

PAGE 1

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Program or Sector Goal: The broader objective to which this project contributes: (A-1)	Measures of Goal Achievement: (A-2)	(A-3)	Assumptions for achieving goal targets: (A-4)
The socio-economic development of a 655,000 km^2 area in the Volta River Basin.	1. Annual agricultural production increased by approximately 355,000 tons valued at $30 million. 2. Settlement of between 1-1.5 million people in areas freed of onchocerciasis.	National ag. statistics Government reports	1. Onchocerciasis is the relevant factor in abandonment of fertile river valleys in the Volta Basin. 2. Families can be induced to occupy the fertile river valleys without major tribal conflict. 3. Climatic conditions have been used in calculating the agricultural production levels will continue to be equally favorable in the future.

AID 1020-29 (11-72)
SUPPLEMENT 1

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Life of Project:
From FY _____ to FY _____
Total U.S. Funding _____
Date Prepared: _____

Project Title & Number: Onchocerciasis Control in the Volta River Basin

PAGE 2

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Project Purpose: (B-1)	Conditions that will indicate purpose has been achieved: End-of-Project status. (B-2)	(B-3)	Assumptions for achieving purpose: (B-4)
1. To interrupt the transmission of onchocerciasis for a sufficiently long period (20 years) to permit the disappearance of the parasite from the human population in the program area and to allow for reoccupation of river valleys in the Volta Basin. 2. Through applied research, to advance the state of knowledge of onchocerciasis and to refine methodologies for controlling the disease.	1. After 20 years: no active onchocerciasis infection in the program area population from which disease transmission could be reinstituted even should the area again become reinfested by S. Damnosum. 2. After 6 years: Vast areas will be permanently freed from the vector. 3. Increased knowledge gained of the epidemiology, transmission, and chemotherapy of onchocerciasis, the effects of larvicides on aquatic environments, new insecticides, sensitivity of the vector to insecticides, and equipment to best implement control programs.	1. Program epidemiological and entomological reports. 2. Program research reports	1. Maturation of S. Damnosum larvae in less than 7 days will not invalidate the plan to larvicide on a 7 day schedule. 2. Virtually total destruction of larvae in the program area can be achieved within 18 months after initiation of the campaign and the area thereafter kept free of S. Damnosum in order that there will be no surviving adult worms by the 20th year. 3. Transmission cannot be maintained by migrant flies coming from beyond the program area boundaries. 4. After a successful conclusion of the planned 20-year program, the simultaneous reintroduction of S. Damnosum and infected humans can be prevented

AID 1020-28 (1-73)
SUPPLEMENT 1

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Life of Project:
From FY _____ to FY _____
Total U. S. Funding _____
Date Prepared: _____

Project Title & Number: Onchocerciasis Control in the Volta River Basin

PAGE 3

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Project Outputs: (C-1)	Magnitude of Outputs: (C-2)	(C-3)	Assumptions for achieving outputs: (C-4)
1. Treatment with larvicides of all S. Damnosum breeding sites throughout the program area.	1. 1974-Phase I area; 1975-Phase II area; 1976-Phase III area	1. Program sector records	1. No major change in flow rate in the program area.
2. Location of all S. Damnosum sites ascertained and characteristics analyzed.	2. Mapping completed by conclusion of 6-month pre-larviciding period. Surveillance every 15 days by 55 sector and sub-sector surveillance teams.	2. Epidemiological reports	2. All S. Damnosum breeding sites can be identified.
3. Periodic evaluation of effectiveness of larvicidal treatment and modification of larvicidal procedures made as needed.	3. Surveillance every 15 days by 55 sector and sub-sector teams.	3. Epidemiological and entomological surveillance	3. Epidemiological sample studies can be successfully implemented over time.
4. Epidemiological studies of the human population of the program area.	4. Base-line study. Follow-up studies of 3,000 people every 3 years. Intensive studies on sub-sample annually.	4. Epidemiological reports	
5. Definition of behavioral characteristics and vector capacity of various genetic types of S. Damnosum.	5. All genetic types in program area studied.	5-9 Research reports	
6. Additional larvicides developed to be used in case insect resistance to Abate occurs.	6. A number adequate to overwhelm S. Damnosum resistance capacity.		
7. Development of effective drugs for treatment of onchocercal infections.	7. At least one new drug which will be fully effective.		
8. Manufacture and field evaluation of prototypes of equipment for the accurate delivery of specified dosages of larvicides	8. Prototypes of fixed wing aircraft and helicopters.		
	9. See p. 20 for details.		
	9. Trained Af. personnel to assist in implementing program, conducting research and maintaining surveillance.		

AID 1020-22 (11-73)
SUPPLEMENT 1

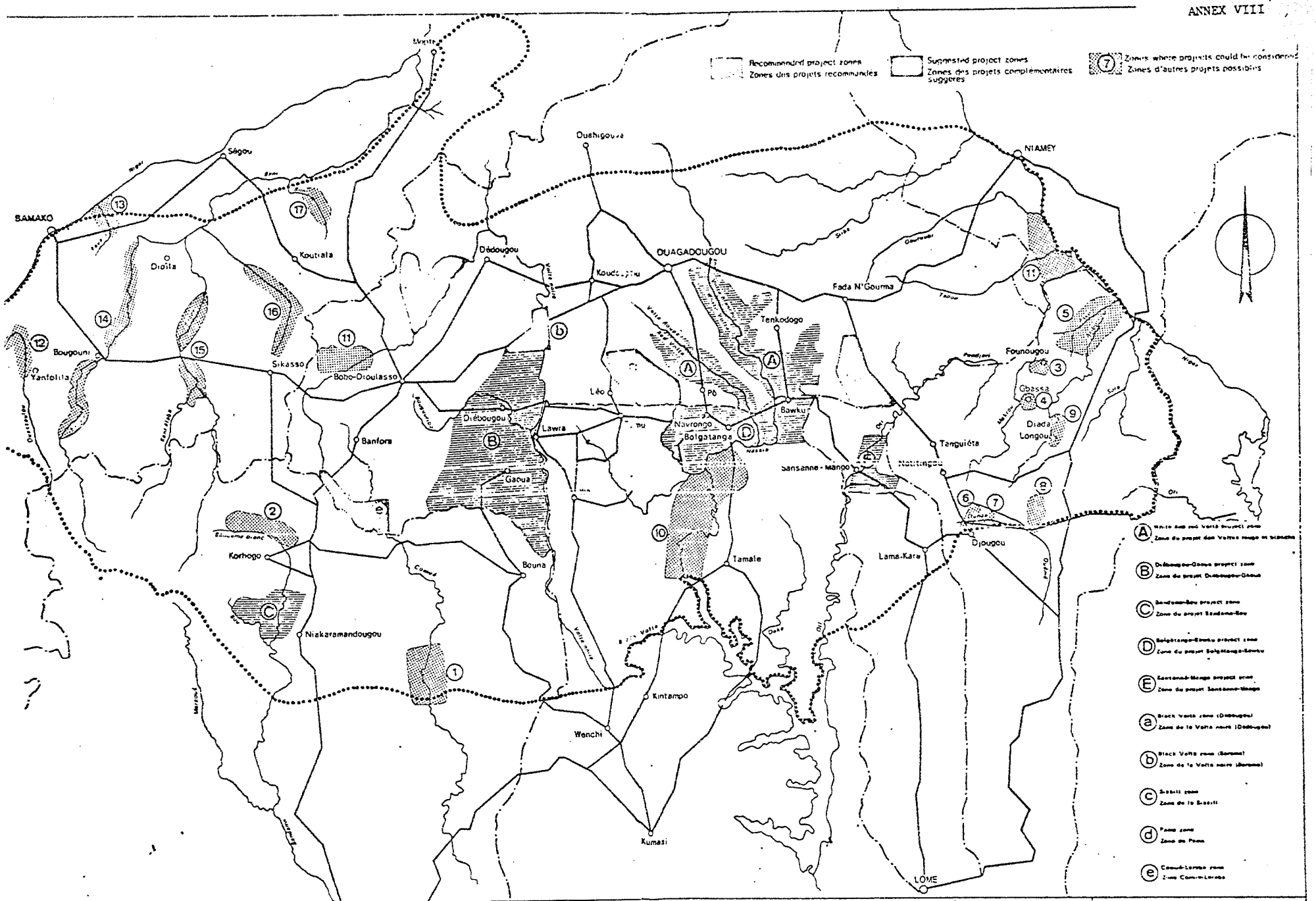
PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Life of Project:
From FY _____ to FY _____
Total U.S. Funding _____
Date Prepared: _____

Project Title & Number: Onchocerciasis Control in the Volta River Basin

PAGE 3

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Project Inputs: (D-1) 1. Personnel services 2. Aerial spraying 3. Insecticide 4. Research and training 5. Rental, supplies and maintenance 6. Capital items, including vehicles and buildings 7. Operational travel 8. Consultants including FAO support 9. Meetings. 10. Provision for contingencies	Implementation Target (Type and Quantity) (D-2) See PP for details	(D-3) Program records	Assumptions for providing inputs: (D-4) 1. Required professional and technical personnel can be recruited. 2. Construction of facilities can be completed on schedule. 3. Supplies of vehicle fuel, lubricants and spare parts are available. 4. Technical equipment will be received in good condition. 5. WHO headquarters, which has the responsibility for data processin will be able to receive and analyze material from the field in a timely fashion. 6. It will be possible to maintain the planned larviciding operations despite mechanical failures of equipment, inclement weather, etc.



ONCHOCERCIASIS CONTROL PROGRAMME IN THE VOLTA RIVER BASIN AREA

REGION DU PROGRAMME DE LUTTE CONTRE L'ONCHOCERCOSE DANS LE BASSIN DES VOLTAS

FIGURE : I.1.33

PROP

Onchocerciasis Control in the Volta River Basin Area

SYNOPSIS

Following a number of preliminary steps, it was decided in 1970 at the request of the Governments of Dahomey, Ghana, Ivory Coast, Mali, Niger, Togo and Upper Volta, to prepare a strategy for a programme destined to control onchocerciasis in the Volta River Basin area. The Preparatory Assistance Mission which resulted was set up by the World Health Organization in association with the Food and Agriculture Organization over the period 1971-73 and was financed by the United Nations Development Programme.

The main objectives of the Programme envisaged are twofold: to combat a disease that is widespread and severe in the area, and to remove a major obstacle to economic development.

Onchocerciasis is an infection by a parasitic filarial (threadlike) worm, Onchocerca volvulus, transmitted in the programme area by the bite of an infected female blackfly of the species Simulium damnosum. The fly itself becomes infected by biting an infected human host. Both man and fly are therefore essential elements in the life cycle of the parasite.

The clinical manifestations of onchocerciasis include intensely itching rashes, wrinkling, thickening and depigmentation of the skin, the characteristic skin nodules in which the adult worms are to be found, and eye lesions leading to blindness as the most serious consequences of the disease. Heavily-infected patients often lose weight and suffer from debilitation.

The larvae of the insect vector, S. damnosum, can develop only in fast-flowing rivers. Onchocerciasis is therefore a disease of the fertile areas flanking the rapids of rivers, hence its common name "river blindness". Moreover, apart from its role as a vector of disease, the blackfly constitutes an intolerable nuisance, the average number of bites per man per day sometimes amount to several thousand, although only a small proportion of these result in infections.

The savanna area of the Volta River basin is one of the worst endemic onchocerciasis zones in the world. On the basis of surveys carried out by the national health services, it is estimated that over 1 million of the 10 million inhabitants of the area covered by the programme (nearly 700 000 km^2) are infected by onchocerciasis, and that of these at least 70 000 are blind or have a serious impairment of sight.

Apart from the great personal suffering it causes, onchocerciasis has a two-fold destructive economic effect: not only is there a reduction in the productive capacity of those afflicted by the disease, but the blind and near-blind become a charge on society; inhabitants of the fertile valleys flanking the rivers migrate to poorer lands that are overcropped and, far from yielding marketable produce, do not provide an adequate means of subsistence. Furthermore, the persistent and critical effects of drought in the sahel and the savanna, following the failure of the rains in 1972 for the fifth successive year, have greatly complicated the already precarious socio-economic balance in the Volta River basin area.

Among the measures to control onchocerciasis that have been considered are:

(a) Mass chemotherapy. Unfortunately, the two available drugs of proved value - suramin and diethylcarbamazine - may have dangerous side-effects, and can therefore be administered only under close medical supervision. This precludes their use for mass chemotherapy in populations whose access to medical care is minimal. Research to find safer onchocercicidal drugs is under way, but has not yet resulted in a definitive solution.

(b) Biological control of the vector, using known predators, parasites, and pathogens of S. damnosum. This method is under study, but as yet is far from being of practical significance.

(c) Protection of the potential human host by chemical or physical barriers. The vector usually bites below the knee, and in theory the use of an effective insect repellent or protective clothing would interrupt the transmission of onchocerciasis. While such measures have a limited value in special circumstances, their mass application in the programme area would be quite impracticable.

Elimination of the insect vector by chemicals offers the sole means at present available for preventing the disease. This cannot be achieved by an attack on the adult fly because an immense area would have to be treated with insecticides - the flight-range of the fly may, in favourable circumstances, extend to as much as 150 km.

Only one line of attack remains: namely, to destroy the blackfly larvae in the circumscribed sites in which they mature. Fortunately, the physiological requirements of the larvae are such as to make such a method of control eminently feasible. Attached to their submerged supports, they depend on the fast-flowing water to bring them oxygen for their respiration and particulate matter, for their nutrition. Particles suspended in the water are ingested indiscriminately, whether or not they are of nutritive value, and ingestion of a chemical larvicide in adequat concentration results in the destruction of the larvae.

The desiderata for a chemical compound lethal to the larvae are: (a) that it should not unduly affect other forms of life ("non-target fauna"), especially fish that are of economic importance; (b) that it should soon be decomposed in the biological environment (biodegradability); and (c) that it should be possible to apply it to rivers in such formulations as will result in its ingestion by the larva together with other suspended particulate matter. The two compounds that best meet these requirements are Abate[1] and methoxychlor. Although DDT is also effective against the Simulium larva, its chemical stability and consequent persistence preclu its use.

Because of the inaccessibility by land of many of the breeding sites of Simulium, the only feasible method of applying the larvicide is from the air. In the case of large rivers that are sufficiently straight, light planes can be used, but narrow twisting waterways and those overhung by forest require the use of helicopters. In the rainy season, when the rivers flow swiftly, a single application may eliminate the Simulium larvae for up to 50 km downstream. In the dry season, relatively fast-flowing stretches of river may be interrupted by areas of still water, in which case each of these stretches must be treated separately.

Because of the long life of the adult worm in the human host, sufferers from onchocerciasis may remain infective for as long as 15 years even if not re-infected. The duration of a campaign to prevent the disease by eliminating its insect vector must therefore be not less than this length of time after the last new case in the programme area.

The strategy, cost and organization of the control campaign are presented in the report. For its execution, co-ordination of field operations will be assured by a headquarters at Ouagadougou, Upper Volta, which is centrally situated in the programm

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[1] This is a proprietary name. "Temephos" is under consideration by the International Organization for Standardization as a non-proprietary name for this compound.

area and in one of the most severely affected of the seven countries involved. The effects of the larviciding operations on the presence of Simulium will be under continuous surveillance and will include repeated tests of larval susceptibility to the compounds used as well as periodic hydrobiological studies of typical treated stretches to ensure that the biological equilibrium of the rivers is not seriously disturbed. The impact of the campaign on the prevalence and severity of the disease will also be continuously monitored by epidemiological teams.

The repopulation and/or settlement of the uninhabited fertile areas freed from the disease is a major objective of the Onchocerciasis Control Programme. Such action would also permit development measures to be taken in areas of high population density. It is expected that major reclamation of deserted land will be possible some 18 months after the start of insecticide treatment in the zone concerned. A series of reclamation plans based on the development of agriculture and stock raising has been studied and costed for the guidance of the Governments of the programme area.

Clinical, entomological, parasitological, sociological, economic, and agronomic studies of the overall consequences of onchocerciasis in the programme area have shown not only that control of the vector, and hence of the disease, is feasible but that - in addition to the relief of suffering, which must universally be recognized as an end in itself - wide-ranging socio-economic benefits would be made possible by the exploitation of lands that are now deserted although fertile.

It is planned to launch the Programme - which will last about 20 years - in 1974 after the endorsement by all concerned of the strategy proposed. Funds in the region of US$ 120 million will be required to finance the Programme and a Special Fund for onchocerciasis is being established.

As Executing Agency, WHO will assume technical responsibility for the Programme in conjunction with the Governments involved.

The executive organ of the Programme will be the Steering Committee for Onchocerciasis Control in the Volta River Basin area, representing the four sponsoring agencies (UNDP, FAO, IBRD and WHO).

I. INTRODUCTION

The problem

This deals with a disease that affects over a million people in the Volta River basin area covering nearly 700 000 square kilometers in seven countries of West Africa. The disease is onchocerciasis, or river blindness, which is propagated by a species of the blackfly (Simulium damnosum) that breeds in rapidly flowing sections of the rivers. The disease brings with it debilitation, misery and blindness and constitutes for the area the most important single deterrent to human settlement and the subsequent economic development of many fertile valleys, which lie uninhabited and unproductive. This situation inhibits the development of the vast savanna belt of the Volta River basin area, and countless thousands of families have left productive ancestral lands to crowd the adjacent areas where low-yielding, poor soil predominates.

For populations dependent on agriculture and cattle-raising the situation is economically crippling. Furthermore, the persistent and critical effects of drought in the sahel and the savanna, following the failure of the rains in 1972 for the fifth successive year have gravely complicated the already precarious socio-economic balance in the Volta River basin area, resulting in a population movement towards the south.

The first steps

Awareness of the extent of the problem had been steadily developing, particularly in the minds of the national authorities concerned, when in 1968 the World Health Organization (WHO) in joint sponsorship with the United States Agency for International Development (USAID) and the Organisation de Coordination et de Coopération pour la Lutte Contre les Grandes Endémies (OCCGE) convened a technical conference in Tunis to consider the problem of onchocerciasis. The Tunis meeting brought together the world's leading experts on onchocerciasis and its insect vectors, and its major objective was to assess whether the control of onchocerciasis is possible with currently available methods.[1]

The conference concluded that control is technically feasible, and that the chances of obtaining successful and lasting effects would be greatest if the control were carried out in ecological zones sufficiently large to obviate the need for continuous protection of the whole area against reinvasion by the blackfly vector.

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[1] World Health Organization (1969) Report of a joint USAID/OCCGE/WHO technical meeting on the feasibility of onchocerciasis control, Tunis, 1-8 July 1968, WHO/ONCHO/69.75, 60 pp., 1 maps

The possibility of launching a large-scale control programme led the meeting to recommend that priority should be accorded to onchocerciasis in Africa, and specifically to an initial campaign in the severely affected area of the Volta River Basin involving adjoining parts of Dahomey, Ghana, Ivory Coast, Mali, Niger, Togo and Upper Volta. The delineation of the area was dictated not only by the high prevalence of onchocercal infection there but also by reason of the severity of the disease and the manifestly high rates of blindness. Moreover, certain field operations were already under way in the area; some success had already been achieved and significant entomological, epidemiological and economic data accumulated. Above all, the recommendation regarding the area reflected the determination of the interested Governments, supported by public opinion, to cooperate in a control programme that was recognized to be a prerequisite for economic development, as well as for the health of future generations.

According this priority to the area of the Volta River Basin in no way precludes the future extension of control operations to neighbouring onchocerciasis foci in the African savanna zone. Although further studies will be required before extensions can be envisaged in some areas, the present scheme should serve as a basis for the formulation of operational patterns for subsequent expansions. Thus the Volta River basin scheme would constitute the cornerstone of future coordinated action against onchocerciasis and for the associated economic development in Africa south of the Sahara.

In April 1969 a further meeting was organized in Brazzaville by the WHO Regional Office for Africa to refine further the approach needed to secure technical assistance for the proposed campaign.[1] Experts from the Government of Ghana, OCCGE and USAID, in addition to WHO representatives, attended these discussions.

Requests from Governments

Shortly thereafter, in 1969 and in 1970, several of the interested countries submitted formal requests - emanating from the highest authorities - to international and bilateral sources of assistance liable to be interested in supporting this great undertaking which was taking practical shape. Among those organizations were the Fonds Européen de Développement (FED), the Food and Agriculture Organization of the United Nations (FAO), the International Bank for Reconstruction and Development (IBRD), the United States Agency for International Development (USAID) and the World

[1] World Health Organization (1969) Report of a preliminary meeting on the extended onchocerciasis control project in the Volta River Basin, Brazzaville, 30 April - 2 May 1969, AFR/ONCH/13, 36 pp

Health Organization (WHO). Simultaneously the United Nations Development Programme (UNDP) manifested its interest in the subject, particularly as it was already financing a WHO onchocerciasis project in West Africa.[1]

Preparatory Assistance to the Governments (PAG Mission)

On the basis of the requests received and at the suggestion of IBRD, WHO and UNDP sponsored a planning meeting in Geneva in July 1970 which brought together representatives of the Conseil de l'Entente,[2] the Government of Ghana, and OCCGE, FAO, FED, IBRD, UNDP, USAID and WHO. At this meeting terms of reference were drawn up for a mission designed to carry forward, on behalf of the seven Governments concerned, the essential preparatory work required for the definition of an overall strategy for the proposed onchocerciasis control programme. The Mission was scheduled to start in mid-1971 and initially programmed for one year - this was later extended to cover the whole of the year 1972. The Administrator of UNDP agreed to provide the necessary funds and accordingly nearly US$ 0.2 million was allocated to WHO as the Executing Agency in association with FAO, which accepted responsibility for certain aspects of the work.

The PAG Mission received as its mandate[3] a major two-fold objective. In the health sector, it was requested to prepare a plan of work to achieve control of onchocerciasis over the entire recommended project zone, taking into account economic development of reclaimed areas; to work out the expected costs and benefits of the scheme; and to analyse the possible financial resources available. In the economic sector, the Mission was later called upon to identify areas within the project zone, which owing to their economic potential and location in relation to centres of population density, offered development possibilities; it was requested also to draft preliminary terms of reference for feasibility studies to be conducted later in these areas.

The Government of Upper Volta agreed to act as host to the PAG Mission and to place at its disposal premises at Ouagadougou for its headquarters which were set up in August 1971. Operating from Ouagadougou, the Mission has benefitted from the full collaboration and encouragement of the Government of Upper Volta and the Governments of the other six countries in which it has carried out its activities.

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[1] The Onchocerciasis Advisory Team (RAF/72/188) assigned to Northern Ghana, Togo and Upper Volta and operating from Bolgatanga, Ghana.

[2] A consultative body in which the Governments of Dahomey, Ivory Coast, Niger, Togo and Upper Volta participate.

[3] The terms of reference of the PAG Mission are set out in Annex O-1.

The staff of the Mission comprised a Chief of Mission, an entomologist, a general economist and an administrative officer, supplemented by short-term consultants on aerial larviciding operations, a project planning (costing) expert, a statistician, two human geographers, an agricultural production economist, an agricultural (costing) economist, an agriculturalist, a sociologist, a veterinarian and two development economists. In addition, the Mission received considerable support from the WHO regular research programmes, including operational research conducted with funds provided by the Governments of the Federal Republic of Germany and the United States of America.

Research undertaken by the Onchocerciasis Unit of the Ministry of Health of Ghana, by the Centre Muraz and Ophthalmological Institute of OCCGE, and by ORSTOM[1] has proved of invaluable help in the study of the disease and its vector and in the development of an appropriate methodology for epidemiological evaluation. The collection of data has been made possible through the cooperation of the departments of health, agriculture, economics and planning and their related bodies in all the countries concerned. During its assignment the PAG Mission reinforced its affiliations with ancillary work in progress, such as the entomological studies being performed in northern Ghana, the FED campaign in the Comoe-Leraba region, OCCGE's Onchocerciasis Section, and hydrobiological work on Lake Volta.

Apart from the continuous technical contacts maintained by the PAG Mission with local and international bodies, a series of meetings took place during the PAG Mission's assignment to review progress and advise on the future work. Discussions of current problems, particularly in logistics took place at Ouagadougou in September 1971 between the Upper Volta authorities and representatives of WHO and FAO, with the participation of an IBRD representative. A review meeting was held at WHO headquarters in Geneva in February 1972, and this was followed by a full project review meeting in Geneva in July 1972. In October of the same year a planning meeting between the regional and field representatives of UNDP, FAO, IBRD and WHO was organized in Accra, Ghana.

The Steering Committee

Meanwhile, in April 1972, the Director-General of FAO, the President of IBRD, the Administrator of UNDP and the Director-General of WHO decided in view of the importance and complexity of the scheme envisaged, to set up a Steering Committee for Onchocerciasis Control comprising a representative from each of the four agencies.

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[1] Office de la Recherche Scientifique et Technique Outre-Mer supported by the Government of France.

The Steering Committee had a general mandate to ensure coordination of the action taken by the four agencies in the planning and implementation of the programme. The Committee held its first session in July 1972 in Geneva and subsequent meetings in October 1972 (New York), February 1973 (Geneva), May 1973 (Geneva) and July 1973 (Rome). The Steering Committee has thus been able to monitor the progress of work during the various preparatory phases, discuss technical, administrative, financial and logistic matters and review the form and content of the present report.

Extension of the work in 1973

Among the major recommendations made by the Steering Committee at its first session was that the preparatory work phase should extend through 1973. Accordingly, an interim project covering the year 1973 was formulated to allow operational research to proceed in the form of field trials in a pilot zone, to adjust the aerial spraying technique and refine its costing; the interim project also included the initiation of field trials with established drugs. Another important part of the work was establishing firm baseline data to enable progress to be continuously checked during the proposed Onchocerciasis Control Programme. In addition the interim project was requested to review the possible ecological changes that might ensue and suggest precautions that should be taken; and also to plan and launch the training programme for national staff.

On the understanding that other financial assistance would be forthcoming for the full programme scheduled to start in 1974, the Administrator of UNDP agreed to extend the financial support to the PAG Mission to maintain the interim project in 1973. The sum allocated was approximately US$ 0.5 million, but this was later increased to nearly US$ 0.6 million.

Onchocerciasis Control in the Volta River Basin Area

II. Logical Framework (Narrative):

A. Project Goal:

1. Goal Statement:

The goal of this project is the socioeconomic development of an area in the Volta River Basin which encompasses approximately 655,000 square kilometers of land, of which 65,000 km^2 are abandoned valleys, and has an estimated total population of 10,100,000 people. The main objective of the development programs that are to accompany the onchocerciasis control program are to maximize the enormous potential socioeconomic benefits which will arise from the control of this disease. Goal accomplishment requires the transference of several million people from a subsistence, or below subsistence, level to a higher status which not only will provide them with an adequate standard of nutrition but also permit them to satisfy their minimum economic needs and to participate in a cash economy. The onchocerciasis control component of the total project seeks to remove the cause of existing disequilibria in the area which include: (a) overpopulation and over-exploitation of soils in highland areas where the prevalence of onchocerciasis either is low or the disease is absent, (b) extremely low population densities or complete desertion of fertile river valleys, (c) an inadequate and unequally distributed infrastructure which is incompatible with development of the economic potential of the area and (d) a generally low level of incomes which necessarily must be greatly improved in order to achieve an improvement in the quality of life.

2. Goal Rationale:

A basic assumption in the design of this project is that the parasitic disease onchocerciasis, i.e., river blindness, which is caused by the worm Onchocerca volvulus and is transmitted by the biting black fly, Simulium damnosum, is predominantly if not solely responsible for population desertion of fertile river valleys and consequent heavy population concentrations in the highland areas. Government, economists and public health officials in the countries concerned have openly expressed distress concerning the impact they feel onchocerciasis has upon economic development. Acceptance of this basic premise has not been based solely upon such impressions. Indeed, additional efforts have been made to confirm or reject the hypothesis. Data which it has been possible to collect, while not providing indisputable proof of the cause and effect relationship between onchocerciasis and desertion of the fertile river valleys that have dense concentrations of S. damnosum, do provide indirect quantitative evidence which supports this hypothesis. The tests in questions have examined the correlations between the size of village and prevalence of blindness, patterns of population movements within the project area, and age/sex ratios in areas with different prevalence levels of onchocerciasis.

There is an exponential association between village population and prevalence of blindness (correlation coefficient $r = -0.523$).

In another analysis, a total of 1,757 communities were grouped according to population as follows: group one - 40 to 199 inhabitants,

group two - 200 to 699 persons and the remainder having 700 or more residents. Onchocerciasis prevalence rates in excess of 50% were found in 22% of the smallest communities as compared with 10% of those in group two and only 2% in the group three towns. Although this striking association supports the hypothesis of a causal relationship between onchocerciasis and emigration, it is also compatible with an hypothesis that villages with high frequencies of onchocerciasis are located "at the end of the road" where difficult subsistence is coincidental with high exposure to infected black flies with a consequent high prevalence of blindness.

Further evidence, however, tends to support the hypothesis that onchocerciasis is a major determinant in the small sizes of villages in the high prevalence onchocerciasis areas. Census data from Tumu district, northern Ghana, in which onchocercal blindness prevails, reveals a negative correlation between population growth rates and blindness rates during the seventeen year period between 1931 and 1948.

Migratory movements of people in the hyperendemic areas of northeastern Ghana during the past decade reveal an overall migration loss of up to 2.9% per annum from the riverine areas to upland water shed areas. Aerial photographs, ground surveys and oral histories indicate that this retreat has been in progress since 1910 to 1915. Field studies of the intensity of onchocerciasis infections and prevalence of onchocercal nodules reveal the disease probably to be the primary cause of retreat and, in addition, geographic patterns of onchocerciasis and

blindness strongly correlate with the patterns of abandonment. Similar patterns have been found in Upper Volta and other parts of the program area.

Age sex ratio calculations suggest that young males in the economically active age group of 15-44 years are tending to leave the project area because insufficient land is available even to support a family at subsistence levels. In the hyperendemic and densely populated area of northeast Ghana for example, the ratio averages 65 males per 100 females and falls to 55-60 males per 100 females in some districts in comparison with the ratio of 93 males per 100 females for the whole of Ghana.

Mapping of population densities also correlate negatively with the prevalence rates of onchocerciasis. In northeast Ghana, the areas adjoining the large river systems have densities below 20 people per km^2, extensive areas only 2-6 people per km^2, and large areas are unoccupied. On the other hand, at higher elevations of the water shed densities increase sharply to 60-120 persons per km^2 and sometimes as much as 160 per km^2. Similar patterns occur in other territories in the program area.

The retreat from the river valleys has placed on the plateau lands a burden of human occupation that cannot be supported.

3. Goal End of Project Status:

a. General

The total area of abandoned valleys is estimated at 65,000 km^2, i.e., 6,500,000 hectares. It is expected that full development of

the potential of the area will continue beyond the planned twenty year period of the program now under consideration. It is the expectation, that after twenty years of onchocerciasis control operations, all of the adult onchocercal worms in the population will have died. The maximum life of such worms is about 18 years. It is therefore expected that by the end of the twenty year control operations, transmission of onchocerciasis cannot be reinstituted even if the river valleys are reinvaded by heavy densities of Simulium damnosum. Consequently, onchocercal blindness would cease to be a significant problem.

Socioeconomic development plans encompass ten separate project areas, and the prospects for similar developments in two of the countries, Mali and Niger, have not yet been assessed. In Dahomey, about 40,000 hectares have been identified as suitable for agricultural development but as yet plans for this area have not been completed and therefore are not considered in the projection of end of project status.

It is expected that population pressures can be greatly relieved in the densely populated areas by the transfer of 800,000 people into the deserted valleys in the 12,000 km^2 that comprise the ten currently planned projects. Considering that average family size has been estimated as six people and allowing one hectare per person, leads to the expectation that approximately 134,000 new farms will have been created. It is further estimated that production from the new farms will total about 355,000 tons annually of sorghum, millet, maize, rice, cotton, ground nuts, and sesame.

Although there is good reason to believe that control of onchocerciasis will make possible the agricultural development of vast abandoned areas, this alone is inadequate to insure the economic development of the program area. Accordingly, it is expected at the end of the project that not only will a much more favorable distribution of population have been achieved in addition to increased agricultural production, but there will also be improvement in the land tenure system, and the necessary infrastructure required for socioeconomic progress in the program area will have been developed. Infrastructure networks are interpreted to include not only those services and facilities necessary for agricultural activities, such as wells, storage facilities for grain, repair shops for equipment, and meeting rooms for training courses and extension work but also facilities necessary for human needs including potable water supplies, health centers, medical posts and schools.

4. Goal Assumptions:

a. Onchocerciasis is the relevant factor in abandonment of fertile river valleys in the Volta Basin.

b. Total interruption of onchocerciasis transmission can be achieved and maintained over the planned twenty year control program period.

c. Families can be induced to reoccupy the abandoned fertile river valleys and tribal conflicts, which could significantly deter agricultural development efforts, would not develop.

d. Climatic conditions which have been used in calculating the agricultural production levels will continue to be equally favorable in the future.

B. Project Purposes:

Explanatory Remarks:

As previously indicated, the total scheme for development of the Volta River Basin includes two major programs. These are, respectively, the socioeconomic development program which is concerned with the development of new farms and infrastructures in the abandoned fertile river valleys, and the onchocerciasis control program which is considered to be a prerequisite for economic development of the area. Plans for the economic development program are incomplete at this time. However, the cost-benefit estimates that have been prepared for ten projects indicate an internal total return of 10% over the 35 year life of the project over and above the cost of the spraying campaign and the total cost of the economic development programs. This rate may be slightly over-estimated, since the calculations for a 30,000 hectare tract of land in Togo appeared to have included a value figure for agricultural production without including a cost of the economic development effort. Excluding Togo, the economic development cost are estimated at $118,196,000 for the ten projects. This amount would be over and above the $120,000,000 that has been programmed for the onchocerciasis control component, which is the sole subject of this PROP. It is expected that a separate PROP will need to be prepared for the economic development component at a later date.

1. Onchocerciasis Control:

a. *Simulium damnosum* larviciding operations:

1) Objective:

The objective of the *Simulium damnosum* control campaign in the Volta River Basin is to interrupt the transmission of

onchocerciasis for a sufficiently long period to permit the disappearance of the parasite from the human population in the program area. Since onchocercal worms survive up to approximately 18 years, a 20 year control campaign has been planned. This campaign will need to be highly effective, since in this area low densities of S. damnosum are sufficient to insure the persistence of onchocerciasis transmission. It is proposed that the point of attack for interrupting transmission of this disease be the larval stage of the vector fly, S. damnosum which matures in rapidly flowing turbulent water. The aim of the larvicide campaigns is to eradicate S. damnosum by treating breeding places of the species at intervals of time less than that required for larval development, since both eggs and the pupas show very little susceptibility to insecticides. Under the average conditions encountered in the Volta River Basin, this implies weekly treatment.

An additional objective is to achieve these results with a minimum expenditure and with a minimum of insecticide so as to avoid any useless disturbance of the freshwater biological equilibrium. The larvicides employed should have no tendency to accumulate and their acute toxicity for the non-target fauna should be as small as possible. Susceptibility of S. damnosum to the insecticide being operationally employed will be examined periodically and replacement insecticides substituted in the event that tolerance or resistance appears in any given program area.

It is intended that all S. damnosum breeding sites will be subjected to larvicide treatments at weekly intervals during an initial phase of several weeks. Thereafter, application of the insecticides will be limited to those sites which still contain larvae and others

situated in areas where adult S. damnosum remain plentiful. Application of the insecticides to the breeding sites will be made by fixed wing aircraft when the breeding sites are situated in large strong flowing rivers that are open to the air. Helicopters will be used for smaller water courses in which breeding sites are frequently concealed by vegetation and other situations where only small or moderate amounts of insecticide are required.

a. Performance Targets:

The simultaneous launching of vector control operations throughout the program area has not been considered feasible in view of the many problems that might arise involving logistics, infrastructure, staff training, etc. It is proposed, therefore, to spread the starting times over a period of three years from 1974 to 1976 inclusive. Phase I operations beginning in 1974 are to cover the Black Volta, Comoé-Léraba, Bandama and Banifing Basins as well as the isolated onchocerciasis focus of Bandiagara. Phase II operations beginning 1975 will extend to the neighboring Red Volta, White Volta and Daka Basins. Phase III starting in 1976 will incorporate the Basin of the Oti-Pendjari and the valleys of the southern tributaries of the Niger river. Operations in each of the three operational areas are scheduled to begin after the end of the rainy season when the S. damnosum population decreases naturally.

It is expected that major economic reclamation of deserted lands will be possible some 18 months after the start of insecticide treatment in each particular zone. (OCP/73.1, pages 47 and 50).

b. End of Project Status:

(1) By the end of the 20th year of the program, there should be no active onchocerciasis infection remaining in the population from which disease transmission could be reinstituted should the area again become reinfested by S. damnosum.

(2) After 18 months in each of the control operations areas all S. damnosum breeding sites should have been located, treated with effective larvicides, and breeding brought to a virtual halt except in-so-far as it may be reinstituted by migrant flies.

(3) Within 3 to 6 years after the start of vector control operations, vast areas will be permanently freed from the vector. By then the problems of reinfestation of treated areas should be well known both as regards the reinfestation routes and those sectors in which breeding is most likely to be reinstituted.

c. Means of verification:

Three other major components of this program will serve to evaluate the efficacy of the control operations. These are the entomology, epidemiology, and applied research components, all of which are discussed below.

d. Important Assumptions:

1) Maturation of S. damnosum larvae in less than seven days will not invalidate the plan to larvicide on a seven day schedule.

2) Virtually total destruction of larvae in the program area can be achieved within 18 months after initiation of the campaign and the area thereafter kept free of S. damnosum in order that there will be no surviving adult worms by the 20th year.

3) Transmission cannot be maintained by migrant flies coming from beyond the program area boundaries.

4) After a successful conclusion of the planned 20 year program, the simultaneous reintroduction of S. damnosum and infected humans can be prevented.

2) Outputs:

The sole output of the Simulium damnosum control operations is the effective treatment with larvicides of all S. damnosum breeding sites throughout the 655,000 km^2 program area at sufficiently frequent intervals as to achieve the permanent interruption in the transmission of onchocercal infection. The control program is designed to attack the S. damnosum larvae because neither the eggs nor pupae are susceptible to existing insecticides. Since, in the Volta River Basin larval development of S. damnosum generally takes just over a week, and since females probably do not live more than six to eight weeks under the most favorable conditions, it is considered sufficient that the insecticide be applied to the breeding sites at weekly intervals for more than two months. The 700,000 km^2 control program area has been selected because in the past campaigns that were conducted in much more limited areas reinfestation quickly occurred with the consequence that disease transmission was rapidly reinstituted. Lack of permanent surface access routes prevented treatment of all breeding sites over a large area such as the one proposed in this program. The present program will solve the problem of access routes through the use of helicopters and fixed wing aircraft and by covering all of the Volta River Basin will reduce the risks of reinfestation to which smaller project areas would be susceptible.

a. Output Targets:

Control operations will be phased in over a period of three years from 1974 to 1976. Phase I operational area will cover the Black Volta, Comoa-Leraba, Bandama and Banifing Basins, as well as the isolated onchocerciasis foci of Bandiagara. It is anticipated that in this area a maximum of 4,695 liters of insecticide (unformulated) will be dispensed annually in the treatment of breeding sites. The annual output in flying time will be approximately 110 hours and 30 minutes.

Phase II control operations will include the Red Volta, the White Volta and Daka Basins and calls for the application of 6,544 liters of insecticide (unformulated) involving 171 hours and 42 minutes of flying time annually.

Phase III which will begin in 1976 incorporates the Basin of the Oti-Pendjari, and the southern tributaries of Niger River flowing into Dahomey, Ivory Coast, Niger and Upper Volta. Additional surveys of the last river basins are needed in order to present definite flight and treatment plans but according to preliminary estimates, a total of 14035 liters of insecticide (unformulated) will need to be applied during 336 hours and 58 minutes of flight time.

b. Means of Verification:

Three methods for verifying outputs can be employed. The first, involves initiation of operations in the three different project operational areas during each of the consecutive years from 1974 through 1976. Since it is planned that insecticiding operations will

will begin after the end of the rainy season in each area, it will be possible to verify progress by inspecting purchase orders for the necessary equipment, recruitment of personnel and the condition of the operational bases, both main base and secondary bases. Second, a check of invoices for and stores of fuel and insecticides will provide some indication of whether or not the planned operational program is being carried out. Third, and probably the most meaningful method of verification, involves the matching of the entomological surveillance data from the field with operational insecticide records, especially flight patterns, insecticide treatment points, and the amounts of formulated insecticide applied at each point.

c. Assumptions:

Suitable conditions for the breeding of *Simulium* spp. are provided by rapidly flowing turbulent water which contains rocks or vegetation to which the larvae can attach. Development of the present operational plan has relied heavily not only upon field entomological surveys but also upon the collection of hydrological data from many of the waterways throughout the rainy and dry seasons. The latter data of course are essential for the calculation of the quantities of insecticides that will be required. A number of changes therefore could alter the magnitude of the output levels. For example, the turbulence downstream of dams provides an ideal setting for *Simulium* breeding. The construction of such dams throughout the now abandoned fertile valleys as the agricultural development program progresses could significantly alter the level of

output required. Significant changes in flow rates such as might occur during a prolonged rainy or dry season would also alter the required output levels.

3) Inputs:

Project inputs include personnel, equipment, capital improvements at operations bases, hydrological stations and expendable supplies. As each successive phase of the S. damnosum control campaign is initiated during the period 1974 through 1976, the annual project budget increases from $979,600 in 1974 to a total of $2,213,830.00 in 1976. Purchases of helicopters, fixed wing aircraft, radio equipment, and the construction of buildings at the operations bases constitute major expenditures during these three years. Except for building maintenance, no additional expenses for construction or radio equipment are anticipated after 1976. However, in 1977 the purchase of two more helicopters and one fixed wing aircraft is planned to complete the operational aircraft fleet of six helicopters and three fixed wing aircraft. The annual budget for the entire larviciding operation reaches a maximum in 1977 to $2,448,660.00 because of the aircraft purchases at a time when the operational program is fully staffed and the maximum expected amounts of fuel and insecticide are being consumed throughout the full year.

It is expected from 1978 through the end of the program the annual cost of this component will be in the order of $2,260,410.00. Of this amount, the major annual expenses are $882,000 for insecticide, $593,000 for the salaries of pilots and engineers, $262,000 for depreciation and insurance on the aircraft and $115,000 for fuel.

All expenses are based upon the U.S. dollar exchange rate in July 1972.

Field trials which were completed earlier in the program area revealed that fixed wing aircraft, which always travel at a considerable speed, are not able to apply insecticide accurately in water courses that are winding, narrow, or covered partially by a forest canopy. On the other hand, the helicopter can carry out these applications much more efficiently and, if necessary it is always possible to land near the treatment site and apply the insecticide by hand. Moreover, with the helicopter it is easier to adjust the way in which the insecticide is applied; it may either be sprayed in a dense mass to obtain long range larval kills downstream when the river is in spate or it may be sprayed over a wide area to give effective coverage, at low water, to the downstream breeding sites that are the closest to the treatment point. The earlier comparative study of the characteristics of these types of aircraft and of the corresponding plans of operation in actual field trials have been supplemented by a large number of simulation exercises on charts supported by cost-effectiveness studies. As previously described, the solution which has adopted up to this point is based upon the simultaneous use of medium sized airplanes and helicopters, the fixed wing planes being used for large, strong flowing rivers that are open to the air, while the helicopter will be sued for smaller water courses that are frequently concealed by vegetation and require only samll or moderate amounts of insecticide. It should be noted however that simulation exercises and economic analyses are continuing in an effort to find out whether it would be possible to work out a plan of operations at the samo cost, using only

one type of aircraft. This would have considerable advantage with regard to the maintenance of the machines and the subcontracting of treatment.

HF radio communication network, if possible using a frequency especially assigned to the program will permit the rapid exchange of information between air crews, the entomological surveillance sectors, and the program headquarters. It is planned that fixed radio stations will be established at the headquarters of each sector and in surveiallance centers of strategic importance that are a long way from the headquarters of the corresponding sector. The fixed network would be supplemented by Landrovers equipped with both HF and VHF transmitter-receivers which will make it possible to maintain contact with the aircraft whenever the situation requires, particularly during geographical reconnaisance and the evaluations of equipment and formulations.

In addition to the fixed radio stations, other buildings which will need to be constructed during the first three years of the program include: aircraft hangars, sector stores, garages and accommodations for personnel, particularly pilots and possibly engineers, in towns where present accommodation facilities are limited.

The timetable for providing staff, aircraft minor service equipment, hydrological stations, fuel, and insecticide is presented in Annex I attached to this PROP. Annex II is the budget for this component of the total onchocerciasis control program.

d) Assumptions:

1) Because of the rapidly increasing costs of fuel and other inflationary pressures, the cost of this component, especially, will be higher than originally estimated.

2) Timely procurement and delivery of necessary equipment and supplies will be accomplished.

3) It will be possible to maintain the planned larviciding operations despite mechanical failures of equipment, inclement weather, etc.

4) The mandatory requirement that all breeding sites can be located and treated with such efficiency and effectiveness that no adult S. damnosum females can emerge will be achieved throughout the planned program's duration, the possibility of larval migrations notwithstanding.

5) Migrant flies from beyond the project's boundaries will be unsuccessful either in maintaining transmission of onchocerciasis, or in reestablishing breeding within the area of control activities.

6) Adulticiding will not be required.

b. Entomological Surveillance

(1) Objective:

The multiple objectives of the entomological surveillance component of the total program vary at different stages in the campaign to eliminate S. damnosum by means of larviciding. Before larviciding operations actually begin, it is the responsibility of the entomological surveillance teams to ensure that all potential S. damnosum breeding sites have been located and that their characteristics have been analyzed. Throughout the remainder

of the twenty year control program, the entomology teams will have responsibility for evaluating the effectiveness of larvicidal treatment and of instituting any changes which may be required in the application of insecticide to insure that complete interruption of onchocerciasis transmission is achieved as planned. In discharging these responsibilities, the teams will undertake the collection of hydrological data to determine those points which need to be treated and the doses of insecticide which are to be applied. Under special conditions, they will also undertake the ground application of insecticides to those breeding sites which cannot be treated by aircraft.

Special efforts are to be made to identify those routes by which migrant flies most frequently reinfest the area and to identify specific sectors in which breeding is most likely to be renewed by migrant flies. If reinfestation occurs only by means of a limited number of routes and if breeding can be shown to become reestablished only in limited areas, then it may be possible to reduce the surveillance network an appreciable degree after completion of the initial attack phase.

Measurement of the intensity of onchocerciasis transmission at selected points will be undertaken by the entomology teams during the initial years of the program in order to collect baseline information for the epidemiology component which is not scheduled for activation until three to six years after the control program has started.

The final objective of the entomological surveillance component is to provide entomological support to the applied research program

in studies on the S. damnosum complex, the insect vector's susceptibility to different insecticides, the hydrobiological research program, and in any other operations within their area of competence that are applicable to other field research activities.

a) Performance Target:

The program area is being divided into three permanent bases, seven sectors, and 24 subsectors. This arrangement provides areas of responsibility which are small enough to be covered forenightly by a collection team. Such teams are required to transmit information rapidly to a sub-regional or regional decision making center for appropriate action. Since the larviciding campaign is being implemented in 3 phases, it is intended to begin entomological surveillance six full months before the start of insecticide treatment in each of the 3 operational areas in order to collect basic data which are not now available and to familiarize teams with the area one rainy season in advance of the initiation of insecticide treatments.

The plan calls for activation of entomological surveillance networks on May 1, 1974 throughout the Bobo-Dioulasso sector, the Korhogo sector, at Tamale and in one of the 4 subsectors in the Tamale sector. In preparation for phase II of the campaign, the entomological surveillance networks are to be established on May 1, 1975 in the remaining subsectors of Tamale, at Ouagadougou, and in three of the five subsectors in the Ouagadougou sector. Completion of the network throughout the program area is scheduled for May 1, 1976 with the establishment of teams in the remainder of the Ouagadougou subsectors and the sectors and subsectors of Bamako, Sokode and Natitingou.

It is further expected that substantial reductions in the level of surveillance activities may be possible during the period between January 1, 1978 and January 1, 1980. This is predicated apparently upon the premise that by then many areas will have been permanently freed of Simulium damnosum breeding and that attention can be focused upon clearly defined reinfestation breeding sites.

b) End of Project Status:

The end of project status given for the Simulium damnosum control operations are applicable to this activity since entomological surveillance is supportive of the larval control effort. In addition, however, the accomplishment of certain specific tasks by the entomology teams during the course of the control campaign will determine to a large extent the success of that campaign. These are visualized as follows:

(1) Both the mapping and characterization of most of the active S. damnosum breeding sites should have been completed in each of three operational areas by the conclusion of the six month pre-larviciding period.

(2) Data collected on breeding site characteristics will have proven satisfactory for determining the method of larvicide application, i.e., by helicopter, fixed wing aircraft, or ground based personnel, and also will have proven satisfactory for determining the minimum effective insecticide doses that are necessary at different flow rates throughout the river systems.

(3) It very likely is unrealistic to expect that all breeding sites can be localized prior to the initiation of active larviciding. The duration of time that further efforts will be required to accomplish this task cannot be predicted with any degree of reliability. Recognizing that this is a very difficult task, it is tentatively projected that all breeding sites will have been identified at least by the end of three full years of larviciding operations.

(4) The feasibility will have been determined of identifying breeding sites which regularly are reactivated by migrant flies which use well established migratory routes to reinfest the area; and the feasibility will have been comprised of separating these sites from other breeding sites which, having been freed of Simulium, no longer constitute a threat to the program area. It is arbitrarily suggested that this may have been accomplished within the first six years of larviciding operations.

Means of Verification:

Provision has been made in the design of this component of the program to employ two out of three possible methods for verifying the efficacy of entomological surveillance in guiding a successful larvicide operational campaign. The two verification methods incorporated in the design are supervision of entomological surveillance by project personnel and epidemiological field studies to determine whether or not interruption of disease transmission has in fact been achieved. The third verification method which has not been provided for would be an external review of the entomological surveillance activities by non-project personnel.

Project supervision will be vested in a qualified entomologist assigned to each sector. In addition to this technical supervision, at least one roving team will be assigned to each sector for the purpose of carrying out all operations outside the fixed program and to make spot checks on the results achieved by the regular sector and sub-sector teams. Aircraft are to be employed by entomologists and senior entomologist technicians for the purpose of inspecting critical areas in their respective sectors and sub-sectors when space is available and when this can be accomplished without any substantial change in the aircrafts flight plan for larviciding operations. It is proposed further that supervision be facilitated by allowing representatives of the program headquarters to be able at any time to request changes in the surveillance machinery, to give instructions directly to the treatment teams, to use the facilities and staff of the surveillance network for their surveys and inspections and to have any employee whose work is not satisfactory replaced at very short notice. The data which would serve to evaluate regular epidemiological team performance would be the verification or contradiction by supervisory staff of team reports with respect to larval breeding and hydrological conditions.

Epidemiological field studies that are incorporated in the plan will be conducted for the purpose of identifying continuing disease transmission. This component of the project is described in more detail in the following section of the PROP. It is sufficient here to point out that any time the epidemiologist finds a continuing transmission of disease such a result will signal the high probability that some active *Simulium damnosum* breeding sites either have not been found or have not been treated. This activity then serves as a very important double check upon the field supervisory staff of the entomology surveillance component.

No mention has been made in the work plan of the possibility that personnel oould conduct evaluations of the entomological field work. While such external reviewers would have limited utility in the accomplishment of the entomological surveillance objectives, they could serve several useful purposes. During a non project staff review, it would be possible to determine that the required staff are on board at each of the sectors and subsectors. Conditions of the equipment could be checked. Verification of data reported from the field could be sought during site visits to various points throughout the program area. It might also be valuable if such an external review discussed with project staff problems that may have been encountered and solutions sought to such problems.

2) Outputs:

The outputs of the entomological surveillance activity will include the data collected by the regular subsector teams, the roving teams and the results of special studies conducted by the sector entomologist and his senior entomology technicians.

a) Output Targets:

It is planned that the regular collection teams will cover their respective subsectors at fortnightly intervals. Their data outputs before larviciding begins will be the mapping of all active breeding sites that are accessible to surface based teams and the estimation of the larval densities in the respective breeding sites. Data output during the larviciding campaign will concern the effectiveness of the operations as measured by the reduction in larvo densities. In the event that complete kills are not achieved, specimens of larvae will be collected for further examination by senior technicians and qualified entomologists to determine

whether or not insecticide resistance has developed or, in the event that this is not the case, to indicate changes in larvicide dosages which need to be made. Another data output, of the subsectors teams, namely the water depths and flow rates, will be employed to adjust larviciding dosages when necessary. After total destruction of larvae in each of the respective sectors has been achieved, the teams will have responsibilities for reporting the reactivation of breeding at any points throughout their sectors. In addition to these activities, the regular teams will maintain surveillance for any adult flies which may appear in their areas, an event which would indicate failure to find and adequately treat all of the breeding sites except in-so-far as some migrant adult flies may enter the area from beyond the limits of this control program.

Outputs of the sector entomologists will be those instructions which they provide to the larviciding teams concerning the larvicide which should be employed, the points that are to be treated, and the dosages that are to be applied.

Magnitude of the outputs will vary depending upon local conditions within the sectors, and the stage of the larviciding operations. It is to be expected that since there are 55 sector and sub-sector teams, a minimum of 55 fortnightly team reports will be filed. However, over and above these regular reports, additional information will be fundled in through the radio communication systems concerning larvicide treatment failures, newly found breeding sites, and other information of relevance to the larviciding control operations.

c) Means of Verification:

A principal means of verifying field team activities will consist of the teams fortnightly reports and a sector headquarters log of additional communications received from each team. A more important verification method will rely upon the diligence of the sector entomologists and senior technicians in providing supervision to the field teams.

d) Assumptions:

It is assumed that since rapids provide favorite breeding places for *Simulium damnosum*, it will not be possible to conduct direct inspections of all of the breeding sites. Under these circumstances, the discovery of all treatment failures may prove impossible.

It is, therefore, necessary to assume that a number of indirect measurements will prove suitable for the elimination of the larval stages of *S. damnosum* in breeding sites which are not accessible for direct inspection. Such measures employ the trapping of adult flies as an indicator that some breeding may be continuing in a treated area. Another indirect measure is the recording of hydrological data and the direct aerial inspection of inaccessible stretches of water in an effort to spot those situations which provide the appropriate conditions of water flow rates and turbulence that are the favored breeding sites of *S. damnosum*.

3) Inputs:

The basic operational unit of the surveillance network will be the survey team, consisting of at least three collectors and a driver, with a cross country vehicle and if necessary for their particular area a light boat, with an outboard motor. Since the collection points often are inaccessible to motor vehicles, each team will be provided with bicycles, to make for easier and more rpaid access to the collection points.

Each sector will have a laboratory to carry out the identification and dissection of specimens needed for the proper execution of the plan of operation. It will also have a group of laboratory auxiliaries who can either be distributed among the subsectors, each of which will be provided with elementary laboratory equipment, or be formed into a team to study all the biological specimens collected in the sector.

Each sector will also have a mechanic and assistant mechanic to ensure that proper maintenance of the vehicles and the equipment in general. A secretary with a good knowledge of simple bookkeeping and a storeman will complete the staff for each sector. All of these personnel will work under the supervision of the sector entomologist and his senior technician.

a) Implementation Targets:

It is supposed that the staff for the full program will be assigned on May 1, 1974 to all of the Bobo-Dioulasso and all of the _____ sector as well as the Tamale sector with one subsector.

Staff are to be assigned on May 1, 1975 to the remained of the Tamale subsectors and to the Ougaudou sector and three of its subsectors.

The remainder of the 55 teams are to be assigned on May 1,1976.

b) Budget:

The budget, staffing pattern, and equipment requirements for this component of the program are presented in Annex 2. The budget which is presented in Table V-3.8 projects annual increasing expenditures of $463,739.00 in 1974 to a peak annual expenditure of $1,011,458.00 in 1977. Thereafter the annual expenditures decline gradually to $718,980.00 in 1980 which thereafter remains as the expected annual expenditure to the end of the project in 1994.

c) Means of Verifying Inputs:

Verification of inputs necessarily will rely rather heavily upon reports submitted to the donor agencies by the project managers. Such reports should be required to include sections dealing with itemized expenditures for staff and equipment. Further verification could be accomplished during site visits through a review of invoices, personnel records, and most effectively by observing entomological surveillance personnel in the performance of their assigned tasks.

d) Assumptions:

The most significant assumptions applicable to these inputs are first, that the required professional and technical personnel can be recruited and begin their work in accordance with the total program schedule, and second that construction of necessary facilities can be completed on schedule.

Once the field work begins, it is necessary that necessary supplies especially of vehicle fuel, lubricants and spare parts be available continuously and that equipment maintenance be performed satisfactorily.

(c) Epidemiology Evaluation Component:

1. Objective:

The epidemiological evaluation component of the onchocerciasis control program has been designed to provide an additional method for evaluating efficacy of *S. damnosum* control operations. In contra-distinction to the entomological surveillance activity, which evaluates control operations by identifying active breeding sites and finding living adult flies, the

epidemiological studies will seek to determine whether or not transmission of infection is continuing by examining people living in the area. The first objective of the epidemiology element, therefore, is to maintain a sufficiently careful surveillance of a sample of the human population as to be able to detect continued disease transmission. The second objective is to achieve improvement in larvicidal operations by the reporting to the entomological surveillance staff in the appropriate sector and subsector those areas where onchocerciasis transmission continues. The third objective is to further elucidate clinical manifestations and the progression of onchocercal disease in the project area. The last objective of this component is to determine the prevalence and severity of other important co-endemic diseases.

a) Performance Targets:

The first priority during the period 1974 through 1976 is to complete all of the basic work necessary for the planned epidemiological surveillance. This includes the selection of sample villages that will be followed through the 19th year of the program.

Once the sample villages have been selected, a census is to be conducted in each village. Collection and processing of baseline epidemiological and clinical data from all the sample communities then will be completed.

When these basic requirements have been fulfilled, the first of the ongoing intensive studies is to be completed in ten selected villages or clusters.

During the period 1977 through 1992, two types of surveys mentioned above are to be repeated, one at three yearly intervals and the other annually for the purposes, respectively, of determining changes in the onchocerciasis infection rates, and of closely following the clinical changes that occur in the same onchocerciasis infected individuals. The twentieth year of the program will be devoted to a final epidemiological evaluation, the content of which has not been specified.

b) End of Project Status:

It is expected by the end of the twentieth year that no evidence of active onchocercal infections can be found anywhere in the project area. One manifestation of a fully successful *S. damnosum* control effort that should be revealed by the epidemiology program is a total absence of any evidence of infection of children born after full larvicidal coverage of the program area had been achieved.

The epidemiology studies also will have produced a considerable amount of new information concerning clinical progression of onchocerciasis in this area of the world as a consequence of the intensive longitudinal follow-up of the same individuals.

Statistically valid data also will have become available concerning the prevalence and severity of a number of other important co-endemic diseases and, hopefully, the hypothesis concerning the sole responsibility of onchocerciasis for desertion of the fertile river valleys will have been either confirmed or repudiated.

c) Means of Verification:

Verification of the accomplishment of the objectives recorded above will rely upon a variety of reports that reflect the total results of the epidemiological and clinical surveys. Of these, the most important with respect to evaluation of the control operations will be the summary reports of tests performed for the diagnosis of active onchocercal infections. The appearance of new infections among individuals who not longer should be at risk of infection as a consequence of the operational control program will signify a failure that demands an explanation and very probably a change in operational larviciding procedures or schedules. In assessing the operational program, therefore, concurrent examinations should be conducted of the epidemiological reports, entomological surveillance records and the operational larviciding flight schedules.

Summary reports of the clinical evaluations conducted longitudinally upon the same individuals will serve to verify the objective of elucidating clinical manifestation and the pathological progression of onchocercal disease.

The prevalence of co-endemic diseases can be verified by the summary reports of results obtained from tests performed for the diagnosis of those diseases selected for inclusion in the survey because of their potential importance in the area.

d) Assumptions:

A major assumption concerns the extent to which the results obtained from the sample populations will accurately reflect the total situation in the program area. The probability that this will be true have been enhanced to

some extent by selecting a stratified sample based upon different levels of endemicity with approximately two-thirds of the population to be surveyed coming from villages where endemicity levels are estimated to be either medium or high. Nevertheless, it is highly probable that undetected transmission will continue in populations not included in the epidemiological studies. It must, therefore, also be assumed that any tightening up of entomological surveillance which is prompted by epidemiological findings can be successfully extended to those areas where complementary epidemiological evaluation does not exist.

2) Outputs:

The total outputs of this component will be epidemiological and clinical data. Two approaches are to be employed for studying the impact of the vector control program upon onchocerciasis and the human population.

The first (hereinafter designated Type I) is the systematic study of age and sex specific rates of infection and clinical manifestations of onchocerciasis in representative population samples. First, a baseline study will be conducted in all of the sample villages to determine prevalence of infection and to grade clinical severity of the disease. Data producted by these surveys will include the results of examination of skin snips taken to determine the presence or absence of infection, external examination of nodules and specified skin lesions, the results of measurements of visual acuity by the illiterate "E" test and a simple physical examination of the eye. These same studies are to be conducted regularly at three year intervals in all of the sample communities wherever they may be located.

Intensive epidemiological and clinical studies (hereinafter designated Type II) are to be conducted in a small sub-sample of the communities. The output from these studies will include the results of elaborate eye examinations conducted with the use of a slit lamp, funduscopic examinations, multiple standardized skin snips, urine examinations for the presence of microfilariae of O. volvulus, and of a battery of diagnostic tests that have been selected to determine the prevalence and severity of the most important co-endemic diseases, such as malaria, schistosomiasis, trypanosomiasis, intestinal helminthiases, gross incapacitations, etc.

a) Output Targets:

Type I studies are to be completed on the total sample population at three year intervals such studies to begin as soon as selection of the cluster sample has been completed, essential personnel are on board, and census data have been collected.

Type II studies will be conducted annually beginning no later than 1976.

b) Magnitude of outputs:

The magnitude of the epidemiological data outputs will be determined by two factors, the sample design and the success which the epidemiological teams have in completing the full examination of their assigned population groups. Surveys conducted under auspices of the PAG mission in preparation for this program has provided estimates of onchocerciasis prevalence for communities and cantons representing approximately 5.6 million persons or about half of the population in the program area. Some additional

data remain to be added to this pool of information. Based upon this 3 year cycle to completely cover the sample population, it is estimated that a minimum of 55,000 items of data are to be produced annually in Type I study.

It is planned that the longitudinal follow-up study of the same individuals be conducted on approximately 3,000 people. The data code sheet presented as a part of the work plan indicates a minimum yield of 132,000 data items annually excluding those additional diagnostic tests performed to determine the prevalence and severity of other co-endemic diseases.

Of the 44 data items to be collected on each individual, 21 are related to the condition of the eyes. (Despite the considerable attention which seems to be given to the eyes, there is no indication that any effort will be made to diagnose diseases of the eye or to identify causes of blindness.)

c) Means of Verification:

The production of outputs from both Type I and Type II studies is verifiable by inspection of the data scheduled to be collected. The spectrum of possibilities varies from raw data sheets prepared on each individual in the field to the final analysis of the summarized information. The output of paramount importance with respect to verification are those data which reveal the time trend of age and sex specific onchocercal infection rates in the sample population.

With respect to Type II studies, it is probably desirable that verification of data dealing with the prevalence of other diseases in the area be merged with a process of decision making concerning the incorporation of other disease control capabilities into the infrastructure that is to be developed as a part of the socio-economic component.

d) Assumptions:

The paramount assumption with respect to both Type I and Type II studies is that the people in the sample will be prepared to submit themselves to the examinations in the proposed studies.

Since it is expected that there will be considerable movement of people from their present locations back into the fertile river valleys, it is assumed that those individuals selected for inclusion in the longitudinal study can be found each year for their scheduled follow-up examinations.

3) Inputs:

The work in these investigations is to be divided between two teams each comprising an epidemiologist, an ophthalmologist, a laboratory assistant, a nurse, two drivers and an unspecified number of local aides at the village level. The teams are to be reinforced during the first survey cycle, i.e., baseline study, by statisticians and sociologists whose task will be to organize and conduct population censuses in all the villages to be monitored for three months each year by consultants who will assist in the conduct of the intensive epidemiological and clinical studies. Technical and secretarial support services will be provided to both of the teams by a technical officer and a clerk-typist. The team members and consultants will be working under the direct supervision of the director of the onchocerciasis control program, with technical guidance and assistance provided by WHO headquarters where data processing will be centralized.

To encourage population cooperation, the teams will be able to provide some medical treatment.

a) Implementation Targets:

There is a serious dearth generally of epidemiologists and ophthalmologists, especially of those experienced in parasitic diseases. Delays in recruitment of specialists, even as short term consultant, have been found by WHO to entend frequently from six to nine months. Furthermore, it is expected by the project planners that for the full 20 year duration of the evaluation program, replacement of the professional field teams will be necessary at least every three years.

It is expected that personnel for both of the field teams will be on board before the end of calendar year 1974. Accomplishment of this input requires recruitment of two epidemiologists, two ophathalmologists, two sociologists, one technical officer and six man months of consultant time per year. Locally recruited staff will include two statisticians, four drivers, two census assistants, two nurses, two laboratory aides, one clerk-stenographer and aides at the village level.

b) The budget for this component is presented in Appendix 3. Total estimated cost for the entire twenty year period from 1974 through 1993 is $5,751,020. A reduction of $28,820.00 from 1974 to 1975 occurs because of the inclusion of non-recurring expenses in the 1974 budget for vehicles and field equipment and a slightly greater amount for contingencies. Another reduction in the annual budget occurs between 1976 and 1977 as a consequence of dropping the sociologists and statisticians from the staffing patterns and further reducing the level of the contingency funds. From 1977 onwards the annual budget is estimated at a level of $273,570.00.

The budget item of $66,000 in 1974 for two epidemiologists appears to be a misprint which instead should be $60,000. The latter figure

is compatible with the printed horizontal and vertical totals. In the absence of any item for travel and personnel support costs, it is assumed that these have been incorporated into the respective technical staff budget items. On the other hand, if this is in fact the case, it is to be expected that such costs would be increased every three years to cover the international travel of the newly recruited and departing teams. The prospects for recruiting qualified epidemiologists and ophathalmologists at an annual wage of $30,000 is not judged to be particularly bright.

c) Means of Verifying:

Verification of inputs will need to rely upon the project records of attempts to recruit the required personnel, vouchers of the equipment and supplies procured, salaries paid and such other records as may be appropriate to check expenditures for travel, per diem and personnel support costs.

d) Assumptions:

The major assumption regarding inputs is that the program will be successful in its efforts to recruit qualified professional personnel every three years in order to maintain program continuity. It is clear that the project managers recognize that this may prove to be a very difficult problem.

It is assumed that the technical equipment required for this project will be received in good condition and be ready for use of the teams before the end of 1974.

Lastly, it is assumed that the WHO headquarters, which has the responsibility for data processing, will be able to receive and analyze material from the field in a timely fashion.

d. Applied Research Component:

The activities planned in this portion of the program are directl supportive of the efforts to control S. damnosum genetic types, which are capable of transmitting onchocerciasis, using insecticides and insecticide formulations which will have a minimum detrimental effect on the environment.

1) Objectives:

a) Performance Targets:

The applied research component of the program includes a total of 11 different activities which are described below and identified in the master budget Table V-5.8 (Appendix 4).

There are many genetic variations of S. damnosum in Africa. Some of these genetic types are capable of transmitting onchocerciasis while others are not. Flies with different genes sometimes behave differently in other respects. For example, some types live only in forests while others occupy the Savannah areas but in all areas waterways that are suitable for breeding must be present. Studies of the S. damnosum genetic complex is planned to continue for a period of ten years.

A simple and reliable device for sampling S. damnosum populations, especially one which would be suitable for areas that are difficult for project personnel to reach, but which also would be suitable for use in all areas, is badly needed. Owing to the lack of success achieved in previous studies, it is planned that the research will start anew from the beginning and will endeavor to develop devices that are suitable for the sampling, both larval and of adult populations. This effort also is proposed to begin in 1974 and continue for a period of ten years.

Research projects on insecticides will encompass several different subjects. These include the development of more suitable field methods for detecting the development of insecticide resistance, the evaluation of alternative insecticides and formulations for efficacy against S. damnosum larvae, bio-degradability of each insecticide impact of the different insecticide preparations upon non-target fauna including man and the development of prototype aerial larviciding equipment which will improve the accuracy of larvicide doses applied to the breeding sites. With regard to the effects of the insecticides and different formulations upon non-target fauna, both acute and long-term chronic effects will be investigated. It is proposed that all except the aerial larviciding equipment portion continue throughout the planned 20-year program but with reductions in the annual funding levels occurring after the first three years and a further reduction occurring after the next seven years of work.

The last component of the applied research effort will be a multidisciplinary research program on the chemotherapy of onchocerciasis. Neither of the two drugs which now must be used in the treatment of this disease are suitable for mass treatment programs. Of the two drugs, one is effective only against the microfilarial form. However, serious reactions occur so frequently that treatment must be given under close medical supervision, a feature which makes mass treatment campaigns unthinkable. Hoever, both, under appropriate circumstances of medical supervision, can be of value in preventing the development of blindness in individuals who already have onchocercal infections. It is for this reason that investigations will be conducted on the sociological and cultural factors in different ethnic groups that may affect acceptance of this treatment.

Additional chemotherapeutic research is planned to include the screening of other existing drugs in the hope that some of these compounds, which have never before been employed in the treatment of onchocerciasis, may prove suitable for use in mass treatment campaigns. Other work will seek to accomplish this same objective through the development of new drugs. It is suggested that these activities could be undertaken either as a part of the work of a Chemotherapy Research Center forParasitic Diseases or as a single effort directed solely toward the onchocerciasis problem. In either case, funds budgeted in this program would be used only for chemotherapy research on onchocerciasis. Any additional work upon the chemotherapy of other parasitic diseases would require separate funding.

d) End of Project Status

Successful completion of the planned applies research activities would have the following results:

(1) The distribution of the various genetic types of S. damnosum which comprise the S. damnosum complex will have been defined. Based upon these studies, the behavioral characteristics and vector capacity of each of the forms present in the program area will have been sufficiently well-determined that entomological surveillance can be limited to those members of the complex which actually represent a threat with respect to the transmission of onchocerciasis.

(2) It will be possible to consider reducing the need for human collectors for the sampling of S. damnosum larvae and adult populations by the end of the fifth year of the program. There after gradual reductions of such personnel actually will take place without any deterioration either in quality of quantity of entomological surveillance data.

(3) Entomological surveillance staff will be able in the field to monitor the susceptibility of S. damnosum larvae to the principal insecticides being used in the control program. In addition, they will be able to perform preliminary screening tests for susceptibility of larvae to alternative insecticides once tolerance develops to those which are being used operationally.

(4) Applied research on insecticides is a continuing effort, and it should be noted that this subject has received considerable attention during the project planning period. This large preliminary effort included a review of the characteristics of 1400 insecticides that previously had been studied by WHO with respect to safety for mamals, toxicity to mosquito larvae, residual larviciding action in polluted water, and commercial availability. From this large number of insecticides, five that have been selected are considered to possess the most suitable attributes for the S. damnosum control campaign. These are methoxychlor, Abate®, methyl-Dursban®, phoxim and chlorphoxim. Some of these previously had been evaluated against S. damnosum. Samples of those which have not yet been so evaluated were requested from the producers in the form of emulsion concentrates and were submitted to the WHO International Reference Center at Bobo-Dioulasso, Upper Volta for field study, and to hydrobiological laboratories for evaluation against non-target fauna. At the outset, a DDT emulsion concentrate used for many years against S. damnosum served as reference substance; it was replaced later by the best substitute formulation available. Most of the evaluations were made following ground application but additional studies were subsequently carried out after application from planes and helicopters, both in the rainy season and at the beginning of the dry season. During the final planning stage, the

evaluation of emulsion concentrates of those insecticides, whose performance in the field seemed sufficiently satisfactory, was undertaken by a team of hydrobiologists from the ORSTOM Center at N'djamena, Chad. These studies comprised on the one hand, laboratory determination of the effects of a whole range of concentrations of each compound on characteristic West African fresh water zoological groups and on the other, field observation of the action on non-target fauna of applications to water courses of operational doses (0.05 and 0.1 ppm during 10 minutes) as well as of the highest dose liable to be used accidentally in large hyphen scale operations following an unexpected drop in the flow rate of the river treated (0.5 ppm during 10 minutes). During simultaneous laboratory studies a known quantity of labeled molecules of several promising insecticides were introduced into model ecosystems, in an enclosed space, so as to determine their degree of biodegradability according to a method developed by the WHO International Reference Center in Urbana, Illinois, for the study of compounds of the DDT family. These studies have been supplemented by an analysis of all accessible published documents concerning the persistence in nature and the action upon non-target fauna of the insecticides being investigated, so as better to determine the conditions under which they might be used.

Based upon all of these observations, Abate® has been selected for use in the operational control effort.

The end of project status of the applied research work on insecticides, their formulation, biodegradability, and effects upon non-target fauna will be, that an adequate number of effective insecticides will have been available for the operational larviciding campaign throughout the planned 20 year program and that their use will not have produced detrimental effects upon the environment. It is not possible at this point to state how many

different insecticides may be required. This depends solely upon the capacity for S. damnosum larvae to develop tolerance or resistance to those insecticides which may be employed.

(5) Chemotherapeutic research, it is hoped, may be concluded by the demonstration of at least one new drug for the treatment of onchocercal infections which will be fully effective and so safe that it can be used in mass treatment campaigns. Failing accomplishment of this ideal objective, the end of this project may be marked by a clear definition of the value or absence of value which a number of existing drugs, that heretofore have never been used in onchocerciasis treatment, may have in the control of this disease.

(c) Means of Verification:

Verification of the accomplishment of these objectives will rely exclusively upon the reports of the responsible investigators.

(d) Important Assumptions:

(1) The proposed studies on the S. damnosum genetic complex appear to make two significant assumptions. The first is that, by examining the bands of giant chromosomes from the salivary glands of the larvae, reliable predictions can be made concerning the behavior of adult flies. Second, the genetic studies of S. damnosum can be brought to such a level of perfection that the larvae of flies which actually can transmit onchocerciasis can be deferentiated from those which cannot. If true, this may permit a sharper focusing of the larviciding operations to eliminate those specific insects which have a disease transmitting potential.

(2) The work on sampling of S. damnosum populations assumes simply that simple reliable devices can be developed for use in studies of population densities of S. damnosum larvae and adults.

(3) It is indeed prudently assumed that S. damnosum will, during the 20 year duration of this project, exhibit a capacity to become resistant to one or more insecticides that will be used in the operational control campaign. It is further assumed that a sufficiently large array of insecticides can be brought to bear upon the insect as to overwhelm its capacity to develop resistance. It is assumed further that a sufficient number of insecticides with the desirable levels of biodegradability and absence of detrimental effects upon non-target fauna now exist to keep the program area free of S. damnosum for the planned 20 year operational program.

2) Outputs:

The program document from which this PROP is being prepared does not incorporate explicit protocols for each of the research activities. Hence, it is not possible to incorporate the type of quantitative output information which usually is incorporated in Agency PROPs. Any attempt to do so would be pure conjecture. Hence, only minimal attempts have been made to do so. It is probably well that this approach is taken since research efforts such as these need flexibility in order to deal with a wide variety of developments which cannot be foreseen.

(1) Several outputs are expected from the studies of the S. damnosum complex which will contribute to accomplishment of the purpose. First, is an mapping of the breeding sites of the different genetic types of S. damnosum larvae throughout the project area, during both wet and dry seasons. Second, is a correlation between larval genotypes and their taxonomic or phenotypic

characteristics, whereby the adult females developing from each type of larvae can be identified by direct examination, either in the field or in the laboratory. Third, is the correlation of the phenotypic characteristics of the different genetic types of adult flies with their respective vector potentials for transmission of onchocerciasis and mapping those localities that represent a real threat to the human population.

It is not possible to quantify the magnitude of these outputs except in so far as the expectations are that the correlations of different genotypes with phenotypic characteristics will have been completed during the first five years of this effort, covering the entire program area and that the remainder of the work may be completed at the end of the following five years.

Verification of the results of these studies will rely upon those documents drafted by the investigators which record the correlations of genotype with phenotype and insect behavior and it is presumed also by maps which indicate the ecological settings inhabited by each type of S. damnosum.

It is assumed that this effort will encompass the entire program area but that in all probability not all breeding sites will need to be studied. This is based upon the further assumption, on our part, that categories of breeding sites can be developed and these in turn can be sampled in order to identify those S. damnosum types which have real significance in onchocerciasis transmission.

(2) The output of the research program on the sampling of S. damnosum populations will be a simple reliable device or devices that can be used for the sampling of the insect larvae and adult populations in all

types of areas, including those uninhabited areas that are difficult to reach.

The magnitude of the output of this research is expected to be two devices, the efficacy of which, for population sampling studies, will have been proven during field tests under a variety of circumstances representative of the project area. One device would be for studies of the adult fly population, while the other would be for studies of larvae densities throughout the river systems of the project area. Once the prototype devices have been developed and field tested, it will be necessary to produce a sufficient number of each for operational use in the entomological surveillance program. A decision concerning the numbers required will necessarily have to be deferred until more information becomes available as a result of the entomological surveillance portion of the total program.

Verification in the progress of this activity necessarily will be the responsibility of the project supervisors. Methods of verification will include inspection of the various devices developed and the examination of data gathered through their use in studying the densities of S. damnosum adults and larvae. Verification by donor countries can be accomplished only through the examination of progress reports.

It is assumed that the investigators are correct in their assessment of previous unsuccessful studies and in their decision to begin this research activity from the beginning. It is further assumed that development of satisfactory devices for sampling will prove to be a considerable task, but recognizing that because of its possible repercussions on the cost and effectiveness of the entomological surveillance network, early completion of the prototype development work will be possible. Lastly, it is assumed that production of a sufficient number of satisfactory devices for the sampling of S. damnosum populations can be accomplished sufficiently rapidly to be of benefit to the entomological surveillance network.

(3) The present cumbersome task which must be conducted in base laboratory facilities for the determination of presence or absence of insecticide resistance will have been complemented by the availability of a much simplier screening test that can be employed by entomological surveillance personnel under field conditions.

The magnitude of this output will include the specifications for all of the necessary equipment and supplies as well as a description of the field testing methods which will permit entomological surveillance field staff quickly to become competent in its use.

(4) It is expected that the following outputs will be achieved with respect to the five insecticides that are now under consideration for potential operational use in the S. damnosum control effort.

(a) Formulations that will be suitable for operational application of each insecticide in the larviciding campaign will have been developed.

(b) The biodegradability of each insecticide formulation will have been defined in the laboratory and under field conditions to which an overdose has been deliberately applied.

(c) The spectrum of the potential of each insecticide formulation for creating disturbances in the ecological balance in the waterways of the program area will have been defined and the most satisfactory means for reducing these detrimental effects, while still retaining the capacity to kill S. damnosum larvae, will have been determined.

(d) The monitoring by applied research personnel for any untoward acute or chronic toxic effects upon man or non-target fauna will have been successful in preventing any irreversible damage from those insecticides and formulations which are used operationally.

Items (a) through (c) enumerated above are to be accomplished for all of the five insecticides thus far selected for possible use in the program. These are: methoxychlor, Abate®, methyl-Dursban®, phoxim and chlorphoxim. Monitoring of the treated waterways for the purpose of detecting any untoward acute or chronic toxic effects upon man or non-target fauna will be performed continuously on all of those insecticides and formulations which are used operationally throughout the twenty year program.

Verification of these studies will need to be undertaken in two different fashions. Preliminary work on insecticide formulations and biodegradability will be conducted in reference laboratories. Verification of the performance of these initial studies could be accomplished through a review of the scientific protocols and the data collected during the studies. Field trials in subsectors of the control program area will be conducted by the manufacturing company in association with a reference center that specializes in formulations. Once again performance of this work is expected to be verifiable through the reports of the reference center, such reports incorporating a description of the materials and methods employed in the test and a description of the results achieved. Field test of biodegradability on the other hand will seek to discover any accumulations of the insecticide in the various strata of one or more water courses in the program area to which an overdose has deliberately been applied for test purposes. It appears that

these are to be conducted by project personnel and would be under the supervision of senior project personnel. Accordingly, verification would be dependent upon the reports submitted to donor countries. Reliance will also need to be placed upon the annual report for verification of work performed on the acute and long term effects of insecticides and formulations on non-target fauna and man.

The final output of research dealing with insecticides is the manufacture and field evaluation of prototypes of equipment for the accurate delivery of specified dosages of larvicides by aircraft. The number of such prototypes that are to be developed has not been specified but it would seem reasonable to expect that systems employed on fixed wing aircraft would differ from those employed on helicopters.

Verification of this activity would be obtained by reviewing the specifications of the prototypes of larviciding equipment and the results of the field evaluation trials.

Since the larviciding program is projected to begin during 1974 and the target completion date for the development of the newer equipment appears to fall somewhere between 1974 and 1977, it is assumed that equipment already available will be suitable for use in the early operational campaign which proposes to use Abate® formulations that already have been subjected to extensive tests in the first of the three operational zones. The equipment to be developed under this item presumably will not be required before replacement of Abate® by other larvicides becomes necessary as a consequence of larval tolerance or resistance to Abate®

(6) Chemotherapeutic research, it is hoped, may be concluded by the demonstration of at least one new drug for the treatment of onchocercal infections which will be fully effective and so safe that it can be used in mass treatment campaigns. Failing accomplishment of this ideal objective, the end of this project may be marked by a clear definition of the value or absence of value which a number of existing drugs, that heretofore have never been used in onchocerciasis treatment, may have in the control of this disease.

No indication has been given of the magnitude of effort now contemplated. Accordingly, it is stated that this aspect of the chemotherapeutic research program requires further precise development with respect to the number of existing compounds that may have potential therapeutic value and, thus, warrant further investigation.

Since it is proposed that this work be subcontracted to established medical research units, verification of the accomplishments under this activity would rely upon the findings of such units.

International assistance agencies do not have direct access to the resources that are necessary for the development of new chemotherapeutic agents. The commercial pharmaceutical industry is the major resource for such activities. However, the industry has never shown a high level of interest in treatment of parasitic diseases and in recent years the interest which previously existed has undergone a continuing decline. Nevertheless, most of the chemical compounds which have known potential therapeutic value and those whose vale has not yet been demonstrated already are patented by the commercial firms. The problem is compounded by the great general dearth of experienced pharmacologists and clinicians who are capable of carrying out chemotherapeutic agent development and clinical evaluations according to modern standars. Overlying all of these factors are the stringent requirements of the regulatory

agencies which must be fulfilled before any drugs are approved for general usage. It is therefore a major assumption with respect to chemotherapeutic research program that satisfactory linkages can be established between the pharmaceutical industry, non-industry research pharmacologists, research clinicians prepared to work in the program area and the onchocerciasis problem in the Volta River Basin.

3) Inputs:

Major inputs to the applied research portion of the program are presented in Appendix 4. These data include the total budget for the 11 projects that comprise this component for the period 1974 through 1993 and individual tables that present the personnel, equipment and other expenses that have been estimated for seven activities. Individual tables of such requirements have not been prepared for four other activities. These include development of new aerial larviciding equipment, drug trials, chemotheraphy research, and appraisal of the safety of new insecticide formulations for man. In general, the input requirements for these activities have been described in the narrative discussion but some clarification of the funding requirements or the purpose for which funds would be used in the equipment development effort is needed.

On the other hand, the narrative discussions do not describe specific dates for implementation of each of the activities but do indicate the total duration of time that each is expected to be in progress. The consolidated budget table indicates that all activities are expected to begin during 1974. Decreases in the levels of funding which occur in subsequent years reflect expectactions that activities can be reduced as a consequence

of having achieved the earlier unspecified more costly objectives.

a) Taxonomic and behavioral characterization of the S. damnosum genotypes that inhabit the program area has been estimated to require a total of 10 years at a total cost of $556,312.00. The annual cost of this effort during the first five years is $74,175.00. During the second five years a reduction of 50% is anticipated. No indication has been given as to how this reduction would be implemented. Of the total annual amount of full funding, $55,000 is for salaries. No explanation has been given regarding the equality of salaries of a professional entomologist and a senior technician. Locally recruited staff requirements have not been specified.

Verification of these inputs will depend upon the annual program financial report. However, the verification of the need for these amounts, and further detail as to the purposes for which they are to be used probably should be obtained before implementation of the project.

It is assumed that the annual amounts budgeted for the entomologist consultant and senior technician include not only salary but also travel and other supporting cost. It may also be true that the senior technician contemplated is a specialist in Simulium genetics. Such individuals are rare and may command premium salaries.

b) The research program on the sampling on S. damnosum populations is projected for a total period of 10 years at a total estimated cost of $482,137.00. This work also has been divided into two five year periods with the annual budget for the first period being $64,285.00 and thereafter the annual amount is reduced by 50%. Personnel costs during the full funding period are $43,500.00 of which $30,000 is for an entomologist for a period of 12 man months and 3 man months of consultant time at $7,500.00. Locally recruited

staff requirements have not been specified, nor is there any indication as to how the 50% reduction in annual cost during the second five year period will be made.

Verification of these inputs will necessarily rely upon the annual financial report.

It is assumed that the amounts budgeted for the entomologist and consultant include travel expenses and support costs.

c) The research program on the susceptibility of S. damnosum to the insecticides will be long tern but the inputs will be most intensive during the first three years of the twenty year program. The annual budget during this period of intensive work is $29,900 of which $15,000 is for six man months service of a professional entomologist and $3,000 is for locally recruited personnel. The balance of the budget is for equipment, supplies and support costs. The initial purpose, it will be recalled is to develop a much simpler method which can be used under field conditions to screen for the development of insecticide resistance. The annual budget for the remaining 17 years of applied work on insect susceptibility will continue at a reduced cost at a level of 20% of the annual budget required for the first three years. Funds will be required during this period to permit the periodic intervention of a specialist in the field concerned who will be able to coordinate activities, analyze results, and carry out any supplementary studies that may be necessary.

Verification of these inputs appears to be possible only through a review of the annual financial report.

The provision of only six man-months of professional entomologist time per year during the first three years appears to be based upon an assumption

that the development of a simple field method to screen for the development of insecticide resistance does not require full time professional attention. It also appears to be assumed that no serious problems of resistance to Abate which will be employed as the first operational insecticide is expected during the first three years. Lastly, since neither the narrative description of this activity nor the budget provide a target date for the development of the field method, it is our assumption that this effort has paramount importance during the first three years of work.

d) The applied research effort concerned with entomological evaluation of insecticides in formulations for the Simulium damnosum control campaign will of course require an input of insecticides formulated in various ways and the capability of performing preliminary tests and other tests under field conditions. The cooperative effort required anticipates the participation of a reference center which specializes in field studies, a reference center which specializes in formulations and one or more manufacturing companies which can produce the required quantities of the various insecticide formulations. It has not been indicated just how these requirement coincide with the projected budget which does not provide for any contractual arrangements with organizations such as these. On the other hand, the budget of $102,350 per year during the first three years provides an entomologist for six man months, a senior technician for six man months, consultants on formulations for three man months and locally recruited staff. The total staff costs come to $40,000 annually. Other major budget items during the first three years include 150 aircraft hours, $30,000, transport cost for insecticides and formulations, $10,000, and scientific assistance and management, $13,350.

The program is projected to extend through the entire twenty year control effort. The initial three year period at the full annual funding level of $102,350.00 is followed by a seven year period funded at only 25% of that level and subsequent ten year period funded at only 12½ of that level.

Pre-project verification of the intention with respect to the manufacturers and the funding of reference center activities probably should be obtained. Once the project is initiated, verification of inputs can be achieved only through reports submitted by the project managers.

It is assumed that no further inputs are required for the purpose of examining the suitability of the Abate formulation which has been selected for initiation of the operational control program. It is further assumed that the development and evaluation of new insecticide formulations will be required throughout the entire operational control program; at least funds for this activity are requested to cover the entire planned twenty year operational program albeit at reducing levels.

e) Inputs of the studies of the biodegradability of insecticides will be required after completion of the first phase of the respective insecticide's evaluations in the field. At this point, arrangements will be required for an international reference center to determine the degree of biodegradability. Laboratory results obtained at the International Reference Center will need to be confirmed by other staff under field conditions, to insure that the insecticides do not accumulate in the various strata of the treated water courses. Studies at the International Reference Center will require radioactive labelled mollocules of the insecticides. The field test will require equipment and materials for chemical analyses, in addition to the necessary staff. This work is projected

to continue for a total of twenty years at an annual funding level for the first three years at $31, 866.00. This level is reduced for the next seven years to 25% of the annual full funding required for each of the first three years. The total projected budget comes to $191,196.00. The extent to which these funds are distributed between reference center and field has not been explained. Of the total annual funding of $31,866.00, $25,600.00 are personnel costs. These include four man-months for a consultant biochemist, four man-months for a consultant chemist, two man-months for a senior technician and unspecified locally recruited staff time.

Verification of the inputs will rely upon the annual fiscal report.

The extension of this activity over a total period of 20 years appears to assume a need for continuous monitoring for an unacceptable accumulation of the insecticides employed operationally in the program area. It also appears that most of the basic work on biodegradability of a sufficient number of insecticides for the total program will be completed during the first three years, with perhaps the next seven years being devoted to closer monitoring than will be necessary during the last half of the control effort. It also is assumed that the budget presented includes the cost for both work at the Reference Center and in the field.

f) The principal inputs for laboratory and field studies of the possible effects of insecticides and formulations upon non-target fauna will be

specialized hydrobiological teams. This activity is programmed to continue for 20 years with the most intensive input occuring during the first three years. The annual funding level during this initial phase is $141,450 of which $15,000 is for six man-months of consultant hydrobiologist time. An additional $1,2000 per year for locally recruited staff, that have not been specified, completes the salary costs. The balance of the maximum annual budget of $23 575 is for equipment and supplies, operating costs, and scientific assistance and management. Funding of the next 7 years of work has been set at 25% of the initial full annual funding level and for the remaining ten years at 12½% of the $23,575 level. The laboratory studies will obviously require a supply of the insecticides and formulations that are to be tested for biological effects.

Verification of the inputs will be through the annual financial report of the Project Director.

Since no mention has been made concerning the location of the laboratory facilities which will be used for the preliminary testing, it is assumed that such facilities will be in the project area and are provided for in the funding of other components of the total program, probably the entomology surveillance activity.

g). Inputs for the laboratory and field studies on the long-term safety of insecticide treatments for non-target fauna include a full-time, small permanent team strengthened periodically by appropriate consultants both of whom will work in close liaison with the insecticide treatment teams and entomology surveillance teams as well as the regional hydrobiological and hydrology laboratories. The volume of work levels are expected to remain

constant throughout the entire campaign. Staff for the team include a full-time hydrobiologist and a full-time senior hydrobiology technician, each of whom is budgeted at a level of $30,000. A total of $10,000 has been budgeted for four man-months annually of time from consultant hydrobiologists. Unspecified locally recruted staff, budgeted at $5,000 annually, complete the personnel requirements for this work. The annual total budget of $97,750 brings the total 20-year cost to $1,950,000.

The Project Director's annual report will need to include information verifying these inputs.

No assumptions come to mind which could explain the equality of salary and allowances budgeted for the professional hydrobiologist and the senior hydrobiology technician.

h) Only one input is required for the studies on the safety of insecticides for man. This is an annual two-month requirement for a consultant toxicologist at an estimated cost of $5,000 each year.

Expenditures for this purpose should be reported in the annual financial report.

It appears to be assumed that the preliminary testing and screening of candidate insecticides and formulations will have been conducted so thoroughly that little risk will be presented for man by those in operational use. It also appears that the consultant toxicologist services will be required primarily at those times when new insecticides or new formulations are being introduced into the operational program. In the absence of the toxicology consultant, monitoring for unanticipated adverse effects presumably will be the responsibility of other project personnel. It is further assumed that in the event that unexpected toxicity problems do arise, ad hoc consultation could be obtained.

i) Efforts to develop new aerial insecticiding equipment have been programmed for a four year period at annual expenditure levels of $50,000 for the first two years and $25,000 for the last two years. The precise arrangements that are required for development of such equipment have not been described except to say that highly specialized personnel are required.

It is assumed that development of such equipment will be undertaken through a contract with an appropriate commercial firm.

j) The research on chemotherapy has been divided into two separate activities for which separate budgets have been presented. Little has been provided in the way of input information and the budget totals presented in Table V-5.8 appear to be in error.

(1) Field trials evaluating those different regimens for the administration of those drugs which exist today for the treatment of onchocerciasis are expected to continue under a sub-contract with an established medical research unit. The work will include investigations of the sociological and cultural factors of different ethnic groups which may affect acceptance of mass treatment. As newly developed drugs become available they will be incorporated into this work. Provision has been made for the assistance in 1974 and 1975 of a consultant sociologist for a period of three man-months during each of the two years. This field trial of anti-onchocercal drugs is programmed for 20 years. Funding for each of the first two years, i.e., 1974 and 1975, is $27,500. Annual funding then is reduced to $20,000 for the period 1976 through 1983 and thereafter to an annual total of $10,000. This totals $185,000 and if increased 15% to compensate for unforeseen expenditures the total becomes $212,750 rather than $315,000 as shown in Table V-5.8.

It is assumed that planning for this activity has received more attention than is reflected in the program document.

(2) Development of new chemotherapeutic agents also is projected to continue for 20 years at a total estimated cost, not including a 15% increment to cover unforeseen expenditures, of $2,295,000. The only inputs that are now definitely proposed are two senior consultants to be recruited in 1974 to serve for four man-months for the purpose of advising WHO on the feasibility of setting up the proposed Chemotherapy Research Center for parasitic diseases in the onchocerciasis control program area and to suggest alternative measures that would restrict the research to work devoted exclusively to onchocerciasis chemotherapy if appropriate. Whichever approach is taken, funds incorporated in the budget would be used solely for research on anti-onchocercal drugs. It also is noted that in either case it would be necessary to provide facilities for clinical and pharmacological studies including a suitably equipped hospital, clinical laboratories, chemistry laboratories, and pharmacology laboratories. The possibility of using an existing provincial hospital is raised but it appears that this possibility has not been explored with any existing institution.

It is assumed that a great deal more information will be forthcoming before a final decision must be made concerning the contribution of funds to these activities.

Course of Action

A. Organization and Management of the Program Sectors

1. Institutional Framework

In April 1972 the executive heads of FAO, IBRD, UNDP and WHO decided to establish a Steering Committee for Onchocerciasis Control in the Volta River Basin Area. The Committee comprises the personal representatives of the heads of these four organizations and has the general mandate of ensuring coordination of action, mobilizing support, and advising on and endorsing forward planning for the work.

The project's headquarters is located in Ouagadougou (Upper Volta) from where operations in the various sectors foreseen will be managed by a Project Manager assisted by experts and consultants in entomology, parasitology, ophthalmology, hydrobiology, medical statistics, economics, etc.; the project will also have an administrative officer and sufficient support personnel.

In order to effect the progressive integration of other elements and projects engaged in the area on onchocerciasis control work, the Steering Committee has called for the merging into the major project of the UNDP-assisted Onchocerciasis Advisory Team (RAF/68/758) assigned as a regional project to Ghana, Togo and Upper Volta and operating from Bolgatanga, Ghana.

The present regional project therefore integrates the functions of the former Onchocerciasis Advisory Team whose work henceforward will be directed from the operational headquarters

at Ouagadougou. Bolgatanga will thus act as one of the project's sub-centers for operational research.

At the field level, the regional project will maintain close working relations with OCCGE and the WHO International Reference Centre on Insecticides at Bobo-Dioulasso, Upper Volta. Links will also be continued, as during the PAG Mission's operations, with the offices of the seven UNDP Resident Representatives, and the FAO regional office, senior agricultural advisers and country representatives.

At the country level the Government cooperating agencies primarily concerned with the 1974 work are the Ministries of Health of the seven countries. During the year, however, the other Ministries and Government departments which will be involved in the campaign itself, the resettlement programme and the economic development projects, will be brought into the picture.

It is anticipated that the establishment of national authorities for onchocerciasis control will be considered and possibly legislated for during the year during the year in accordance with the recommendations of the Steering Committee.

Provision is made under the project for technical contacts at the inter-country level to facilitate consultations between the national counterpart elements entrusted with the respective country responsibilities in preparing for the campaign.

Within the Executing Agency, a special programme team is being entrusted with the overall duties of planning, implementation and monitoring of the project and of carrying forward the detailed planning of the campaign itself. This programme team is located in WHO headquarters and maintains direct contact with project headquarters, the WHO regional office and other regional bodies, and the headquarters of the Associate Agency, FAO. In addition, the programme team will serve as secretariat to the Sterring Committee and maintain policy and implementation with UNDP links and IBRD.

Special arrangements have been made with the WHO network of collaborating laboratories and international and/or regional reference centres, especially those dealing with insecticide formulations and screening and with drug evaluation.

2. Provisions for Government follow-up

The main responsibility of each participating Government and its national authorities will of course be their full and active role in the Onchocerciasis Control Campaign which is scheduled to start, on a phased basis, in 1974 and last for nearly two decades; during this period each Government will accord a major priority to the control of the vector, the development of the reclaimed areas and resettlement.

To this end, and as said above under the description of the institutional context of the scheme, each Government will be encouraged to establish appropriate structures at the country

level to contribute to the implementation of the future basin-wide campaign. Such entities should have the necessary authority to mobilize the national inputs needed and each may be headed by a National Director for Onchocerciasis Control.

Medical field units and national and/or federal research institutions of the seven countries involved will contribute to the investigations and field trials as well as to the training of the national specialists required by the future campaign.

After an attack phase of three years and a surveillance phase (the duration of which has yet to be determined), each national authority will be invited to assume full responsibility for the maintenance of the control programme within its borders and in unison with the progress of the general campaign. As to the development programmes, it is anticipated that these may, for the most part, be run from the outset with multilateral or bilateral assistance.

B. Training Personnel

A large-scale, long-term project, such as the Onchocerciasis Control Programme in the Volta River basin area, usually devotes an appreciable part of its budget to personnel training. This is not clearly apparent in the budget of the present programme, although training problems are relatively important, because some of the operations have been planned and costed on the basis of sub-contracting. The cost of the training and re-orientation of the necessary qualified staff thus becomes one of the items in the management costs of the sub-contractor, estimated to total 20% of the basic cost of the sub-contracted activity.

1. BIOLOGY, VECTORIAL IMPORTANCE AND CONTROL OF SIMULIUM DAMNOSUM:

The training programme for the three main categories of personnel: entomologists, technicians and laboratory assistants, should deal essentially with the biology, vectorial importance and control of simulium damnosum. However, the vectors of the other major diseases in the Volta River basin area, such as malaria, trypanosomiasis, yellow fever, etc., cannot be completely neglected.

Entomologists:

Two main possibilities should be considered: (a) the training of specialists, starting with graduates of universities or any other centre of higher education who have merely a good knowledge of general zoology, or better, of general entomology; (b) the re-orientation of professional entomologists, either medical, or, failing that, agricultural, who have no special knowledge of simulium biology, onchocerciasis epidemiology or vector control.

TECHNICIANS:

Persons who have completed their secondary education or have commenced university studies in the field of biology or technology can be trained as

TECHNICIANS:

ordinary grade technicians. They should receive specialized training lasting four months, including at least two months work in a blackfly control campaign. Their scientific and technical training should cover all aspects of the life cycle and control of the vector and of related problems, while stressing practical and operational features.

Higher grade technicians, who will be responsible as medical entomologists in certain fields, should have good experience of blackfly control campaigns; failing this, the best of the ordinary grade technicians could be trained in two months to the higher grade level, after having served at least one year in the field. Training should deal essentially with data analysis and interpretation, as well as the general organization and programming of insecticide treatment and entomological surveys in an entomological surveillance sector.

LABORATORY ASSISTANTS:

Laboratory assistants will be one of the essential elements in the entomological surveillance system, but they will bear no responsibility for the planning or modifying of treatment operations. They should be recruited among young people who have a good primary education record or have even followed a course of secondary studies, if there are any candidates on that level.

The training programme will be essentially practical, centered on problems of vector trapping, identification and dissection, and the keeping up-to-date of survey cards and laboratory records. The training, lasting two months, could be given in the laboratory of the Onchocerciasis Section of the OCCGE in Bouaké, or in that of the national Onchocerciasis Control

LABORATORY ASSISTANTS:

Unit in Bolgatanga, Ghana.

2. PARASITOLOGY AND CLINICAL FEATURES OF ONCHOCERCIASIS:

Training programmes can also be envisaged for the two categories of staff, physicians and nurses, who will work for the Onchocerciasis Control Programme by evaluating the results and perhaps later on organizing chemotherapeutic treatment of onchocerciasis sufferers.

PHYSICIANS:

Physicians can hardly be given specialized training in the parasitology and clinical aspects of onchocerciasis other than on a regional basis, by using the research and training centres situated in the endemic onchocerciasis areas and provided with both qualified personnel and suitable equipment. The number of specialists to be trained every year will not be high, so that there will be no serious problems as regards supervisory staff or transport. Training will bear essentially on the epidemiology of the disease, its differential diagnosis, classification of lesions, standardized survey methods, planning of surveys, interpretation of the results, and problems of individual and collective chemotherapy. The work done in the clinic and the field, as a whole, should familiarize the physician with all aspects of the disease and all the problems he will have to solve in epidemiological evaluation surveys during the campaign. The need should also be considered of giving certain physicians additional training in statistics and public health so as to prepare in each country for the organization and implementation of possible onchocerciasis chemotherapy campaigns.

NURSES:

The training of nurses specialized in onchocerciasis (and in the other main parasitic diseases of West Africa) has been undertaken for many years by the Parasitology and Ophthalmology Sections of the OCCGE. The present system of periods of training in Bobo-Dioulasso, Upper Volta and Bamako, Mali, might be slightly modified to satisfy the requirements of parasitology evaluation teams for qualified staff.

4. OPERATIONAL STAFF:

The training of radio operators, aircraft mechanics, engineers and pilots, could be planned along the same lines as that of specialists on the vector and the disease. If aerial treatment is carried out by a private company, the latter will certainly reserve to itself the right to recruit and possibly train its flying staff, although it might be invited to help in the training of similar staff of regional origin.

For the time being training has been systematically planned to take place in Europe, where facilities are greater than in West Africa. Consequently, the cost of such training periods will vary more according to their duration (six months for radio operators and mechanics, two years for engineers and pilots) than to the level of recruitment. However, the WHO centre in Lome, training specialists for the maintenance of medical equipment, might be requested to extend its training activities to cover radio operators; this would considerably reduce expenses.

4. NUMBER OF SPECIALISTS TO BE TRAINED AND TRAINING TIMETABLE:

In the fields of vector biology and control and aerial treatment, it is proposed to train - between 1974 and 1977 - a number of specialists in proportion to the long-term requirements of the programme, allowing for a

NUMBER OF SPECIALISTS TO BE TRAINED AND TRAINING TIMETABLE:

replacement ratio of the programme, allowing for a replacement ratio of 5 to 10% per year for the higher grades and 10 to 20% for the junior grades.

In the medical field, the training plans are more ambitious, so as to take into account needs closely linked with the Onchocerciasis Control Programme in the Volta River basin area, but not costed, namely those required by probable mass chemotherapy and those arising from the epidemiological surveillance of population groups moving as a consequence of operations for the economic reclamation of abandoned and unihabited land. Training can therefore be planned from 1974 onwards throughout the duration of the programme, with the aim of one physician to every 20,000 onchocerciasis sufferers registered and one public health specialist to every 66,000. These estimates exceed the strict needs of the regional programme, so that a zero annual replacement rate has been allowed for.

The training timetable envisaged is given in the following pages. Allowing for 15% unforeseen expenses in this field, the overall cost of the training programme would be $1.9 million for the period 1974-1993, or an average annual expenditure of $95,000.

APPENDIX 1

Resources	1974	1975	1976	1977 and beyond
Pilots (man/months)	6	40	78	120
Engineers (man/months)	6	36	60	84
Mechanics	2	3	5	8
Drivers/Assistant mechanics	4	4	6	6
Radio Operators/Typists	10	10	20	20
Watchmen/Storemen	19	35	59	59
Labourers	4	6	12	12
Helicopters	2	1	1	2
Aeroplanes	1	-	1	1
Equipment for sector store	3	1	4	-
Equipment for field store	-	5	2	-
Equipment for field store/accommodation	6	4	6	-
Equipment for fixed radio station	5	-	8	-
Equipment for mobile radio station	4	-	2	-
Hydrological stations (installation and calibration)	5	10	15	-
Estimated consumption:				
Fuel ($)*	10 000	38 000	65 000	115 000
Insecticide (litres)**	20 000	80 000	150 000	200 000

* US Dollars at the July 1972 exchange rate.

** In the form of an emulsifiable concentrate containing 20% active matter.

TABLE V-2.11. SALARIES AND OTHER EXPENSES OF STAFF TO BE EMPLOYED IN THE S. DAMNOSUM CONTROL CAMPAIGN IN THE VOLTA RIVER BASIN (IN US $ AT THE JULY 1972 EXCHANGE RATE)

Category	Unit of time	Amount ($)
Pilot - salary (and travelling expenses)	Month	2 500
- travel allowances	Month	750
Engineer - salary (and travelling expenses)	Month	1 667
- travel allowances	Month	750
Mechanic	Year	1 500
Radio operator (Typist)	Year	1 200
Driver/Assistant mechanic	Year	800
Watchman/Storeman	Year	600
Unskilled labourer	Year	400
Travel allowances for the five categories listed above:		
Mechanic and Radio operator	Day	3
Other categories	Day	1

TABLE V-2.12. BASIC COST OF EQUIPMENT AND BUILDINGS, WITH ANTICIPATED DEPRECIATION PERIODS, FOR THE S. DAMNOSUM CONTROL CAMPAIGN IN THE VOLTA RIVER BASIN (IN US $ AT THE JULY 1972 EXCHANGE RATE)

Category	Anticipated cost ($)	Anticipated depreciation period (Years)
Aeroplane,* fully equipped	140 000	10
Helicopter,* fully equipped	145 000	10
Fixed HF radio transmitter-receiver*	5 000	10
Mobile HF/VHF radio transmitter-receiver* on Land Rover station-wagon	12 100	5
Mobile mechanical workshop for helicopter	25 000	10
Aircraft Hangar	20 000	20
Sector store	20 000	20
Field accommodation/field store	10 000	20
Radio building	5 000	20
Garage for mobile radio station	1 000	20
Garage for mobile workshop	2 000	20
Equipment for sector store: (racks, trolley, loading ramp, hand-cart, desk, pumps, extinguishers)	1 500	10
Equipment for field store: (table, trolley, pumps, extinguishers)	500	10
Equipment for field accommodation: (tables, beds, chairs, cupboards, small cooker, oil-fired refrigerator, generating set)	3 000	10
Equipment for radio stations: (tables, chairs, typewriter, filing cabinet)		
- fixed	800	10
- mobile	500	10

* Specifications as given in Annex V-1, sections 2.1 and 4.3

Item	1974	1975	1976	1977	1978 and beyond
Pilots and Engineers (salaries and other expenses)	34 000	217 000	398 500	593 000	593 000
Locally recruited staff	13 750	43 100	76 500	81 000	81 000
Helicopters	2 290 000	1 145 000	1 145 000	2 290 000	-
Aeroplanes	1 140 000	-	1 140 000	1 140 000	-
Spare parts	5 400	14 400	26 400	34 800	34 800
Depreciation	-	43 000	57 500	86 000	129 000
Insurance	15 000	58 000	95 000	133 000	133 000
Mobile mechanical workshop (cost and depreciation)	25 000	2 500	27 500	5 000	5 000
Fixed radio equipment	25 000	-	40 000	-	-
Mobile radio equipment	48 400	-	24 200	-	-
Equipment for stores, field accommodation, fixed and mobile radio stations	28 500	16 000	32 400	-	-
Depreciation on this equipment	-	15 030	16 630	28 710	28 710
Aircraft hangars (20,000 each)	20 000	20 000	40 000	-	-
Sector stores (20,000 each)	60 000	20 000	80 000	-	-
Fixed radio stations (5,000)	25 000	-	40 000	-	-
Garages (mobile radio stations, and mobile workshops for helicopters)	6 000	-	4 000	-	-
Field accommodation and stores (10,000 each)	120 000	130 000	140 000	-	-
Maintenance of these buildings	-	11 550	20 050	35 250	-
Fuel	10 000	38 000	65 000	115 000	115 000
Insecticide	90 000	360 000	675 000	882 000	882 000
Insurance of buildings and equipment other than aircraft	7 800	9 800	18 900	18 900	18 900
Maintenance of equipment by specialist services	-	2 000	4 000	6 000	6 000
Installation and calibration of hydrological stations	15 750	31 500	47 250	-	-
Annual total	979 600	1 177 150	2 213 830	2 446 660	2 026 110

APPENDIX 2

APPENDIX 2

TABLE V-3.1. GEOGRAPHICAL LOCATION AND VOLUME OF ACTIVITY OF THE SECTORS AND SUB-SECTORS OF THE ENTOMOLOGICAL SURVEILLANCE NETWORK, WITH ANTICIPATED DATES OF THE START OF OPERATIONS AND PROBABLE DATES FOR THE REDUCTION AND/OR TRANSFER OF ACTIVITIES

Sector and sub-sectors	Number of teams (and location of the permanent centre if there is one)	Date operations are due to start	Dates for reduction and/or transfer of activities (if envisaged)	
BOBO-DIOULASSO	1	1.05.1974	-	1.01.1980
Bobo-Dioulasso	2	1.05.1974	1.01.1978	1.01.1980
Banfora	2	1.05.1974	1.01.1978	-
Diébougou	2	1.05.1974	1.01.1978	1.01.1980
KORHOGO	1	1.05.1974	-	-
Korhogo	2	1.05.1974	-	1.01.1980
Bouna	2	1.05.1974	-	1.01.1980
Dabakala	2	1.05.1974	-	1.01.1980
Odienné	2	1.05.1976	-	1.01.1980
TAMALE	1	1.05.1974	-	-
Wa	2	1.05.1974	1.01.1978	-
Tamale	2	1.05.1975	-	1.01.1980
Yendi	2	1.05.1975	-	1.01.1980
Bolgatanga	2	1.05.1975	1.01.1978	1.01.1980
OUAGADOUGOU	2	1.05.1975	-	-
Ouagadougou	2	1.05.1975	1.01.1978	1.01.1980
Léo	2	1.05.1975	1.01.1978	1.01.1980
Tenkodogo	1	1.05.1975	1.01.1978	-
Pama	1 + Arly	1.05.1976	1.01.1978	1.01.1980
Niamey	2 + La Tapoa	1.05.1976	1.01.1978	1.01.1980
BAMAKO	1	1.05.1976	-	1.01.1980
Sikasso	2	1.05.1974[a]	-	1.01.1980
Bamako	2	1.05.1976	1.01.1978	1.01.1980
Bougouni	2	1.05.1976	-	1.01.1980
Koutiala	1 + Bandiagara	1.05.1976	1.01.1978	-
SOKODE	1	1.05.1976	-	-
Sokodé	2	1.05.1976	-	1.01.1980
Dapango	2	1.05.1976	1.01.1978	1.01.1980
NATITINGOU	1	1.05.1976	-	1.01.1980
Natitingou	2	1.05.1976	-	1.01.1980
Kandi	2	1.05.1976	1.01.1978	1.01.1980

[a] From 1 May 1974 until 30 April 1976 the Sikasso Sub-sector will come under the Bobo-Dioulasso Sector.

APPENDIX 2 (2)

TABLE V-3.2.

Category	Bobo-Dioulasso	Korhogo	Tamale	Ouaga-dougou	Bamako	Sokodé	Nati-tingou	Total
Entomologists	1	1	1	1	1	1	1	7
Senior technicians	1	1	1	2	1	1	1	8
Ordinary technicians	3	4	4	6	4	1	1	23
Secretary/book-keepers	1	1	1	2	1	1	1	8
Storemen	1	1	1	2	1	1	1	8
Mechanic/drivers	1	1	1	1	1	1	1	7
Assistant mechanic/ drivers	3	4	4	6	4	1	1	23
Laboratory auxiliaries	4	5	5	7	5	2	2	30
Drivers	10	11	12	13	12	6	6	70
Skilled labourers	7	9	9	12	9*	5	5	56
Unskilled labourers	20	26	26	32	25*	14	14	157
Landrover station-wagons	1	1	1	2	1	1	1	8
Landrover pickups	10	13	13	14	12	6	6	74
Trucks (approximately 3 metric tons)	1	1	1	2	1	1	1	8
Boats	3	4	3	4	4	1	1	20
Outboard motors	4	5	4	5	5	1	1	25
Bicycles	18	24	24	31	24	12	12	145
Number of bases	3	4	4	7	5	2	2	27
Number of teams	7	9	9	12	8	5	5	55

* With, in addition, during the rainy season, 2 skilled labourers and 4 unskilled labourers for insecticide treatments to be applied from the ground in the Bandiagara and Koutiala ar (cf. Annex V-2, section 4.2).

TABLE V-3.3. UNIT COST IN US $[a] AND PERIOD OF DEPRECIATION IN YEARS FOR THE MAIN TYPES OF EQUIPMENT AND MATERIAL TO BE USED BY THE ENTOMOLOGICAL SURVEILLANCE NETWORK[b]

Category	Unit cost	Depreciation period
Landrover station-wagon[c]	5 100	3
Landrover pickup[c]	4 500	3
Truck	7 200	6
Boat	400	8
Outboard motor	600	6
Winch (for freeing vehicles when stuck)	200	10
Jerrican	18	10
Jack	36	4
Bicycle	60	5
Basic equipment for a sector:		
- Furniture, optical equipment, office equipment	5 312	10-20
- Generating set, vacuum flasks	720	5
- Equipment for camping and tours of inspection	945	3
- Expendable minor items, glassware, stationery, etc.[d]	2 140	1
Basic equipment for a sub-sector:		
- Furniture, optical equipment, office equipment	2 580	10-20
- Isothermic containers	120	5
- Expendable minor items	388	1
Basic equipment for a technician:		
- Equipment for camping and tours of inspection	386	5
- Expendable minor items	44	1
Basic equipment for a surveillance team:		
- Equipment for camping and tours of inspection	141	3
- Expendable minor items	60	1

[a] At the exchange rate of July 1972.

[b] Not including water, electricity, postal charges, and depreciation or rent of buildings.

[c] With double fuel tanks and roof rack for boat.

[d] Annual expenditure to be reduced to $ 1140 as from 1 January 1978.

APPENDIX 2 (4)

TABLE V-3.4.

Category	Bobo-Dioulasso	Korhogo	Tamale	Ouaga-dougou	Bamako	Sokodé	Nati-tingou	Total
Entomologists	-	1	1	1	1	1	1	6
Senior technicians	2	1	2	2	1	1	1	10
Ordinary technicians	2	3	1	3	2	1	1	19
Secretary/book-keepers	1	1	1	1	1	1	1	7
Storemen	1	1	1	2	1	1	1	8
Mechanic/drivers	1	1	1	1	1	1	1	7
Assistant mechanic/drivers	2	4	3	5	3	2	2	21
Laboratory auxiliaries	2	2	2	2	2	1	1	12
Drivers	5	8	7	9	6	5	5	45
Skilled labourers	4	9	7	9	6	4	4	43
Unskilled labourers	12	26	20	25	18	12	12	125
Landrover station-wagons	-	1	1	1	1	1	1	6
Landrover pickups	5	10	8	12	7	5	5	52
Trucks (approximately 3 tons)	1	1	1	1	1	1	1	7
Boats	2	3	3	3	3	1	1	16
Outboard motors	3	4	4	4	4	1	1	21
Bicycles	12	24	18	18	15	9	9	105
Number of bases	2	4	3	6	3	2	2	22
Number of teams	4	9	7	8	6	4	4	42

APPENDIX 2(5)

TABLE V-3.5. MANNING TABLE AND TRANSPORT FACILITIES ENVISAGED FOR THE ENTOMOLOGICAL SURVEILLANCE NETWORK, BY SECTOR, AS FROM 1 JANUARY 1980

Category	Korhogo (Bamako)	Ouagadougou (Bobo-Dioulasso)	Tamale	Sokodé (Natitingou)	Total
Entomologists	1	1	1	1	4
Senior technicians	3	3	2	2	10
Ordinary technicians	3	3	2	2	10
Secretary/book-keepers	1	1	1	1	4
Storemen	2	2	2	2	8
Mechanic/drivers	2	2	2	2	8
Assistant mechanic/ drivers	7	7	4	4	22
Laboratory auxiliaries	6	6	6	6	24
Drivers	7	8	4	4	23
Skilled labourers	20	16	10	10	56
Unskilled labourers	16	12	7	7	42
Landrover station-wagons	1	1	1	1	4
Landrover pickups	17	17	10	10	54
Trucks (approximately 3 tons)	2	2	2	2	8
Boats	6	5	3	2	16
Outboard motors	8	6	4	3	21
Bicycles	39	30	18	18	105
Number of bases	5	4	3	3	15
Number of teams	10	8	5	5	28

TABLE V-3.6. AVERAGE ANNUAL PAY, DAILY TRAVELLING EXPENSES AND AVERAGE ANNUAL TRAVELLING EXPENSES IN US $[a] FOR THE VARIOUS PERSONNEL TO BE EMPLOYED BY THE ENTOMOLOGICAL SURVEILLANCE NETWORK[b]

Category	Annual pay	Travelling expenses	
		Daily	Estimated annual
Entomologist	15 000	10	720-1320
Senior technician	6 000	10	960-1320
Ordinary technician	3 000	3	540-660
Mechanic/driver	2 400	3	48-192
Secretary/book-keeper	1 800	3	72-288
Assistant mechanic/driver	800	1	60-220
Laboratory auxiliary	800	1	0-220
Driver	720	1	60-220
Storeman	600	-	-
Skilled labourer	600	1	0-220
Unskilled labourer	400	1	0-220

[a] At the exchange rate of July 1972.

[b] Accommodation and furniture for personnel are not included in these figures.

TABLE V-3.7. ANNUAL AVERAGE UNIT COST, IN US $[a], FOR THE OPERATION OF THE VARIOUS MEANS OF TRANSPORT TO BE USED BY THE ENTOMOLOGICAL SURVEILLANCE NETWORK

Category	Type of expenditure	Cost
Landrover	Petrol, oil, tyres, inner tubes, repairs, insurance (30 000 km/year)	3 380
Truck	Petrol, oil, tyres, inner tubes, repairs, insurance (15 000 - 20 000 km/year)	3 128
Boat + motor	Petrol, oil, repairs	200
Bicycle	Tyres, inner tubes, repairs	12

[a] At the exchange rate of July 1972.

APPENDIX 2 (7)

TABLE V-3.8. ESTIMATED ANNUAL COST OF ENTOMOLOGICAL SURVEILLANCE IN US $[a]
(NOT INCLUDING BUILDINGS, ACCOMMODATION, WATER, ELECTRICITY, AND POSTAL CHARGES)

Expenditure category	1974	1975	1976	1977	1978	1979	1980 and beyond
Salaries	117 680	235 720	385 573	447 200	357 800	357 800	284 960
Travelling expenses	18 861	36 831	61 935	72 352	54 660	54 660	58 580
Major equipment[b]	241 737	123 967	237 455	152 055	108 824	103 864	103 864
Minor expendable items	9 928	15 828	27 398	18 265	25 180	25 180	25 180
Helicopter flight hours[c]	6 600	9 600	21 600	16 800	16 800	16 800	24 000
Operating expenses[d]	68 933	157 747	264 830	304 786	222 396	222 396	222 396
Total	463 739	577 693	998 791	1011 458	785 660	780 700	718 980

[a] At the exchange rate of July 1972.

[b] Purchase price from 1974 to 1978; annual depreciation value from then on.

[c] 80 hours of geographical reconnaissance per annum, from 1974-1976, before each phase of the campaign
235 hours per annum for surveillance and liaison purposes from 1974 to 1976;
140 hours per annum for surveillance and liaison purposes from 1977 to 1979, then 200 hours as from 1980.

APPENDIX 3

TABLE V-4.2. ANTICIPATED ANNUAL COST AND TOTAL COST OF THE EPIDEMIOLOGICAL EVALUATION

(Costs and currency at their July 1972 values, US$)

Categories	1974	1975	1976	1977 and onwards	Total 1974-1993
Epidemiologists	66 000	60 000	60 000	60 000	1 200 000
Ophthalmologists	60 000	60 000	60 000	60 000	1 200 000
Sociologists	60 000	60 000	60 000	-	180 000
Technical officer	30 000	30 000	30 000	30 000	600 000
Consultants	15 000	15 000	15 000	15 000	300 000
Statisticians	16 000	16 000	16 000	-	48 000
Drivers	4 000	4 000	4 000	4 000	80 000
Census assistants	4 000	4 000	4 000	4 000	80 000
Nurses	6 000	6 000	6 000	6 000	120 000
Laboratory aides	2 800	2 800	2 800	2 800	56 000
Clerk-stenographer	1 200	1 200	1 200	1 200	24 000
Village aides	1 000	1 000	1 000	1 000	20 000
Vehicles	25 100	7 200	7 200	7 200	161 900
Technical equipment	2 000	2 000	2 000	2 000	40 000
Field equipment	10 000	1 700	1 700	1 700	42 300
Laboratory supplies	3 000	3 000	3 000	3 000	60 000
Drugs	10 000	10 000	10 000	10 000	200 000
Office supplies	1 500	1 500	1 500	1 500	30 000
Building renting and maintenance	6 800	6 800	6 800	6 800	136 000
Vehicles' operating costs and maintenance	13 500	13 500	13 500	13 500	270 000
Miscellaneous local expenses	3 000	3 000	3 000	3 000	60 000
Internal meetings	5 000	5 000	5 000	5 000	100 000
Reporting costs	11 000	11 000	11 000	11 000	220 000
Contingencies	35 090	32 470	32 470	24 870	522 820
Total	385 990	357 170	357 170	273 570	5 751 020

APPENDIX 4 (1)

TABLE V-5.1. AVERAGE ANNUAL COST OF THE RESEARCH PROGRAMME ON THE SIMULIUM DAMNOSUM COMPLEX IN THE VOLTA RIVER BASIN (IN US$ AT THE JULY 1972 EXCHANGE RATE)

Type of expenditure	Annual amount
Entomologist, 12 man/months	30 000
Consultant (reference laboratory), 3 man/months	7 500
Senior technician, 6 man/months	15 000
Locally recruited staff	3 000
Equipment and supplies	5 000
Operating costs	4 000
Scientific assistance and management	9 675
Annual total	74 175
Overall cost (5 years at 100% and 5 years at 50%)	556 312

TABLE V-5.2. AVERAGE ANNUAL COST OF THE RESEARCH PROGRAMME ON THE SAMPLING OF SIMULIUM DAMNOSUM POPULATIONS IN THE VOLTA RIVER BASIN (IN US$ AT THE JULY 1972 EXCHANGE RATE)

Type of expenditure	Annual amount
Entomologist, 12 man/months	30 000
Consultant, 3 man/months	7 500
Locally recruited staff	6 000
Equipment and supplies	8 000
Operating costs	4 100
Scientific assistance and management	8 385
Annual total	64 285
Overall cost (5 years at 100% and 5 years at 50%)	482 137

TABLE V-5.3. AVERAGE ANNUAL COST OF THE RESEARCH PROGRAMME ON THE SUSCEPTIBILITY OF SIMULIUM DAMNOSUM TO INSECTICIDES IN THE VOLTA RIVER BASIN (IN US$ AT THE JULY 1972 EXCHANGE RATE)

Type of expenditure	Annual amount
Entomologist, 6 man/months	15 000
Locally recruited personnel	3 000
Equipment and supplies	4 000
Operating costs	4 000
Scientific assistance and management	3 900
Annual total	29 900
Overall cost (3 years at 100% and 17 years at 20%)	191 360

APPENDIX 4 (2)

TABLE V-5.4. AVERAGE ANNUAL COST OF ENTOMOLOGICAL EVALUATION OF INSECTICIDES AND FORMULATIONS FOR THE SIMULIUM DAMNOSUM CONTROL CAMPAIGN IN THE VOLTA RIVER BASIN (IN US$ AT THE JULY 1972 EXCHANGE RATE)

Type of expenditure	Annual amount
Entomologist, 6 man/months	15 000
Senior technician, 6 man/months	15 000
Consultants on formulation, 3 man/months	7 500
Locally recruited staff	2 500
Equipment and supplies	5 000
Operating costs	4 000
150 aircraft hours	30 000
Transport costs for insecticides and formulations	10 000
Scientific assistance and management	13 350
Annual total	102 350
Overall cost (3 years at 100%, 7 years at 25%, 10 years at 12.5%)	614 100

TABLE V-5.5. AVERAGE ANNUAL COST OF BIODEGRADABILITY STUDIES IN THE LABORATORY AND IN THE FIELD ON THE INSECTICIDES TO BE USED IN THE SIMULIUM DAMNOSUM CONTROL CAMPAIGN IN THE VOLTA RIVER BASIN (IN US$ AT THE JULY 1972 EXCHANGE RATE)

Type of expenditure	Annual amount
Consultant biochemist, 4 man/months	10 000
Consultant chemist, 4 man/months	10 000
Senior technician, 2 man/months	5 000
Locally recruited staff	600
Equipment and supplies	480
Operating costs (including despatch of samples by air to laboratories for analysis)	1 760
Scientific assistance and management	4 026
Annual total	31 866
Overall cost (3 years at 100%, 7 years at 25%, 10 years at 12.5%)	191 196

APPENDIX 4 (3)

TABLE V-5.6. AVERAGE ANNUAL COST OF STUDIES ON THE POSSIBLE ACUTE EFFECTS ON NON-TARGET FAUNA OF THE INSECTICIDES AND FORMULATIONS TO BE USED IN SIMULIUM DAMNOSUM CONTROL IN THE VOLTA RIVER BASIN (IN US$ AT THE JULY 1972 EXCHANGE RATE)

Type of expenditure	Annual amount
Consultant hydrobiologists, 6 man/months	15 000
Locally recruited staff	1 200
Equipment and supplies	1 900
Operating costs	2 400
Scientific assistance and management	3 075
Annual total	23 575
Overall cost (3 years at 100%, 7 years at 25%, 10 years at 12.5%)	141 450

TABLE V-5.7. AVERAGE ANNUAL COST OF RESEARCH ON THE LONG-TERM SAFETY FOR NON-TARGET FAUNA OF THE SIMULIUM DAMNOSUM LARVICIDING CAMPAIGN IN THE VOLTA RIVER BASIN (IN US$ AT THE JULY 1972 EXCHANGE RATE)

Type of expenditure	Annual amount
Hydrobiologist, 12 man/months	30 000
Senior hydrobiology technician, 12 man/months	30 000
Consultant hydrobiologists, 4 man/months	10 000
Locally recruited staff	5 000
Equipment and supplies	4 000
Operating costs	6 000
Scientific assistance and management	12 750
Annual total	97 750
Overall cost (20 years at 100%)	1 955 000

SEP 1 3 1978

ACTION MEMORANDUM FOR THE ASSISTANT ADMINISTRATOR FOR AFRICA

FROM: AFR/RA, E. Dennis Conroy

SUBJECT: Onchocerciasis Control - Volta River Basin
Project No. 698-0399

Problem: It is necessary to amend the subject project to provide additional funding and to update other sections of the project paper.

Discussion: The Onchocerciasis Control Program has proceeded substantively along the lines anticipated in the 1974 Non-Capital Project Paper (PROP). The major change has occurred in project costs which have been somewhat greater than anticipated, due largely to inflation. There have also been requests for a geographic extension in order to cover areas from which reinvasion of blackflies is occurring. Finally, there is Congressional earmarking of funds in the 1978 legislation. These points and the latest data on donor contributions are covered in the revision to the project paper attached.

A Project Committee has reviewed the PP amendment and does not believe it raises any policy issues which warrants an ECPR review prior to submission for your approval. An Initial Environmental Examination (IEE) is attached to the PP Amendment and incorporates the pesticide risk-analysis called for by Regulation 16. The IEE is a redraft of the one prepared last March. This new version addresses the issue of the larvicide more thoroughly and explains the ecological monitoring actions undertaken by the program.

The Congressional Presentation for FY 1978 shows $1,000,000 for the FY 1978 obligation and we have already obligated this amount. We have processed an Advice of Program Change for the full $2,000,000 which we plan to contribute this year, and which is in accordance with the Congressional earmarking. We also plan to increase our FY 1979 contribution to $1,700,000 and this amount is requested in the FY 1979 Congressional Presentation. The funds will be provided in untied grants to the Onchocerciasis Trust Fund administered by the World Bank, who will make it available to WHO, the executing agency.

Recommendation: It is recommended that you approve the Amendment to the PROP by signing the attached Project Authorization and Request for Allotment of Funds(PAF) and the Negative Determination for the Initial Environmental Examination.

Attachments:A/S

Clearance:AFR/RA:MDuffy (draft)
AFR/RA:EGRuoff/BWickland (draft)
AA/PPC:APrintz (draft)
AFR/DR:JNixon (draft)
AFR/DR:JLStockard,M.D. (Draft)
AFR/DR:JKoehring (draft)
AFR/DP:EDonoghee (draft)
GC/AFR:EADragon EAD
AA/AFR:WHNorth

AFR/RA:EDConroy:hsa:9/12/78:X29102

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT AUTHORIZATION AND REQUEST FOR ALLOTMENT OF FUNDS PART I

1. TRANSACTION CODE: C (A ADD, C CHANGE, D DELETE)

PAF

2. DOCUMENT CODE: 5

3. COUNTRY/ENTITY: Africa Regional

4. DOCUMENT REVISION NUMBER: 1

5. PROJECT NUMBER (7 digits): 698-0399

6. BUREAU/OFFICE: A SYMBOL: AFR; B CODE: 06

7. PROJECT TITLE (Maximum 40 characters): Onchocerciasis Control - Volta River

8. PROJECT APPROVAL DECISION — ACTION TAKEN: A (A APPROVED, D DISAPPROVED, DE DEAUTHORIZED)

9. EST. PERIOD OF IMPLEMENTATION: YRS. 06 QTRS

10. APPROVED BUDGET AID APPROPRIATED FUNDS ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE C GRANT	PRIMARY TECH. CODE D LOAN	E. 1ST FY 74 F GRANT	E. 1ST FY 74 G LOAN	H. 2ND FY 76 I GRANT	H. 2ND FY 76 J LOAN	K. 3RD FY 77 L GRANT	K. 3RD FY 77 M. LOAN
(1) PH	510 S	550		2,000		1,000		1,000	
(2)									
(3)									
(4)									
			TOTALS	2,000		1,000		1,000	

A. APPROPRIATION	N. 4TH FY 78 O. GRANT	N. 4TH FY 78 P. LOAN	Q. 5TH FY 79 R. GRANT	Q. 5TH FY 79 S. LOAN	LIFE OF PROJECT T. GRANT	LIFE OF PROJECT U. LOAN
(1)	2,000		1,700		7,700	
(2)						
(3)						
(4)						
TOTALS	2,000		1,700		7,700	

11. PROJECT FUNDING AUTHORIZED (ENTER APPROPRIATE CODE(S)) 1 - LIFE OF PROJECT, 2 - INCREMENTAL, LIFE OF PROJECT

A. GRANT	B. LOAN
2	

C. PROJECT FUNDING AUTHORIZED THRU FY 79

12. INITIAL PROJECT FUNDING ALLOTMENT REQUESTED ($000)

A. APPROPRIATION	B. ALLOTMENT REQUEST NO. 1 C. GRANT	D. LOAN
(1) PH	2,000	
(2)		
(3)		
(4)		
TOTALS	2,000	

13. FUNDS RESERVED FOR ALLOTMENT

TYPED NAME (Chief, SER/FM/FSD)

SIGNATURE

DATE

14. SOURCE/ORIGIN OF GOODS AND SERVICES: [ ] 000 [ ] 941 [ ] LOCAL [X] OTHER Trust Fund

15. FOR AMENDMENTS, NATURE OF CHANGE PROPOSED

Additional funding required for increased costs due to inflation and studies for geographic extension of control area.

FOR PPC/PIAS USE ONLY	16. AUTHORIZING OFFICE SYMBOL	17. ACTION DATE MM DD YY	18. ACTION REFERENCE (Optional)	ACTION REFERENCE DATE MM DD YY

AID 1330-6 (7-76)

PROJECT AUTHORIZATION AND REQUEST FOR ALLOTMENT OF FUNDS

PART II

Name of Entity: Africa Regional

Name of Project: Onchocerciasis Control - Volta River

Number of Project: 698-0399

Pursuant to Part I, Chapter 1, Section 104(b) of the Foreign Assistance Act of 1961, as amended, I hereby authorize grant financing of not to exceed one million United States Dollars ($1,000,000) (the "Authorized Amount") to help in financing certain foreign exchange and local currency costs of goods and services required for the project as described in the following paragraph.

The Onchocerciasis Control Program consists of A.I.D. participation in an initial six year multi-donor program to assist in the control of onchocerciasis (river blindness) in the Volta River Basin of seven countries in West Africa (Upper Volta, Ghana, Ivory Coast, Togo, Benin, Niger and Mali) and to promote settlement and development of the areas in which the risk of onchocerciasis transmission is reduced to an acceptable level. The purpose of the project is to control onchocerciasis through application of insecticides in the turbulent water breeding sites of the blackfly and to carry out supporting entomological, epidemiological and development activities to assure utilization of the area.

I approve a total level of A.I.D. appropriated funding planned for this project through FY 1979 of not to exceed seven million seven hundred thousand United States Dollars ($7,700,000) grant, including the FY 1978 funding as authorized above, subject to the availability of funds in accordance with A.I.D. allotment procedures.

I hereby authorize the initiation of negotiation and execution of grant agreements with the International Bank of Reconstruction and Development or other organizations by the officer to whom such authority has been delegated in accordance with A.I.D. regulations and Delegations of Authority, subject to such terms and conditions as A.I.D. may deem appropriate.

SEP 14 1978

Goler T. Butcher
Assistant Administrator
for Africa

AA/AFR

PROJECT PAPER AMENDMENT

Onchocerciasis Control in the Volta River Basin
Project 698-0399

Purpose of Amendment

This PP Amendment is submitted to present and justify the requirement for additional funding in FY 1978-79 to carry out the vector control and related operations of the project. The overall objective of the project remains the same but this Amendment increases the amount of A.I.D. support to the core program to $1.7 million in each of Fiscal Years 1978 and 1979 and provides $300,000 in FY 1978 to study the extension of the geographic area covered by the project southwards. Another major reason for the Amendment is due to the Congressional earmarking based on inflationary increases in project costs. An Initial Environmental Examination is also attached as this was not required at the time the original Project Paper was prepared.

A. Progress to Date

WHO's progress report for the OCP Program was presented at the Fourth Session of the JCC in December 1977 (document JCC 4.2). Phase I and Phase II operations have been underway for three and two years, respectively. Phase III larviciding operations began in March 1977. Progress in control of the blackfly vector of onchocerciasis are satisfactory through aerial applications of chemical larvicides to selected breeding sites throughout the program area. Although there is a short period of time between the peak breeding season of the blackfly and the JCC meeting in December which does not permit a detailed technical report, maps prepared by the OCP staff for the December 1977 meeting indicate that a high degree of control has

been achieved. The density of the vector fly has been sharply reduced throughout much of the OCP area.

Reinvasion of several sites in the southern portion of the Phase I OCP operational area (on the Leraba and Bandama Rivers and rivers in the south of Mali) have caused grave concern. Intensive efforts have been made to locate the source of the reinvading flies. An experimental larviciding campaign in the Marahoue and Sassandra river basins of the Ivory Coast was successful in disrupting the reinvasion of the southern Phase I area.

The Epidemiological Evaluation Unit is carrying out evaluations as scheduled. Chemotherapy trials are underway at Bobo-Dioulasso and Tamale, Ghana. The Economic Development Unit has provided information on socio-economic aspects of the program in participating countries but there is a need to clarify the broader functions of this unit.

The major area of project implementation which has proceeded slowly is the training of national personnel for work in the reclaimed areas. Additional efforts are needed although specific manpower training outputs are not established in the original project paper. Discussions are underway between OCP headquarters and participating country personnel on the countries' professional staff needs in relation to maintenance of the onchocerciasis control as OCP is phased out eventually.

An important element of the project design was the establishment of a Scientific and Technical Advisory Committee, an Ecological Panel, and an Economic Development Advisory Panel. The first two organizations have functioned at a high level of competence and their annual reports have

constituted an acceptable technical evaluation of project operations. In fact the technical competence on STAC is of such high competence that it would be difficult to form a more experienced technical group to monitor progress. A special working group has established criteria which are to be applied for determining when the risk of transmission has been reduced to a sufficiently low level that resettlement can proceed with reasonable safety. The Economic Development Advisory Panel (EDAP) has been less active and effective in evaluating and assisting in coordinating the identification and preparatory work on specific development projects being done at the national level. Modifications of EDAP are being considered.

Two evaluation studies are currently underway and final reports are expected in September 1978. The first study is on vector control and other medical aspects of the program carried out by the OCP program staff with assistance from consultants. The second study is an economic review; the World Bank Mission organized under the direction of Professor Elliot Berg of the Center for Research on Economic Development at the University of Michigan. The two studies assess the OCP program and make recommendations for the next six year phase. These two studies will provide the basis for the review and decisions on the next six year phase during the 5th meeting of the JCC in Lome in December 1978.

B. Geographic Extension

A geographic extension of the program area was requested at the second (December 1975) meeting of the Joint Coordinating Committee (JCC) (and reviewed at the third meeting) by the Governments of Benin, Ghana,

Ivory Coast, Mali and Togo. The JCC asked the Onchocerciasis Control Program to undertake a study of the implications of extending the control area including the entomological, epidemiological, economic and financial aspects. A report on the study was produced on September 30, 1977 and presented to the fourth session of the JCC in December 1977.

The geographical area covered by the requested extensions is indicated by the hatched area on Annex A. It involves 25,000 km^2 in Benin, 42,000 km^2 in Ghana, 110,000 km^2 in the Ivory Coast, 120,000 km^2 in Mali, and 23,000 km^2 in Togo--total 320,000 km^2 over and above the original 700,000 km^2 control program area. The study indicated the data on the Ivory Coast are sufficient to permit a decision on extension, particularly for the Upper Sassandra and the Marahoue rivers which seem to be permanent sources of reinfestation. The request of Mali concerns an area which may have to include Senegal and Guinea in order to be operationally effective from an entomological point of view and thus adequate data were not available. For the three other countries the study concluded that additional surveys of the epidemiological, entomological and hydrological situation were needed over a two year period to obtain data required to permit a decision on the extension. The cost of the proposed operations and studies are estimated to be:

Country	Year 1	Year 2	Total
Benin	$ $141,400	$ $115,000	$ $256,400
Ghana	259,600	207,000	466,600
Ivory Coast	926,600	1,418,500	2,345,100
Mali	98,000	132,400	230,400
Togo	123,200	106,000	229,200
Total	$1,548,800	$1,978,900	$3,527,700

The following pledges were made for geographical extension operations at the fourth session of the JCC:

Netherland	$ 500,000
U.S.A.	$ 300,000
U.K.	10% of drawings
Ivory Coast	$2,345,000

On this basis the World Bank believed sufficient funds were available to carry out the proposal. The JCC thus agreed with the extension in the Ivory Coast as from 1978 and for studies over the next two years in Benin, Ghana and Togo. WHO will be asked to conduct a pre-feasibility study in Guinea, Senegal and the Mali area included in the OCP report. Some of these studies will be completed in 1979 and a decision on the extension to the south may be requested at the JCC meeting in December 1978. If a decision on extension of vector control operations are required in 1978 or 1979 it is proposed that the A.I.D. agree to the extension if it is necessary to protect the existing area against reinvasion or if all the following criteria are met:

(1) priority is accorded to onchocerciasis control in the extension area;

(2) possibility of applying present systems and techniques;

(3) economic development potential of the area;

(4) reasonable cost and availability of financing and trained manpower.

C. Congressional Earmarking

Representatives of the House International Relations Committee visited OCP Headquarters in Ouagadougou last year. The group was obviously impressed with the project as a provision was introduced in the Foreign Assistance and Related Programs Appropriation Act, 1978 (Public Law 95-148-October 31, 1977). The section in Title I under Economic Assistance is as follows:

"Health, Development Assistance: For necessary expenses to carry out the provisions of section 104(b), $95,000,000: Provided, That $2,000,000 shall be available for the World Health Organization Onchocerciasis Control Program".

D. Revised Total Program Costs

The original PROP contained a Summary Table I on page 2. Attached is a Revised Table I of Total Program Requirements for 1974-79 (excluding the costs of the geographic extension studies) Annex B. For comparison purposes total annual costs from the two summaries are as follows (millions $):

	1974	1975	1976	(est) 1977	(est) 1978	(est) 1979	Total
Origional PROP	4.59	6.83	9.25	10.40	10.90	11.70	53.67
Current Revision	2.74	6.01	10.41	10.98	12.88	14.29	57.32
Increased Cost	-1.85	-0.82	1.16	0.58	1.89	2.59	3.65

E. Revised Planned Donor Contributions

The original PROP contained a rough estimate of possible donor contributions for the first 6-year phase of the program as indicated in the left hand column in Table II (Annex C attached). Current estimates of donor contributions are contained in the two right hand columns.

The actual contributions from 1974-77 of $33.31 million plus the forecast amount of $18.66 million (which are firm pledges) will provide a total of $51.97 million in contributions to the Fund over the first six year period. A number of donors have indicated their hope to increase their contributions and the World Bank is discussing a contribution with several new donors. This pledged amount, when compared to the $54.71 million total budget from the Onchocerciasis Fund, indicates that the six year first phase funding is essentially assured.

ANNEX A

1

GEOGRAPHICAL SITUATION OF THE EXTENSIONS REQUESTED BY THE COUNTRIES

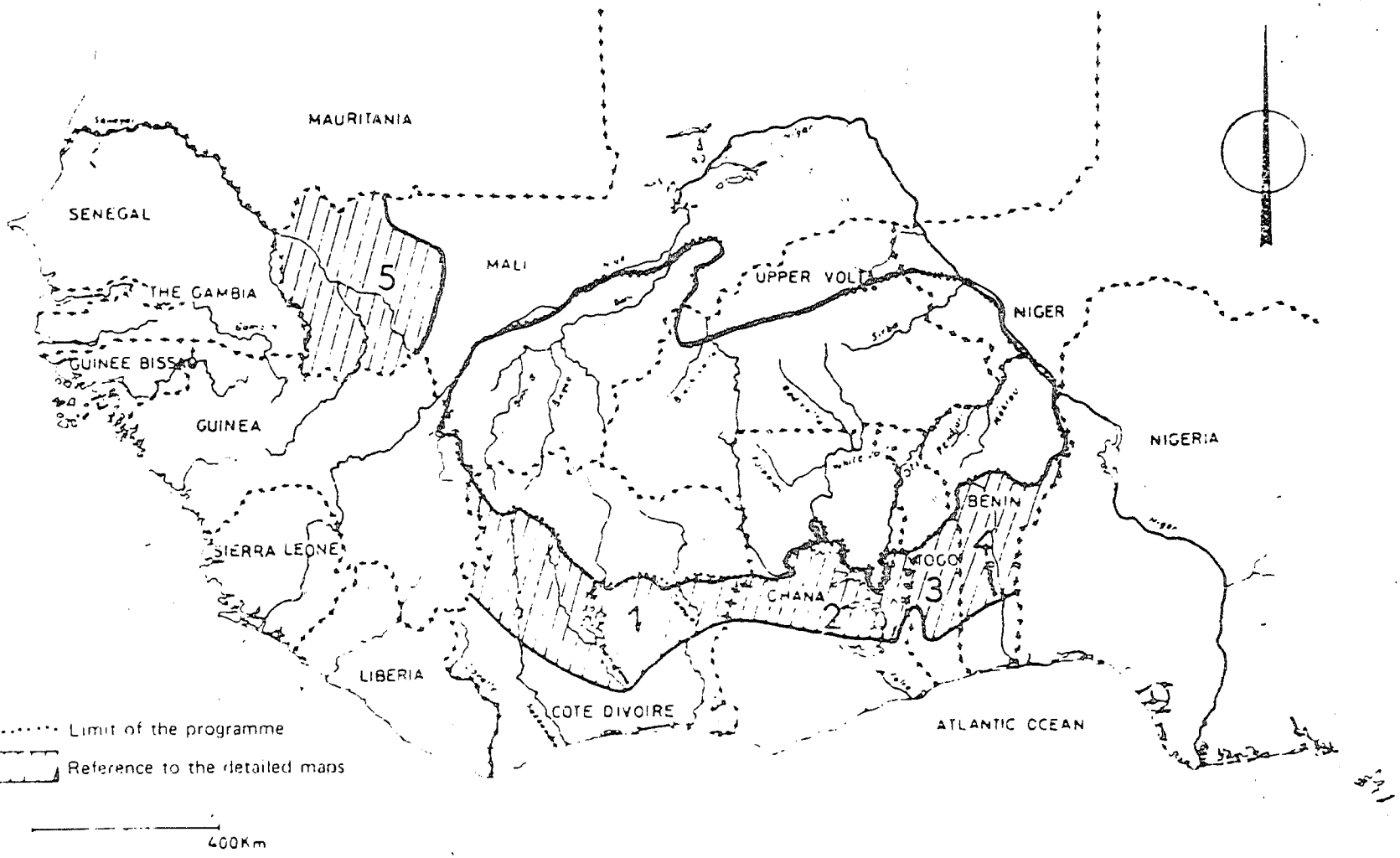

TABLE I. TOTAL PROGRAMME REQUIREMENTS 1974-1979 BY PROGRAMME ACTIVITY

	Actual expenditures			Estimates			Total
	1974 $	1975 $	1976 $	1977 $	1978 $	1979 $	$
ANNUAL COSTS							
Vector control operations	561 362	3 031 000	5 293 755	6 683 500	7 705 000	8 239 000	31 513 617
Epidemiological evaluation	58 199	423 280	519 927	561 300	746 000	819 000	3 127 706
Economic development	-	-	-	185 500	339 000	373 000	897 500
Applied research	431 095	390 729	458 824	463 800	741 700	716 000	3 202.148
Medical research and training - UNDP	101 390	83 750	464 369	350 300	465 000	465 000	1 929 809
Programme Director and Administrative Support Ouagadougou	491 028	875 501	1 019 208	1 105 600	2 048 250	2 228 750	7 768 337
Meetings	20 000	35 169	60 819	130 000	140 000	150 000	535 988
Technical and administrative support, Geneva	300 228	598 389	693 041	535 600	171 000	177 000	2 475 258
Technical support, FAO	3 341	36 716	31 391	90 612	20 000	20 000	202 060
Technical and administrative support, Brazzaville	-	-	-	45 000	48 750	50 250	144 000
SUB-TOTAL - ANNUAL COSTS	1 966 643	5 474 534	8 541 334	10 151 212	12 424 700	13 238 000	51 796 423
Joint Coordinating Committee	5 400	81 738	79 998	99 000	103 000	107 000	476 136
GRAND TOTAL - ANNUAL COSTS	1 972 043	5 556 272	8 621 332	10 250 212	12 527 700	13 345 000	52 272 559
CAPITAL ITEMS							
Buildings	24 135	138 085	303 567	447 000	48 000	82 000	1 042 787
Furniture	87 887	6 446	14 675	15 200	7 000	7 000	138 208
Vehicles	465 769	261 733	1 204 402	28 000	135 300	683 500	2 780 754
Technical equipment	190 618	46 183	269 190	237 800	167 000	174 000	1 084 791
TOTAL - CAPITAL ITEMS	768 409	454 497	1 791 834	728 000	357 300	946 500	5 046 540
TOTAL	2 740 452	6 010 769	10 413 166	10 978 212	12 885 000	14 291 500	57 319 099
OF WHICH: Onchocerciasis Fund	2 639 062	5 780 527	9 835 754	10 627 912	12 100 000	13 732 500	54 715 755
UNDP Funds	101 390	83 750	464 369	350 300	465 000	465 000	1 929 809
Participating Countries	-	146 492	113 043	-	320 000	94 000	673 535

ANNEX B

Table II

DONOR CONTRIBUTIONS TO OCP FUND [a]
(U.S. $ Million)

	Original PROP (1974-79)	Revision Actual (1974-77)	Revision Forecast (1978-79)
Canada	$ 3.00	1.99	1.50
France (10 percent)	5.40	3.65	1.90 [b]
Germany	5.40	5.24 [c]	--
Netherlands	6.00	4.00	2.00
United Kingdom (10 percent)	5.40	3.05	2.43 [d]
U.S.A.	6.00	4.00	3.40
World Bank Group (10 percent)	5.40	2.75	3.25
F.E.D. (10 percent)	5.40	--	--
Iraq	0.05	0.05	--
Kuwait	--	4.00	2.00
Norway	--	--	1.00
African Development Bank	--	0.72	0.36
Belgium	--	1.09	0.82
Japan	--	2.25	?
Income from investments	--	0.52	?
	42.05	33.31	18.66

a/ Excludes contributions to geographic extension, African Grant, and UNDP contributions outside Fund
b/ French Francs 9 Million
c/ DM 4 Million
d/ Est. 10% of drawings

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT PAPER FACESHEET

1. TRANSACTION CODE: C (A ADD, C CHANGE, D DELETE)

PP

2. DOCUMENT CODE: 3

3. COUNTRY/ENTITY: Africa Regional

4. DOCUMENT REVISION NUMBER: 1

5. PROJECT NUMBER (7 digits): 698-0399 *

6. BUREAU/OFFICE: A. SYMBOL: AFR; B. CODE: 06

7. PROJECT TITLE (Maximum 40 characters): Onchocerciasis Control - Volta Basin

8. ESTIMATED FY OF PROJECT COMPLETION: FY 80

9. ESTIMATED DATE OF OBLIGATION: A. INITIAL FY 74; B. QUARTER (Enter 1, 2, 3, or 4); C. FINAL FY 80

10. ESTIMATED COSTS ($000 OR EQUIVALENT $1 -)

A. FUNDING SOURCE	FIRST FY B. FX	FIRST FY C. L/C	FIRST FY D. TOTAL	LIFE OF PROJECT E. FX	LIFE OF PROJECT F. L/C	LIFE OF PROJECT G. TOTAL
AID APPROPRIATED TOTAL	2,000	-	2,000	7,700	-	7,700
(GRANT)	(2,000)	(-)	(2,000)	(7,700)	(-)	(7,700)
(LOAN)	( )	( )	( )	( )	( )	( )
OTHER U.S. 1.	-					
OTHER U.S. 2.	-					
HOST COUNTRY	-		-	3,020		3,020 a/
OTHER DONOR(S)	740	-	740	50,107		50,107
TOTALS	2,740	-	2,740	60,827		60,827 b/

11. PROPOSED BUDGET APPROPRIATED FUNDS ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE C. GRANT	PRIMARY TECH. CODE D. LOAN	E. 1ST FY 74 F. GRANT	E. 1ST FY 74 G. LOAN	H. 2ND FY 76 I. GRANT	H. 2ND FY 76 J. LOAN	K. 3RD FY 77 L. GRANT	K. 3RD FY 77 M. LOAN
(1) H	510 S	550	-	2,000		1,000		1,000	
(2)									
(3)									
(4)									
			TOTALS	2,000		1,000		1,000	

A. APPROPRIATION	N. 4TH FY 78 O. GRANT	N. 4TH FY 78 P. LOAN	Q. 5TH FY 79 R. GRANT	Q. 5TH FY 79 S. LOAN	LIFE OF PROJECT T. GRANT	LIFE OF PROJECT U. LOAN
(1)	2,000		1,700		7,700	
(2)						
(3)						
(4)						
TOTALS	2,000		1,700		7,700	

12. IN-DEPTH EVALUATION SCHEDULED: MM 09 YY 78

13. DATA CHANGE INDICATOR. WERE CHANGES MADE IN THE PID FACESHEET DATA, BLOCKS 12, 13, 14, OR 15 OR IN PRP FACESHEET DATA, BLOCK 12? IF YES, ATTACH CHANGED PID FACESHEET.

1 (1 = NO, 2 = YES)

a/ Includes Ivory Coast contribution to geographic extension

b/ Includes geographic extension

14. ORIGINATING OFFICE CLEARANCE

SIGNATURE: E. Dennis Conroy

TITLE: Director, AFR/RA

DATE SIGNED: MM 09 DD 13 YY 78

15. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION: MM DD YY

AID 1330-4 (3-76)

*Formerly Project No. 625-11-510-908

INITIAL ENVIRONMENTAL EXAMINATION

Project Location: Portions of Upper Volta, Benin, Togo, Ghana, Niger, Mali and Ivory Coast

Project Title: Onchocerciasis Control - Volta River Basin

Funding (Fiscal Year and Amount): FY 78 $2,000,000 (of which $300,000 for studies)

Life of Project: 1974 to 1979

IEE Prepared By: E. Dennis Conroy Date: August 23, 1978

Environmental Action Recommended: A negative determination is recommended. The decision is based on the very extensive studies of the vector, the selection of the insecticide and the methodology employed in its use. It is also supported by the continuing monitoring of the environmental impact which is undertaken by the Ecological Panel that was created by the project and which has performed in a superior manner.

Concurrence: Date:

W. Haven North
Deputy Assistant Administrator 9/14/78

Assistant Administrator's Decision Date: 9/14/78

Approved:

Disapproved:

Clearances:
AFR/DR:JNixon (draft)
AFR/RA:EGRuoff/BWickland (draft)
AFR/DR:JLStockard,M.D. (draft)
DS/AGR:FWhittemore (draft)
AA/PPC:APrintz (Draft)
GC/AFR:EADragon EAD

I. Examination of Nature, Scope, and Magnitude of Environmental Impacts

A. Description of Project

The Onchocerciasis Control Program in the Volta River Basin area is a collaborative undertaking among the seven participating African governments and is being carried out by agencies of the United Nations system with the support of the international community. The objective of the program is (1) to interrupt transmission of the disease by eliminating (reducing) the blackfly vector through periodic aerial applications of non-persistent EPA registered larvicides, involving no risk of significant contamination of the environment, and (2) to assist participating governments in preparing requests for the subsequent socio-economic development of the fertile areas freed from transmission of the disease. The interruption of transmission involves:

(a) aerial larviciding operations

(b) entomological surveillance of the treated areas

(c) epidemiological evaluation of the results of the program

(d) permanent monitoring of the long term safety of the operations relative to the environment

(e) treatment schedules for onchocerciasis patients so the parasites can be eliminated from those already infected

(f) mass treatment if new chemotherapeutic agents become available.

The overall strategy for the program is set forth in the Report of the Preparatory Assistance Mission to Governments (PAG), with technical annexes.

The A.I.D. Non-Capital Project Paper (PROP) was approved by the Deputy Administrator of A.I.D. on February 11, 1975 with a planned A.I.D.

contribution of $6 million over the first six year phase (1974-1979) of the twenty year program. An Onchocerciasis Fund Agreement had been signed by the donors and UN agencies on March 1, 1974. The present amendment to the PROP provides an additional $1.4 million contribution to the control program and a $300,000 contribution to studies for a possible geographic extension of the area treated in Benin, Togo and Ghana. These areas are adjacent to the original control area and presumably involve the same ecology. Surveys of the epidemiological, entomological and hydrological situation are underway in order to make a technical decision on whether to extend the control program boundaries. A financial decision would also be needed but such a decision will rest heavily on whether an extension southwards is necessary to reduce the effects of reinvasion.

Studies in the extension area in the Ivory Coast in 1977 showed that the Upper Sassandra river basin, together with the Marahoue, are the source of reinfestation (reinvasion) of the Bandama, Leraba and Bagoe basins in the original control program area. Hydrological data is adequate for implementation of a larviciding campaign and, therefore, the boundary of the original control program has been readjusted southwards in the Ivory Coast to include these areas from which reinvasion is occurring. The Government of the Ivory Coast is paying for the control program in this area for the next two years.

B. Environmental Monitoring

Concern for the environment was of paramount importance during the development of the program in 1973 and prior years. Although preparatory work was before the adoption of Regulation 16 on Environmental Procedures,

four annexes to the PAG report were devoted to vectors and transmission and were based on extensive field experimentation on the area. These annexes[1/] (1) described the distribution and biology of the vector and transmission of onchocerciasis, (2) examined the principles and methods of blackfly control, (3) explained the technical criteria for selection of insecticides in connection with control of the vector and the prevention of environmental contamination and (4) presented findings with respect to evaluations of insecticides for controlling the blackfly in the Volta River Basin area.

In 1973 an Ecological Panel composed of internationally-known specialists was appointed to study ecological problems connected with the onchocerciasis program and to monitor results and make recommendations to ensure effective protection of the environment in the program area. The Panel was headed by Dr. James A. Lee (and is now headed by Professor H.N.B. Hynes, Faculty of Science, Department of Biology, University of Waterloo, Ontario, Canada) and is composed of individuals with wide experience in river basin ecology, epidemiology of diseases in river basins and the ecological effects of pesticides. In 1973 the Panel examined the pesticide to be used, including its formulation, nature, and rate of application and toxic properties and indicated approval of it on all counts. As a result of an in-depth review of plans for carrying out the control program, the Panel concluded in June 1974 that the program should not lead to any serious untoward consequences for the environment, the biota, or human health.

The Ecological Panel has continued to monitor the ecological effects of the program and to propose such measures as may be needed to supplement the

1/ Available in AFR/RA, Bureau for Africa

ecologic studies undertaken, and to make recommendations to ensure the effective protection of the environment. The Panel has met six times since the program began and members have visited the area to survey results.

C. Risk-benefit Analysis on Pesticide Use[2/]

The Onchocerciasis Control Program, after analysis of the experience with prior campaigns, planned and put into operation a vector control program according to the following criteria:

(1) control measures will be directed against the larvae of the vector which concentrate in areas of rapidly flowing turbulent water and which are the most susceptible development stages of the blackfly;

(2) insecticides will be utilized which have little residual action, are effective at low concentrations and produce little pollution under the conditions of application; and

(3) treatment will be from the air which is the only method proved to be the least costly for practically 100% effectiveness.

The insecticide used is temephos, Abate (0,0,0'-tetramethyl-0,0'-thiodo-para-phenylene phosphorothiaoate) and is registered by the Environmental Protection Agency for the similar use in the United States.

The compound has a specific formulation which has the essential properties of high effectiveness against the S. damnosum larvae of all instars, and, because of its relatively specific action, its low persistence and the very small doses applied, low toxicity for the environment. This insecticide has been used since the start of operations under this program. The Ecological Panel's current view is that until such time as resistance to Abate develops, there would be no justification to alternate

2/ Portions of this analysis were obtained from Evaluation Report, Phase I (draft) prepared by the OCP dated March 31, 1978.

larvicides since the present formulation of Abate seems to have a very low toxicity to non-target organisms. Search and testing for alternative larvicides is underway, however, since larvicide resistance, if it were to appear, might spread quickly.

The application of the larvicide requires constant study and adjustment. As river levels change the breeding sites of Simulium damnosum change and aircraft circuits must be modified accordingly. Rivers treated with a particular quantity of insecticide one week will not usually require the same dosage the following week and rivers are constantly being added or taken away from the circuit as they start to flow or dry up. New treatment maps are produced each week at the aerial operations section of the two bases at Bobo-Dioulosso and Tamale. The pilots are then briefed and carry with them maps which indicate the rivers to be treated and the dosages required. Application of the insecticide is by a metered "dual" system whereby, by operating a switch in the aircraft, the pilot can emit the insecticide either by gravity or through a pressure fed single nozzle. The pressure system is particularly effective in the dry season and in getting a difficult breeding site with small dosages.

The larvicide, Abate was selected because it was observed to be selective in its control of Simulium larvae and to have a marginal effect on the non-target organisms present in the rivers. However, as the control of the Onchocerciasis vector requires the rivers to be treated almost on a weekly basis during their period of flow, it was considered prudent and planned in the PAG Mission Report, to develop a program whereby selected river basins could be studied in detail to observe the possible long-term effects of the generally low concentrations of Abate used on the overall

riverine biota. As the invertebrate population forms a major element in the food chain in the rivers it was obviously of importance to ensure that the end product, fish, were not adversely affected as in many areas they are a major source of protein for the local populations bordering the river valleys.

Initial investigation showed that very little knowledge had been acquired of the ecology of West African rivers and, apart from Simulium spp., there was practically no information on the invertebrate fauna present in running water, especially in the savanna area covered by the Onchocerciasis Control Program. Virtually no classification had been done of the organisms present, other than fish, so that the basis on which to start a regular and meaningful monitoring program was very weak. A routine evaluation procedure was required at the same time as a study was made on the taxonomy, seasonal distribution and ecological behavior and relationships of the principal benthic organisms.

A meeting of hydrobiologists was convened in Geneva and a protocol established for the monthly collection of well-defined samples of invertebrates as found in natural day and night drift. A protocol was established simultaneously for sampling the fish population on a two monthly basis, the principal method being a battery of gill nets of different sizes left in position in the river overnight. A series of coded forms have been devised to enable all information collected from the different samples to be systematically recorded. All forms are stored in computer and analyzed. This enables a space and time review of the situation to be made when required.

Essentially two groups of hydrobiologists are actively engaged in the routine aquatic monitoring program. These are the ORSTOM Hydrobiological Unit in Bouake, Ivory Coast, and the Institute of Aquatic Biology, Achimota, Ghana. Altogether nine rivers are sampled on a regular basis viz. Bagoe, Bandama, Leraba, Comoe, Nzi, Marahoue, Black Volta, White Volta and Oti. A hydrobiologist in Upper Volta has also been involved in the regular sampling of the Red Volta which differs from the others in being seasonal and flowing for only six months each year. The timetable for the implementation of operational activities in the Program was such that it was not possible to obtain data from the majority of the rivers prior to the commencement of treatment. However, the information subsequently collected on a regular basis has proved ideal for monitoring the new ecological balance achieved under pressure of weekly application of Abate.

It was possible to collect base-line data prior to treatment on three rivers within the Program area for periods varying from one year to 18 months. These are the Bagoe, Oti and Red Volta. The first year of treatment on the Red Volta which has only seasonal flow showed a quantitative reduction in the invertebrate fauna collected when compared with the pretreatment situation, but a distinct improvement was reported the following year. The impact of the initial treatment of both the Bagoe and Oti rivers resulted in a marked reduction in the organisms in these rivers. Despite the continuation of weekly treatments a steady recovery in the quantity of the fauna is being recorded in the monthly samples.

Analysis of the data from all the rivers monitored has indicated a general all-around quantitative reduction in invertebrate fauna of about 30%.

This information has to be linked up with that of the fish population which shows that throughout the area there is apparently no reduction in the fish coefficient of condition. Supplementary studies on the fish population in rivers not covered by the routine monitoring program have confirmed that the list of species of fish present remains as it was before treatment and that alvelings are appearing in the rivers at normal times and in regular quantities showing that reproduction is not being affected by periodic exposure to the larvicide.

By the end of 1977 the data being accumulated on a monthly basis on the invertebrate fauna was so stable that, following consultation with the Ecological Panel, it was decided to reduce the frequency of sampling to four times a year at well spaced intervals covering the different aquatic conditions encountered throughout the year.

Consultants were recruited to obtain data on the situation in rivers in the periphery of the Program area particularly in the north and south. When possible this supplementary sampling was done prior to treatment with the intention that it be followed at a similar time in subsequent years following treatment.

The Program was alerted on three occasions to unusual situations observed in the course of monitoring. First was the abnormally high drift associated with the initial application of Abate to the Bagoe and Oti Rivers. Second, was a reduction in the coefficient of condition of fish in a section of the Bandama river, which later recovered, and was apparently the result of some local influences as no other Abate treated rivers were similarly affected.

Third, was the almost complete removal of all aquatic fauna from the Red Volta sampling site, apparently caused by a wrong use of agricultural pesticides by fishermen. Similar misuse of pesticides was reported from the eastern flank of the Program area.

The aquatic monitoring protocol is now well tried and firmly established and will enable the continued evaluation of the impact of Abate, and any other larvicide which might be introduced in the Program, on the benthic and fish fauna.

Because of the need to develop new, field-operable methods for the collection, extraction and storage of Abate samples in water, mud, fish and other organisms, the chemical monitoring program has not made the same marked progress as the aquatic monitoring program. Studies have shown, however, that the Abate quickly disperses in the water downstream from the point of application so that samples taken 500 meters and 8,000 meters downstream show a maximum of 4,342 ppb and 1.7 ppb respectively to be present, reducing to non-detectable amounts shortly afterwards at these sites.

Abate is acknowledged as a readily biodegradable compound and analysis of fish, bivalves and mud taken from rivers treated weekly with 0.1 ppm of Abate showed the following content of Abate:

SITE*	NUMBER OF DAYS BETWEEN TREATMENT AND COLLECTION OF SAMPLES	FISH			OYSTERS	MUD
		Tilapia zillii (temephos, ppm)	Aleste nurse (temephos, ppm)	Labeo parvus (temephos, ppm)	Etheria elliptica (temephos, ppm)	Mud (temephos, ppm)
1	1	14,32	0,77	1,30	0,08	0,19
	6	7,08	0,25	0,96	0,05	0,32
2	1	0,14	-	0,00	0,21	0,56
	6	-	0,25	0,02	0,25	0,41

Site 1 : immediately downstream from treatment point of the bridge

Site 2 : 1 km downstream from Site 1.

Two days after the application of the insecticide, samples are taken at established stations throughout the control area to determine the effectiveness of the insecticide in killing blackfly larvae and the existence of the larvicide in the rivers. Results of these studies are reported to the aerial operations headquarters and pilots are advised in their weekly briefing. Any adjustment in application of the insecticide can be made before the next spraying.

It is believed that the methodology and controls employed in the application of the insecticide are fully adequate to mitigate potential adverse effects of the insecticide and there is no potentially unreasonable risk arising from pesticide use.

D. Recommendation for Threshhold Decision

It is believed that the attention given to environmental factors prior to approval of the program, the continued monitoring underway by experts, and the continuing review by the Ecological Panel meets environmental concerns. It is also believed that the experience to date indicates there is no significant environmental impact. Therefore, we believe a further assessment is not necessary under Regulation 16 to determine that the project will not have a significant effect on the environment, and therefore a Negative Determination is appropriate.

IMPACT IDENTIFICATION AND EVALUATION FORM

Impact Areas and Sub-areas 1/	Impact Identification and Evaluation 2/
A. LAND USE	
1. Changing the character of the land through:	
a. Increasing the population	L
b. Extracting natural resources	N
c. Land clearing	L
d. Changing soil character	N
2. Altering natural defenses	N
3. Foreclosing important uses	L
4. Jeopardizing man or his works	N
5. Other factors	
Resettlement	L
B. WATER QUALITY	
1. Physical state of water	N
2. Chemical and biological states	L
3. Ecological balance	N
4. Other factors	

1/ See Explanatory Notes for this form.

2/ Use the following symbols:
N - No environmental impact
L - Little environmental impact
M - Moderate environmental impact
H - High environmental impact
U - Unknown environmental impact

August 1976

C. ATMOSPHERIC

1. Air additives ---------- N
2. Air pollution ---------- N
3. Noise pollution ---------- N
4. Other factors

D. NATURAL RESOURCES

1. Diversion, altered use of water ---------- N
2. Irreversible, inefficient commitments ---------- N
3. Other factors

Increase use of ground water in oncho- L
safe areas

E. CULTURAL

1. Altering physical symbols ---------- N
2. Dilution of cultural traditions ---------- N
3. Other factors

Enabling return to traditional lands L

F. SOCIOECONOMIC

1. Changes in economic/employment patterns ---------- L
2. Changes in population ---------- L
3. Changes in cultural patterns ---------- L
4. Other factors

G. HEALTH

1. Changing a natural environment ---------- L

2. Eliminating an ecosystem element ---------- N

3. Other factors

Reduction of onchocerciasis ---------- M

H. GENERAL

1. International impacts ---------- N

2. Controversial impacts ---------- N

3. Larger program impacts ---------- N

4. Other factors

I. OTHER POSSIBLE IMPACTS (not listed above)

See attached Discussion of Impacts.

Description of Possible Impacts

A. Land Use

If the blackfly can be controlled and the transmission of onchocerciasis thereby prevented, many fertile river valleys which are underpopulated now will be freed for tillage. Population pressures on land in the highland areas (Mossi Plateau) and other sections of the countries will be reduced through migration to the oncho-safe areas. The areas made oncho-safe contain some less fertile land which will not be suitable for cultivation so there will be dispersal of settlement. The countries are preparing maps of land use and natural resources in order to guide settlement.

B. Water Quality

A larvicide agent, Abate, is added above turbulent areas of fast flowing rivers or streams by either helicopter or fixed wing plane in 7-10 day intervals. The dosage of larvicide is carefully controlled in relation to the volume of water flowing in order to assure low toxicity; the quantities used to kill Simulium damnosum larvae are minimal since the highest concentration to be used are of 0.1 mg per liter during 10 minutes. This corresponds to an average concentration in the water of the treated sections of some 0.1 mg per m^3 of water. Information on the initial and subsequent Abate treatments on the biosystem has shown that, whereas the initial treatment causes a change, the biosystem soon adjusts and stabilizes itself again, and there is very little effect from subsequent treatments. There is no evidence of effect on fish or humans. Abate is biodegradable and aquatic monitoring downstream reveals no residue after a short period (24 to 48 hours).

C. Atmospheric

The larvicide is sprayed from low-flying helicopters (or fixed wing aircraft in [illegible] inhabited areas involving larger rivers) on a specific pinpoint [illegible] directly into the water. There has been no discernible effect on human or animal life based on extensive testing and monitoring.

D. Natural Resources

When the areas are declared oncho-safe there will be settlement of people in the area. Farming of the land will be guided by the governments and services will be provided for agricultural development and maintaining health. At this time no areas have been identified for dams or irrigation development and, in any event, such activities would not be funded under this project and would be the subject of separate environmental examination. It is possible that some of the areas settled are subject to trypansomiasis or other diseases but persons are at risk from these diseases where they now live. The control program will not increase the incidence of diseases and should have the positive effect of eliminating onchocerciasis in the area in 20 years and of reducing the numbers of people who are blind or incapacitated from the disease. The overall effect should be positive.

E. Cultural

The areas declared oncho-safe are in most cases uninhabited or underpopulated. Some of the land is tribally owned and one problem of resettlement is controlling access by tribes without a claim on the land. This is a problem which is being studied by national governments with donor assistance, under this and other projects, in order to minimize adverse effects and strife. Governments are attempting to avoid mixture of tribal groups but the population pressure on highland areas is causing voluntary resettlement.

BEST AVAILABLE

There is a positive element in that some tribes had previously left their river valley habitat largely or partly due to the disease, and they will now be able to return.

F. Socio-economic Factors

The main justification for the vector control program is to provide oncho-safe areas in fertile river valleys which can be farmed for cash and food crops. People have left these river valleys partly as a result of the disease. The oncho program has adopted a methodology for utilizing the new land including an inventory of socio-economic resources, a ten-year plan for development of the area, and feasibility studies of individual projects. One question is whether controlled, planned (and expensive) resettlement is preferable or whether people should be permitted to relocate voluntarily and then be provided with services. This question is under review by an Economic Review Mission and will be discussed by the Joint Coordinating Committee in December 1978.

G. Health

The vector control system is discussed above in Water Quality. The biosystem soon adjusts itself and stabilizes after larvicide treatment. There is no evidence of effect on fish, animals or humans. Health factors are constantly being monitored by specialists on the onchocerciasis control program and the aquatic monitoring unit at Boake in the Ivory Coast.

There is a positive human health affect through reducing river blindness.

H. General

Larviciding an area involving 14,000 km of rivers and streams naturally caused considerable interest in the initial consideration of this project.

An international group of experts continues to monitor the activity. The donor community involving 11 developed countries, 7 African countries and the UN agencies reviews reports and meets annually to consider all aspects of the project, including the reports of the Ecological Panel.

There are no matters of controversy nor does the effect have an impact outside the project area.

February 27, 1980

Mr. Robert E. Lennon
P.O. Box 74
Lincoln, Maine 04457

Dear Bob,

My apologies for not writing sooner. When I returned from Africa Christmas was upon us. In January the Congressional Presentation took all our time.

Things went very well at the OCP meeting in Geneva. I have just received the draft report of the session and the best way to give you the details is to attach a xerox copy of the pertinent sections.

I had discussions with Douglas Marr and Marc Bazin concerning appointments to the ecological group which will perform the functions of the former Ecological Panel within the general framework of the Expert Advisory Committee. They both indicated that you would be invited to be a member of that group. I wonder if they have contacted you? I'll call in a week or so to find out and, if not, will send a cable.

I also had a discussion with Dr. Camus, Chief of ORSTOM in Paris about having you visit their activities in West Africa. He was very receptive and pledged full cooperation of his organization if I would let him know two or three weeks in advance. I think such a trip would add insight to your understanding of the African scene. A.I.D. would pay for it directly through some sort of personal services contract or purchase order. If you agree to the trip would you send me a brief proposal with a budget for the trip and I could then discuss it with our contract office. In addition to visiting Abidjan and Boake in the Ivory Coast, I would think you should visit OCP headquarters in Ouagadougou first then see the aquatic monitoring operation in Ghana and perhaps other countries. I'm not sure when the best time of year to do this but the rainy season would be about over in March, I believe.

I will call you next week so we can discuss all of this.

With best regards.

Sincerely yours,

Clearance:AFR/RA:BWickland(draft)

AFR/RA:EDConroy:mls:2/27/80

E. Dennis Conroy
Director
Office of Regional Affairs
Bureau for Africa

Attachment: a/s

OPERATIONAL [illegible] BUDGET: PROGRAM REVISION REQUEST

TO: Mr. James [illegible] Govan
AFR/DP/PAE, Room 6671 NS

DATE: 2/11/80

OYB/PRR No.:

FROM: AFR/RA, Minnie Sebsibe

Country/Program: Africa Regional
Loans or Grants: Grants
Appropriation Category: Health

AMOUNT ($000s)

		(1) Original OYB	(2) Most Recent Total	(3) Amount of Change (+ or -) from 2	(4) New Total
TOTAL	For columns (1) thru (4) enter budget data for appropriation (i.e. func.) category	12,000	12,000	-	12,000
INCREASE	Accelerated Impact Program			+	
	698-0410	500	500	+1,500	2,000
				+	
				+	
DECREASE	Oncho Control, Phase II			-	
	698-0399	2,400	2,400	- 350	2,050
	Combating Childhood Diseases			-	
	698-0421	3,800	3,800	-1,150	2,650

Summary justification of change by program or activity:

Funds required for additional requests under project 698-0410.

Is Congressional notification required as result of change? x yes ____ no

If yes, give date notification was delivered or is to be delivered (15 days must pass before obligation). *

In the case of individual country or international organization programs has an increase in the total program level requiring justification under Section 653(b) of the FAA been affected? (e.g. has the program been increased by at least $1 million and by 10%).

____ yes no no

If yes, give date justification was delivered or is to be delivered (10 days must pass before obligation). ____

* CNs to be submitted as proposals approved.

AFR/RA:EGRuoff
AFR/RA:BWickland
AFR/RA:EWYates EWY

mls:2/11/80

BRIEFING PAPER

CONGRESSIONAL HEARINGS FY 80

ONCHOCERCIASIS CONTROL

(See Africa Regional C.P. - p. 487)

Purpose: To support an international and multi-donor effort to control onchocerciasis (river blindness) in the Volta River Basin area of Benin, Ghana, Ivory Coast, Mali, Niger, Togo and Upper Volta.

-- The overall effort envisages a lifespan of nearly twenty years and the financial and technical participation of more than a dozen other donors.

-- The project entails the following actions:

* Systematic application of larvicides to water surfaces to destroy the black fly vector.

* Surveillance and re-application of larvicides.

* Research into the development of new and more cost effective measures both for destroying the black fly larvae and for the treatment of onchocerciasis.

* The training of African medical staff.

-- Current status is as follows:

* $1.7 million A.I.D. funds obligated February 1979.

* Control of the black fly vector through aerial application of larvicide has been successful in about 80% of the program area.

* Transmission of the disease to children has been arrested in about 80% of the population samples.

* Reinvasion of black flies into previously treated breeding sites has occurred along the southern and western edges of the program zone.

  - Studies are underway to determine the need, feasibility and methodology for a possible southern extension of the control zone further into Benin, Ghana and Togo.

* Additional countries have requested assistance. A.I.D. has agreed to participate in a study of the area to see if a control program is feasible in:

  - Guinea
  - Guinea Bissau
  - Senegal

AFR/RA:EGRuoff:2/28/79:X28964
Clearance:AFR/RA:EDConroy

CHAPTER I

HISTORY OF THE PROGRAMME

Onchocerciasis, or river blindness, is transmitted in West Africa by blackflies, belonging to the Simulium damnosum complex, which breed in rapidly flowing sections of many rivers. This disease, which is particularly severe in the Sudan and Guinea savanna zones, brings with it debilitation and blindness. In parts of the West African savanna onchocerciasis constitutes an important deterrent to human settlement and the subsequent economic development of many valleys which lie uninhabited and unproductive.

In 1974, at the beginning of the Onchocerciasis Control Programme (OCP) covering nearly 700 000 square kilometres in the Volta River basin, it was estimated that 10% of the population was harbouring Onchocerca volvulus, the parasite causing onchocerciasis, and that about 70 000 people were blind as a consequence of the disease. It is not possible to assess the exact number of blind in the Programme area, but it is more relevant to take into consideration the geographical concentration of blindness due to onchocerciasis in certain areas, when estimating the impact of the disease. The epidemiological pattern of ocular onchocerciasis, with extremely high blindness rates in relatively young age-groups in small rural populations, explains the important socioeconomic consequence of the disease.

Awareness of the extent of the problem had been steadily developing since the 1940s. Systematic surveys to assess the magnitude of the problem and studies to develop and evaluate potential control measures were carried out in many of the countries concerned since the early 1950s, thus providing improved background information on the epidemiology and socioeconomic importance of the disease. Control operations aiming at the destruction of the vector were carried out during the 1960s, beginning on a modest scale and culminating in a campaign involving three countries and 60 000 square kilometres, under the aegis of the Governments of Ivory Coast, Mali and Upper Volta in association with the European Development Fund (EDF), and the Organisation de Coordination et de Coopération pour la lutte contre les Grandes Endémies (OCCGE).

In 1968 the World Health Organization (WHO), in joint sponsorship with the United States Agency for International Development (USAID), and OCCGE, convened a technical conference in Tunis to consider the problem of onchocerciasis. The conference concluded that control by means of larviciding was technically feasible and chances of success would be greatest if the operations were carried out in ecological zones sufficiently large to obviate the need for continuous control of the whole area in order to protect it against reinvasion by the onchocerciasis vectors. It was recommended that priority be given to launching a large-scale control programme in the Volta River basin area, involving adjoining parts of Benin, Ghana, Ivory Coast, Mali, Niger, Togo and Upper Volta, to protect populations severely affected by the disease and to constitute the cornerstone of future coordinated action against onchocerciasis, and in favour of associated development, in Africa south of the Sahara.

In 1969 a meeting was organized in Brazzaville by the WHO Regional Office for Africa to refine further the approach needed for preparing the proposed campaign. Representatives from the Government of Ghana, OCCGE and USAID, as well as from WHO, attended these discussions. Shortly thereafter, in 1969 and 1970, several of the interested countries submitted formal requests - emanating from the highest authorities - to international and bilateral sources of technical cooperation and funding which were thought to be interested in contributing to such an ambitious undertaking. Among those organizations were the Food and Agriculture Organization of the United Nations (FAO), the International Bank for Reconstruction and Development (IBRD), the USAID and WHO. Simultaneously, the United Nations Development Programme (UNDP) manifested its interest in broadening its existing involvement in onchocerciasis studies and control in the Volter River basin area.

The preparatory phase

On the basis of the requests received and at the suggestion of IBRD, WHO and UNDP sponsored a meeting of interested parties in Geneva in 1970 to draw up the terms of reference of a mission designed to carry out complementary investigations in the seven countries concerned, as well as to plan and cost the proposed Onchocerciasis Control Programme. This Preparatory Assistance to Governments (PAG) mission was funded by UNDP with FAO as Associate Agency.

Meanwhile, in 1972, the Director-General of FAO, the President of IBRD, the Administrator of UNDP and the Director-General of WHO, in view of the importance and complexity of the scheme envisaged, decided to set up a Steering Committee, comprising a representative of each of the four sponsoring agencies, to ensure the coordination of the action taken by these agencies in the planning and implementation of the Programme.

The findings of the PAG mission and the data originating from other preliminary investigations were combined to form a report,[1] which was presented during 1973 to the Governments of Benin, Ghana, Ivory Coast, Mali, Niger, Togo and Upper Volta. This report formulated a plan of work for onchocerciasis control in the Volta River basin area which could lead to the repopulation, settlement and economic development of the endemic zones. The report was also presented to various agencies, institutions and governments.

The Plan of Operations proposed by the PAG mission report was endorsed during a conference held at Accra in November 1973, which brought together the seven governments involved, and the four sponsoring agencies. At the conference the agreement governing the operations of the Programme (Operational Agreement) was formally signed by the participating governments and WHO. This agreement, which set out the basic arrangements for the management of the Programme, was supplemented in 1974 by individual Country Protocols defining the specific contributions of each government.

As Executing Agency, WHO was assigned the task of implementing the Programme which was formally established from 1 January 1974 with headquarters in Ouagadougou, Upper Volta. The first year of activity was devoted to setting up the structures, the recruitment and training of staff, the development of infrastructure, the purchase of equipment and supplies, complementary surveys and the intensification of research. Actual control operations began in February 1975.

The machinery established to manage the Programme included, at the country level, National Committees for Onchocerciasis (NOC), comprising representatives of the main national services concerned. The role of these committees is principally, to coordinate the action of all national services involved in the Programme and the subsequent economic development projects, and to ensure liaison between the government and Programme headquarters.

At the agency level, a Scientific Advisory Panel (SAP), made up of nearly 200 technical and scientific workers, was formed by WHO to be called upon, as necessary, for advice on all aspects of the disease and its control.

An Ecological Panel (EP), comprising a small group of specialists with wide experience in river basin ecology, the epidemiology of diseases in river basins and the ecological effects of pesticides, was set up by the Steering Committee to guarantee satisfactory protection of the environment.

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[1] UNDP, FAO, IBRD and WHO (1973) Onchocerciasis control in the Volta River basin area. Report of the Preparatory Assistance Mission to the Governments of: Dahomey, Ghana, Ivory Coast, Mali, Niger, Togo and Upper Volta, OCP/73.1 + Annexes 0-1 to VI-5, 2400 pp.

At the Paris meeting of donor and participating governments and sponsoring agencies, in June 1974, it was agreed to amplify the management structures of the Programme. The additional structures included, in particular, a Joint Coordinating Committee (JCC) composed of representatives of the seven countries, all contributing parties and the four agencies.[1] The role of the JCC was to exercise general supervision over the policies to be adopted in the planning and execution of the Programme and to follow the development of activities. The Committee, which would be presided over by an Independent Chairman and served by a joint WHO/World Bank secretariat, would meet at least once a year for this purpose.

To provide the JCC with a continuous independent evaluation of the technical aspects of the Programme, WHO formed a Scientific and Technical Advisory Committee (STAC) composed of 12 members of the Scientific Advisory Panel. This Committee would meet twice a year to review scientific and technical aspects of the Programme and would prepare an annual report containing its findings and recommendations for submission to the JCC through WHO and the Steering Committee.

Finally, the Steering Committee established an Economic Development Advisory Panel (EDAP) to assure the continuous review of information relating to the economic development aspects of the Programme. This Panel, composed of economists and specialists in agricultural and rural development would meet twice a year and would present an annual report on its findings and recommendations to the JCC through the World Bank and the Steering Committee.

These additional structures were described in a Memorandum of Understanding which was approved by the JCC at its first session in Abidjan, Ivory Coast, in February 1975.

Following the assurances received from contributing parties at this first session of the JCC, an Onchocerciasis Fund Agreement covering the financing of the first six years of operations was signed on 7 May 1975 by nine[2] donor governments, the African Development Bank, the IBRD, IDA, UNDP and WHO.

In 1976, following the consolidation of the Programme activities in the field and within the context of the new orientation being given to the functions of the Organization as a whole, the decision was taken by the Director-General to transfer the responsibility for the Programme from WHO headquarters to the Regional Office for Africa. This transfer implied both a new approach to management and a reorganization of the supporting services. Thus, in December 1976, a new Director was appointed and the headquarters in Ouagadougou assumed full responsibility for the implementation of the Programme under the authority of the WHO Regional Director for Africa. The Office of the Programme Director in Ouagadougou was enlarged by the transfer of staff from the support unit in Geneva, and a liaison office was established in Brazzaville.

Experience so far indicates that the centralization of activities in the field has had the effect of creating a closer association with the different levels of structure, in particular with the participating countries, and a greater flexibility for the management.

The interagency Steering Committee for Onchocerciasis Control in the Volta River basin area, which had been particularly active during the preparatory and launching phases of the Programme, has proved to be a valuable tool for concerted action and rapid decision-making.

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[1] Members of the JCC as of December 1977: Belgium, Benin, Canada, France, Federal Republic of Germany, Ghana, Iraq, Ivory Coast, Japan, Kuwait, Mali, Netherlands, Niger, Norway, Togo, United Kingdom of Great Britain and Northern Ireland, United States of America, Upper Volta, the Africa Development Bank, the United Nations Development Programme (UNDP), the Food and Agriculture Organization of the United Nations (FAO), the World Bank (IBRD) and the World Health Organization.

[2] The Kingdom of Belgium, Canada, the Republic of France, the Federal Republic of Germany, Japan, Kuwait, the Kingdom of the Netherlands, the United Kingdom of Great Britain and Northern Ireland and the United States of America.

National Onchocerciasis Committees

By mid-1974, each of the participating countries had formally established a National Onchocerciasis Committee (NOC). In particular these Committees played a major role in resolving logistical problems which arose during the first years of operations.

At the first joint meeting of the NOCs which was convened in Abidjan in June 1977 it was unanimously agreed that the Committees and the Programme should meet annually. At the invitation of the Government of Benin a second meeting took place in Cotonou in June 1978.

Advisory bodies

During the first four years of activities the Programme has benefited from the guidance and support of the advisory bodies.

In the initial stages, visits were made by members of the Ecological Panel (EP) and the Scientific and Technical Advisory Committee (STAC) to the Programme area for discussions with the field staff, and to obtain first-hand knowledge of the environment and of the operations. With the expiry of the mandate of members of STAC at the end of 1976, the composition of the Committee was reviewed and slighly modified to meet the changing needs. Following the transfer of management, a joint meeting of both groups took place in Ouagadougou in 1977, followed by a meeting of STAC at the WHO Regional Office, Brazzaville, in August 1978.

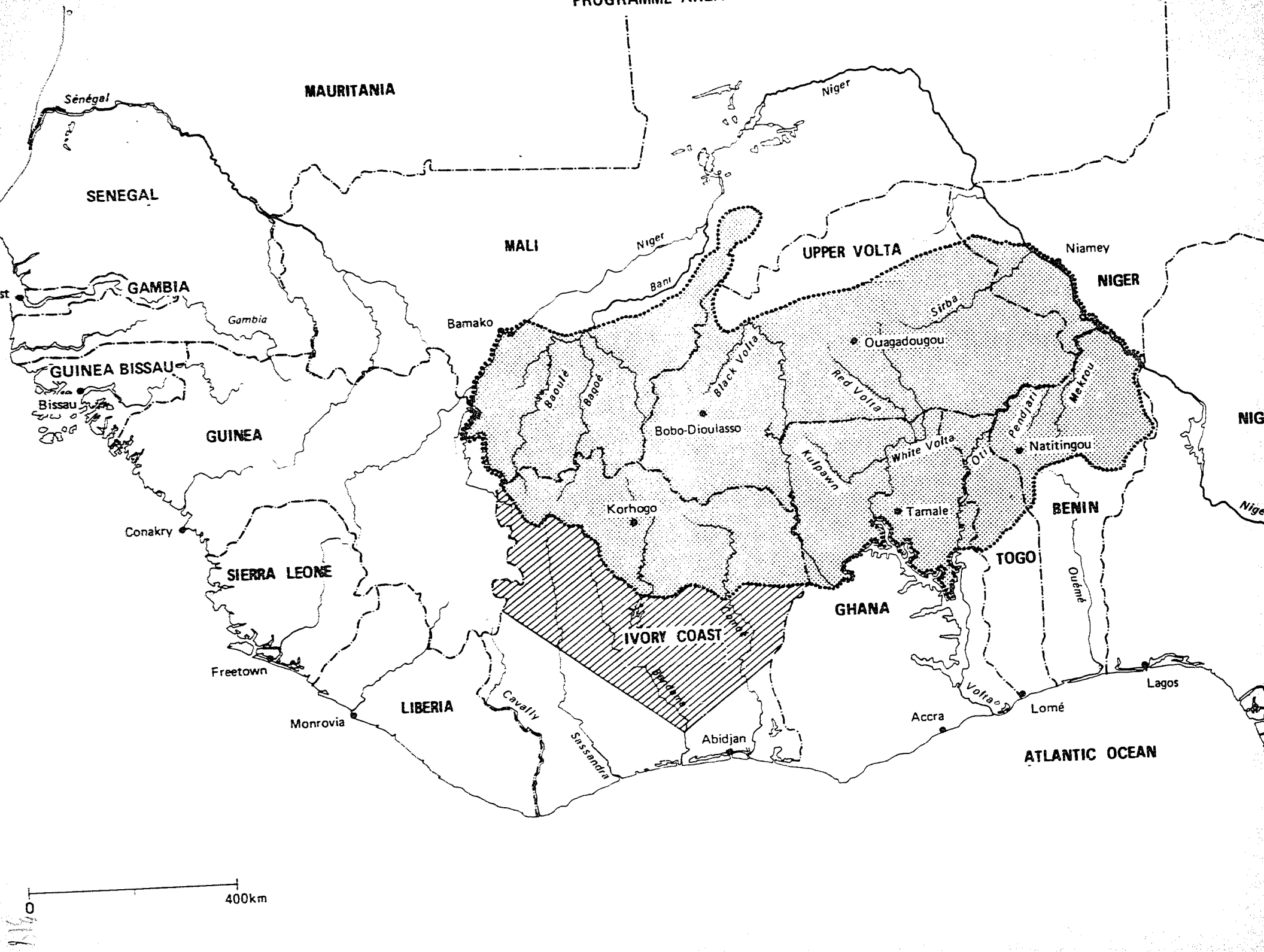
The Ecological Panel has been reviewing the data collected by the hydrobiology research workers under the aquatic monitoring programme and has drawn attention to factors which might be detrimental to the environment. The role of STAC in evaluating the technical aspects of the Programme and, notably, giving guidance in research, has been equally valuable.

Although efforts were made to minimize duplication through joint meetings and through cross-representation at meetings, some overlap between the roles of the Scientific and Technical Advisory Committee and the Ecological Panel has not been completely avoided and solutions to this continue to be sought.

As Administrator of the Onchocerciasis Fund the World Bank is responsible for mobilizing and managing the funds required to carry out the Programme. Advances from the Fund to WHO are made on a quarterly basis on receipt of a written submission of the estimated payments to be made during the following quarter. At half-yearly intervals, the Bank provides to each of the contributing parties and to the Steering Committee, a statement of contributions, receipts of and disbursements from the Fund.

As of 31 December 1977, the amount of advances by the World Bank was $ 30 200 000 of which $ 20 200 000 was for the 1974-1976 period and $ 10 000 000 for 1977.

PROGRAMME AREA AS OF 1 JANUARY 1978



CHAPTER II

THE PROBLEM OF ONCHOCERCIASIS

The disease and the parasite

Onchocerciasis is a parasitic disease caused by a nematode of the filaria group, Onchocerca volvulus. The parasite is strictly associated with man and has no known animal reservoir. It is transmitted by several dipteran flies of the Simuliidae family, which includes the West African vectors, the species complex Simulium damnosum. The Simulium or blackfly is both vector and intermediate host: a microfilaria ingested from a human has to complete a development cycle within the blackfly; in about seven days it becomes an infective larva, the only form which can infect man. There is no possibility of transmission of the disease except by forms of the parasite that have completed this obligatory intravectorial cycle.

Adult Onchocerca volvulus worms, male and female, live in human tissues either in the free state or encapsulated in fibrous formations known as onchocercomas, cysts or nodules. The free worms and deep-seated nodules are normally undetectable. The superficial nodules, which are visible and palpable, are mostly located in the subcutaneous tissues overlying bone: costal margin, iliac crests, trochanters, sacrum, knees, shins, skull. Each cyst contains one or more pairs of worms. As a rule patients have several cysts or groups of cysts, and in nodulectomy campaigns there have been cases where over 40 cysts have been removed from a single patient.

During its lifetime (estimated at 10-15 years) the female Onchocerca produces millions of embryos, microfilariae, which spread throughout the body tissues but with a particular affinity for the skin and eyes. From the skin they may be ingested by a blackfly during its blood meal. In man the microfilariae have a life expectancy of one to two years. After this time, unless they have been ingested by a blackfly and are thus able to continue their development cycle, they die in the tissues.

The main clinical manifestations of the disease are due to reactions to the presence of microfilariae, and their severity is directly related to the intensity of parasite infection. The simplest manifestations are skin lesions which are caused by scratching, and are followed by pruritic papular eruptions. Later on the skin may undergo a variety of changes: thickening and sclerosis in the form of pachyderma (elephant skin), localized or extensive cutaneous atrophy, and depigmentation.

Distribution of onchocerciasis

Onchocerciasis is essentially a disease of tropical Africa, where it is prevalent to varying extents between latitudes 15°N and 15°S. However, it also affects two other continents: America, with foci in Guatemala, Mexico, Venezuela, northern Brazil, and Colombia; and Asia, with the focus in northern Yemen.

Broadly speaking, the northern limit of the disease in Africa runs from Gambia to the south of Lake Chad; it then rises in the Sudan along the Nile as far as the Abu Hamed region (19°15'N) and drops again into Ethiopia along the tributaries of the Nile. The countries situated between this line and the Equator are the worst affected: the whole of West Africa (except Mauritania), Cameroon, southern Chad, the Central African Empire, southern Sudan, western Ethiopia, and northern Zaire.

Further south, the disease occurs in Equatorial Guinea, Gabon, Congo, Rwanda, Burundi, the central basin and southern part of Zaire, Uganda, western Kenya, Tanzania, Angola, and Malawi, where it reaches its southernmost point, 17°S.

The vector and transmission

Vector species

The known vectors of human onchocerciasis are flies which belong to the Simuliidae family. The African vectors are members of the complexes Simulium damnosum (throughout the area of distribution of the disease) and Simulium neavei (in certain parts of central and east Africa). As regards S. damnosum s.l., its area of distribution extends northwards and southwards beyond that of onchocerciasis.

The S. damnosum complex

It has been known for some years that S. damnosum, once regarded as a homogenous species, in fact constitutes a complex of different taxa. As a result of recent studies 24 separate cytological segregates have been identified throughout tropical Africa. For West Africa nine segregates have been described, six of which ("Nile", "Sirba", "Bandama", "Soubre", "Yah", "Bille") are of direct concern to the Programme because they are found in or closely associated with the Programme area. At a Scientific Advisory Panel meeting on vector complexes the decision was endorsed to consider these as species with the following names already given them in publications, S. damnosum s.s., S. sirbanum, S. sanctipauli, S. soubrense, S. yahense and S. squamosum respectively.

Table II-1 and Fig. II-1 show the distribution of these six main species for the whole of West Africa, and for the Programme area and adjacent zones respectively.

Each of the species has a characteristic distribution pattern related to the distribution of the bioclimatic zones of West Africa. Thus S. sanctipauli has never been demonstrated outside the forest zones; S. squamosum and S. yahense are more ubiquitous but mainly confined to certain types of watercourse in well wooded country; S. soubrense mainly inhabits the large rivers in the forest and Guinea savanna zones; S. damnosum s.s. is found mainly in the Guinea savanna zones; S. sirbanum has been found in forest areas but it is mainly in the Sudan savanna zone and the northern Guinea savanna that this species is widespread.

Differences in transmission potential have been demonstrated between species and as a function of the bioclimatic zones.

TABLE II-1. DISTRIBUTION OF SPECIES OF S. DAMNOSUM COMPLEX

Species	Indication of distribution	Habitat
squamosum	Cameroon, Benin, Togo, Ghana, Ivory Coast, Upper Volta	Humid forest and riverine forest in Guinea savanna
yahense	Togo, Ghana, Ivory Coast, Liberia, Guinea	Humid forest and mountain forest; extends into Guinea savanna
soubrense	Benin, Togo, Ghana, Ivory Coast, Liberia, Guinea, Upper Volta	Humid forest and riverine forest, extends into Guinea savanna
sanctipauli	Ghana, Ivory Coast, Liberia	Humid forest
damnosum s.s.	Cameroon, Nigeria, Benin, Togo, Ghana, Ivory Coast, Liberia, Guinea, Mali, Niger, Upper Volta	Humid forest and Guinea savanna; extends into Sudan savanna
sirbanum	Cameroon, Nigeria, Benin, Togo, Ghana, Ivory Coast, Guinea, Gambia, Upper Volta, Mali, Niger	Sudan savanna; extends into Guinea savanna and even forest

Bio-ecology of the vector

Like all blackflies, S. damnosum s.l. develops, during its larval and pupal stages, in running water. Pre-adult development (eggs, larvae and pupae) lasts about a fortnight under tropical running-water temperature conditions. The various species of the complex have somewhat different requirements with respect to the physicochemical conditions of the water of their breeding sites.

Among all the biological peculiarities, two fundamental characteristics stand out because they determine the strategy and tactics to be employed against S. damnosum.

(i) The demands of the larvae of the complex are relatively exacting, particularly in regard to their nutrition. This is reflected in limited spatial distribution of the breeding places and is what makes it possible, after a careful survey of those breeding places, to implement a campaign aimed at destroying, within a given area and by sufficiently specific action, all the larval populations of the species.

(ii) This factor, favourable to the execution of a coordinated campaign, is unfortunately counterbalanced by the flying power of the females; whence, on the one hand, the need to continue larviciding over a very long period to obtain only a satisfactory reduction in the parasite population harboured by man; and, on the other hand, the need to apply treatment to a sufficiently extensive protective zone so as to minimize the consequences of possible reinvasions.

Transmission

The microfilariae of O. volvulus, the pathogenic agent of human onchocerciasis, have to go through a stage in a vector in order to continue their development. These microfilariae, ingested during a blood meal, undergo several moults in the course of a cycle that lasts an average of seven days. On completion of this cycle, the infective larvae break out of the fly during a subsequent blood meal. In view of the duration of the reproductive cycle of the female S. damnosum, it is unlikely that the parasite would develop to the infective stage between two successive blood meals. Thus an infected female does not normally become capable of transmitting the disease until she takes a third blood meal.

The dynamics of transmission depend on many factors, the main ones being:

- the absolute quantity of potential vector blackflies;
- the mean age of the vector populations;
- the vector species concerned (adaptation to the parasite, degree of anthropophilly, etc.);
- the transmission season;
- the degree of contact between human and vector populations, which depends on human activities (linked to age and sex) and on the above-mentioned factors;
- the level of infection of the human populations, which are the only reservoir of the pathogen.

Epidemiology of onchocerciasis

Not all the determining factors in the spontaneous development of onchocerciasis have yet been found, but a number of general rules can be deduced from observations so far.

Parasite build-up

Onchocerciasis is a parasitic infection that progresses slowly as part of a cumulative process. There is a long period of clinical latency after infection (one year on average). Spontaneous cure is belated and is governed by the life-span of the adult worm (10-15 years). Under stable conditions of transmission, the filarial load in the individual steadily increases over the years. The severity of the lesions varies directly with the degree of parasite infection, i.e., with the number of adult worms in the body of the host and the number of microfilariae they release. Level of transmission and length of exposure to blackfly bites are the two factors in man-vector contact that govern parasite build-up.

In four villages of the Programme area it was possible to determine annual transmission potentials (ATP)[1] before the start of the campaign, over a sufficiently long period to have a good idea of the effect of annual variation. Medical examination has shown that exposure to increasing ATPs leads to increasingly severe onchocerciasis lesions among a population (Table II-2).

Geographical disparities

Onchocerciasis occurs in foci, each of which is centred on a breeding place, or succession of breeding places, in the immediate vicinity of which the disease appears in its most severe form. The distribution of foci is governed by the hydrogeographical features of the region. Depending on the density of breeding places, foci may be relatively extensive and continuous, or separate and restricted in area, in a mosaic pattern.

Endemicity in any given focus falls off with increasing distance from the centre. This stratification into levels of endemicity (first-line, second-line and third-line villages) is governed by the frequency of contact between man and vector, which decreases with distance from the larval breeding place and the distance over which the blackfly has to travel.

Endemicity levels

A study carried out in the Programme area in 364 villages has shown that there are two distinct types of endemic situation.

(a) A level of severity of the disease, corresponding to what entomologists have called the desertion level and epidemiologists call the intolerability level, at which the survival of the community as a group is at stake. This seems to occur whenever the blindness rate rises above 4-5% of the toal population. The population then starts to decline, at least relatively, as a result of a combination of health factors and social factors. The surface occupation density tends to fall below 50 inhabitants/km^2 until it reaches a critical threshold value of 35 inhabitants/km^2 at which first-line villages are doing no more than living on borrowed time. All such villages also have:

- over 60% of onchocerciasis;
- over 20% of persons with ocular onchocerciasis;
- over 10% of persons with severe ocular complications;
- mean microfilarial density of over 10-15 mf.

Not all communities with over 60% cases of onchocerciasis are in this situation and they may have different values for the other parameters. However, it seems reasonable to consider this rate as a threshold beyond which there is a major risk of the situation becoming intolerable. The existence of this risk is defined as hyperendemicity.

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[1] For an explanation of ATPs and annual biting rates (ABRs) see footnote on pages 22 and 23.

TABLE II-2. EFFECT OF EXPOSING A POPULATION TO INCREASING ANNUAL TRANSMISSION POTENTIALS

Village	ATP	No. examined parasito-logically (1)	Prevalence of onchocerciasis (2)	Mean mf density	No. examined ophthalmo-logically	Prevalence of ocular onchocerciasis (1)	Proportion of irreversible lesions (3)	Blindness rate (4)
Nasso	200	508	54.8%	13.9	378	14.8%	8.3%	0.2%
Pendie	1 200	234	70.3%	15.6	182	33.3%	14.7%	2.1%
Dangouadougou	1 600	212	68.7%	20.0	176	55.0%	20.9%	4.2%
Fetekro	2 000	154	76.0%	26.8	128	59.0%	25.0%	7.6%

(1) rates adjusted for age and sex with reference to the OCP standard population.
(2) geometric mean of individual parasite loads per biopsy (distilled water for 30 minutes).
(3) calculated on ocular onchocerciasis cases. Iritis not included.
(4) blindness defined as less than 1/20 vision in the better eye. Calculated on total registered population.

(b) On the other hand, when infection is below a certain level, the disease is socially inapparent. In such communities, however:

- onchocerciasis is not a causative factor of blindness, or is an unimportant one, and the blindness rate is generally less than 1% (except in places where there is another major endemic disease, such as trachoma);
- less than 10% of the population have ocular onchocerciasis and the number of irreversible ocular lesions is in single figures (always less than 2.5% of the population);
- mean microfilarial density for all positive cases is less than 10.

This level of perfect tolerance exists in almost all villages in which less than 40% of cases were found. Above this threshold level of 40%, however, more severe symptoms soon begin to appear. Thus, hypoendemicity, the tolerable level of the disease, is defined by the existence of less than 35% of cases in a community.

(c) Between these two limits, less than 35% and over 60%, every type of situation may be found. Collective resistance factors (population density per village territory), individual susceptibility factors, and differences in exposure to risk according to sex, occupational or ethnic category, social division of labour or the mode of working the village territory, mean that no general law can be formulated to describe what is usually called mesoendemicity. The definition of mesoendemicity is thus purely a negative one: a situation is mesoendemic when the disease ceases to be socially inapparent but has not yet reached a level that is intolerable for the group affected.

Blindness

The concentrates of cases of blindness in small rural communities, with extremely high rates in relatively young age-groups (Fig. II-2) has serious repercussions on the working capacity of an important sector of the population. Recent observation of a high mortality among blind persons compared with healthy adults of the same age range, would seem to imply that the present estimate of 100 000 blind in the Programme area is not an exact view of the phenomenon. The risk of blindness incurred by populations living in a hyperendemic area can be two or three times higher than the rate of blindness observed at any given moment.

CHAPTER III

THE CONTROL CAMPAIGN AND ITS RESULTS

Basic data - methods of control and techniques

In default of any therapeutic weapon at present utilizable in a mass campaign, the only feasible method of controlling onchocerciasis is still by control of the vector.

Taking into account the genetic, biological and ecological characteristics of S. damnosum s.l., the control of the vector can be approached, in theory, from many angles.

Ecological control

The elimination of rapids, which are where the vector reproduces and develops, would be a final and, therefore, ideal solution to the problem of onchocerciasis. Thus in Africa the great dams built (Aswan, Akosombo, Kainji, Kossou), being built or planned (Selingué, Manantali, Noumbiel, Jebba, Bui), by eliminating any possibility of S. damnosum breeding up-river, have had or will have an extremely beneficial effect on the onchocerciasis situation. A study undertaken by OCP has established that the construction of just the one hydroelectric dam at Noumbiel, on the Black Volta between Upper Volta and Ghana, will result, apart from the final elimination of local vector populations along considerable reaches (120 km) of this river and its tributaries, in a saving of $ 150 000 a year in the cost of conventional vector control operations.

However, to construct such engineering works for the sole purpose of controlling a disease, important though it may be from an economic point of view, is out of the question. The topography of the African savanna zones would not permit it in all places where it would be desirable, and the cost of such dams is generally very high.

On the other hand, the proliferation of small dams to provide reserve water supplies near rural population centres has often resulted in an aggravation of the onchocerciasis problem because of the favourable conditions for the development of S. damnosum created by their spillways.

Genetic control

The introduction of sterile males into natural vector populations has been the theme of many experiments, and has been successfully utilized in campaigns against certain insects.

The fact that females of S. damnosum mate only at the start of their adult lives and then, having been fertilized, are able to migrate over long distances, rules out the application of this method. There are also currently insuperable problems concerning mass colonization of S. damnosum in the laboratory. The flies cannot be mated in captivity and have difficulty in taking blood and ovipositing.

Biological control

Many parasites infest S. damnosum in nature and research efforts are at present being concentrated on the possibilities of utilizing them with a view to reducing or eliminating vector populations. It is still too early to say whether this technique could be applicable in mass campaigns.

Chemical control

This method can be approached in two ways: control measures directed against the adult, and control of the aquatic development stages (eggs, larvae and pupae).

Adult control

One of the earliest campaigns against S. damnosum employed this principle, though it was not possible to determine the part played by larvicide action (part of the insecticide falling directly into the rapids) in the successful results obtained.

In fact, because of the possibilities of dispersal of S. damnosum females around their sites of reproduction, particularly during the rainy season, it would not be feasible to conduct an adulticide campaign covering a wide area. However, research is in progress with a view to developing a control technique that would allow protection of localized sites, particularly in reinvaded areas.

Control of pre-adult development stages

Eggs and pupae of blackflies are securely fixed to their supports and partly protected from their surroundings by the adhesive jelly, in the case of the egg mass, and by the cocoon, in the case of the pupae. As neither of these stages ingests food particles from its surroundings they could only be destroyed by fairly strong contact poisons. They are not effectively destroyed by any insecticide currently in operational use.

On the other hand the larvae, because of their relative concentration and their mode of obtaining nourishment by filtration of particles in suspension in the water, are the forms most susceptible to insecticides that act mainly through ingestion. In default of any alternative, larval control is therefore the principle upon which most campaigns against blackfly vectors of onchocerciasis have been conducted in Africa.

Widely utilized in prior campaigns, and again adopted for the Programme, larval control is governed by the following principles:

- the larvicide solution must be released upstream from each breeding site, or set of breeding sites, so as to destroy the larvae of all stages; the range of action of the insecticide wave transported by the current depends essentially on the hydrological and topographical characteristics of the watercourse treated;

- applications must be made periodically, at intervals shorter than the larval life-span of the species; the periodicity has been fixed at seven days, which satisfies both biological and logistical exigencies;

- these applications must continue, in a given area, for as long as the capacity for reproduction of the residual blackfly population poses a threat from the epidemiological viewpoint (transmission rate too high) or in entomological terms (re-establishment of local blackfly populations too rapid).

Techniques

Until 1971 the insecticide used was DDT, which is very effective but whose residual properties and effects on the environment were not appropriate to the present ecological requirements. As a result of studies undertaken since 1967, investigators have been able to select several compounds belonging to the organophosphorus group, one of which, temephos (Abate ®, OMS 786), combines in a specific formulation the essential properties of high effectiveness against S. damnosum larvae of all stages, and, because of its relatively specific action, its low persistence and the very small doses applied, low toxicity for the environment.

This insecticide has been used since the start of operations by the Programme, but investigations continue with a view to developing new compounds in different formulations.

Most of the campaigns prior to the Programme, which were based on the principle of larval control by chemical means, used treatment techniques suited to the small geographical areas covered. However, the treatment appliances, both static (drums with holes to release

the insecticide over a given period), or mobile (floating craft of various sizes), very soon proved unsuitable for the treatment of large areas because of the impossibility of utilizing them in all situations.

Access to the rivers in all seasons constitutes the major, often insoluble, problem that the treatment teams have to face when working on the ground, especially during the rainy season which is generally the period of high transmission in most onchocerciasis-infested valleys. The treatment rounds are therefore done incompletely, not always at regular intervals and at the cost of unremitting efforts. Moreover, for these less than ideal results the resources that have to be deployed are considerable. To take one example, the treatment of the Comoë-Léraba River in the Banfora region (25 000 km^2) required from 1969 to 1972 the presence, five days a week, of four strong ground teams, each consisting of one qualified technician, two labourers and one driver, with cross-country vehicles and equipment for larviciding (boat, out-board motor, etc.).

These teams were able to reach all the treatment points only in the dry season, despite the constant maintenance of 300 km of tracks specially built for the purpose.

The results showed the effects of these constraints and the level of transmission in the largely inaccessible southern part of this zone remained too high for the maintenance, or return, of human populations.

In view of the strategic exigencies, largely determined by the biology of the vector and necessitating the treatment of extensive areas, these land-based methods could no longer be considered, so in 1967 spraying from the air was started on a trial basis. Later, a type of aeroplane used for agricultural spraying, then the helicopter, first small and then medium-sized, were tried out.

The aeroplane proved very efficient for medium-sized and large watercourses, where gallery forest vegetation does not hamper navigation and treatment. It proved less so for the smaller rivers obscured by forest canopy, where it is replaced with great advantage by the helicopter, whose manoeuvrability is practically unlimited.

The first five years of operations

Vector control operations

After analysis of the various principles, methods and techniques, and in the light of experience with prior campaigns, the Onchocerciasis Control Programme was planned and put into operation according to the following criteria:

- control measures directed against the larvae of the vector, which are its most concentrated and most susceptible development stages;

- utilization of insecticide with little residual action, effective at low concentrations and producing little pollution under the conditions of application;

- treatment from the air, the only method at present applicable which has proved, for practically 100% effectiveness, the least costly.

Aerial operations

An invitation to bid for a contract to carry out aerial operations gave details of the requirements. This included specifications for the development of equipment for the release of accurately measured quantities of insecticides for both helicopter and fixed-wing machines. The type of machine considered suitable for the work requested as well as the flying hours required were also specified. It was anticipated that it would be possible to treat the large rivers by fixed-wing aircraft and that the smaller rivers would require helicopters.

At the end of July 1974, the contract was awarded to Evergreen Helicopters Inc. from McMinnville, United States of America, who operated Bell 206 helicopters and a Pilatus Porter aircraft.

Work commenced in 1975 in Phase I only, operating from one base in Bobo-Dioulasso, and during that season the following hours of fixed-wing and helicopter were flown to dispense 75 630 litres of Abate:

Phase I 1975

	Larviciding	Prospection	Administration	Total hours	Abate
Helicopter	1 911	782	89	2 782	47 369
Fixed-wing	366	80	94	540	28 261
				Total	75 630

In January 1976 Phase II began with the treatment of the lower White Volta by helicopter while treatment continued in Phase I. This machine flew across from the Bobo-Dioulasso base each Tuesday and when the rains began in May, all the other rivers which started flowing in Phase II were treated by the same helicopter, assisted by the fixed-wing on the White Volta once the flow of water was sufficient for fixed-wing treatment.

At the end of 1976, with the treatment of Phases I and II, the following hours had been flown:

Phases I and II 1976

	Larviciding	Prospection	Administration	Total hours	Abate
Helicopter	3 011	1 192	155	4 358	79 862
Fixed-wing	488	95	41	624	50 085
				Total	129 947

During these initial two years of operation a system evolved which is flexible enough to deal with the constant adjustments that have to be made.

At the end of 1976, the initial aerial contract with Evergreen Helicopters Inc. came to an end. International bidding for the next contract took place in mid-June 1976. The contract was awarded to Viking Helicopters Ltd, an Ottawa based firm, on 6 August 1976. The change of contractor provided an ideal opportunity to improve equipment and techniques, based on the knowledge acquired in the first two years of operation. With the helicopter equipment, the previous contractor had developed a gravity-fed system and although very effective in the wet season, problems had been experienced in distributing insecticide at difficult breeding sites in the dry season. Consequently, the incoming contractor was asked to develop a "dual" system where, by operating a switch in the aircraft, the pilot could elect for the insecticide to be emitted either by the gravity-fed system or through a pressure-fed single nozzle. This newly developed "restrictor" system proved highly successful, particularly in the dry season.

Modifications were also made to the fixed-wing equipment. The previous contractor used an underslung cylinder into which the required quantity of insecticide was fed and emitted by the action of a floating piston. With the newly developed equipment, all parts are internal within the aircraft and the only external part is the emission tube. The system is activated by air pressure and has proved accurate and reliable.

In the first year of operation with the new aerial contractor, the whole designated Programme area was under treatment for the first time and at the end of 1977 the following hours had been flown:

Phases I, II and III 1977

	Larviciding	Prospection	Administration	Total hours	Abate
Helicopter	4 424	685	249	5 350	84 318
Fixed-wing	854	57	114	1 025	71 297
				Total	155 615

The treatment flying was done with six helicopters in spraying configuration and two fixed-wing aircraft operating from Tamale and Bobo-Dioulasso. Fifty-four per cent. of insecticide released was by helicopter and 46% by the two fixed-wing aircraft. The average release of insecticide per hour (80 litres per hour) is four times that of a helicopter (20 litres per hour). Also, the fixed-wing aircraft can be operated for approximately half the cost of a helicopter.

As river levels alter, the breeding sites of S. damnosum change and aircraft circuits have to be modified accordingly. It is unlikely that a river treated with a particular quantity of insecticide one week would require the same dosage the following week, and as rivers start to flow, or dry up, they are constantly being added to or removed from a circuit. Hence, it is necessary to produce new treatment maps each week at the two bases of Bobo-Dioulasso and Tamale. Following this the pilots are briefed on the circuit to be flown that particular week. The pilots carry with them the 1:500 000 treatment maps, which indicate the rivers to be treated and the dosages required, and 1:200 000 maps which show the release points of the breeding sites to treat. Circuits normally take three to four days (Figs III-1 and III-2).

There are eight major fuel distribution points in the Programme area from where the subsidiary caches are supplied. At six of these points bulk fuel is available from airport pumps, but at the other two fuel has to be brought in from elsewhere. There are 80 subsidiary caches of fuel and insecticide in the Programme area (Fig. III-3). Both fuel and insecticide have to be made available in drums. Maintenance of adequate stocks at these caches and the keeping of accurate records are large-scale logistical exercises.

Entomological surveillance

The original plan for entomological evaluation (PAG mission report, Annex V-3) envisaged a network of seven sectors and 24 subsectors, from each of which would operate about two teams of vector collectors. Additional teams were to be attached to each of the sectors to give a total of 58 teams. Each team would consist of three vector collectors, a driver and vehicle; 141 regular catching points were to be visited at fortnightly intervals. At each visit two consecutive days (11 hours) catching would be undertaken. In addition shorter catches would be made at other less important sites and larval searches made at known and suspected breeding places.

This basic plan has been modified in several respects:

(a) the vector collecting team has been reduced from three to two collectors;

(b) the collections at regular catching points have been made at weekly instead of fortnightly intervals;

(c) the number of catching points has been considerably increased, and almost all catches are for the 11-hour period.

These alterations to the original plan were considered necessary to provide satisfactory operational information. As the control operation is based on a weekly cycle, hydrological data collected by the surveillance teams must be transmitted by radio from the subsectors each week. Most of the hydrological stations are important catching points which must be visited weekly regardless of whether a catch is made. Similarly, each team must return to base each week in order to pass on its vital hydrological information. Thus the utility of operating the surveillance network on a weekly cycle is obvious. In addition, the entomological data concerning both larval searches and adult collections is invaluable in planning the aerial control operations. A fortnight's delay in acting on this information is too great when dealing with a vector whose immature stages are completed in less than that time.

In addition to this operational role the entomological evaluation, at this stage, is designed to provide (i) a measure of the effectiveness of the Programme in the period before reliable epidemiological changes can be demonstrated; (ii) statistically valid data to compare biting and transmission rates with the human parasitological and ophthalmological findings; and (iii) data for use in research into the reinvasion phenomenon.

In order to fulfil these requirements 50 vector collecting teams were employed during 1975 and 86 during 1976 and 1977, falling to 78 in 1978. In addition another 20 teams were employed on a temporary basis for an intensive programme designed to study reinvasion problems in 1977 and 1978.

In setting up the entomological evaluation network, 525 catching points were studied in varying degrees of detail, and the catching results stored in the headquarter's computer. These catching points are distributed as follows:

Phase I	227
Phase II	108
Phase III W	70
Phase III E	120

Increasing knowledge has indicated that more intensive catching at fewer sites is likely to yield the most valuable results, especially when reinvasion problems are being studied.

Thus, during 1977, an average of 270 (range 213-302) catching points was visited each month, and over 1400 days catching undertaken per month, to give an average of 5.3 days catching per site per month.

Establishment of criteria

Interpretation of the entomological data presents a number of problems. Clearly, in the complete absence of the vector no further transmission will take place. However, with a vector such as S. damnosum, which under certain circumstances may migrate (page 24), this situation is unlikely to be achieved, or maintained, for long periods over wide areas. It has thus become necessary to determine the level of biting fly populations and potential transmission of O. volvulus which is considered acceptable from the medical and economic viewpoints. In order to make a judgement concerning the success or otherwise of the Programme, and to provide criteria for assessing the advisability of settling populations in zones of severe onchocerciasis, OCP convened a Scientific Advisory Panel Working Group in June 1977. The group considered the available entomological data concerning the transmission situation before vector control activities, together with the known resultant degrees of the disease. The group decided that an Annual Transmission Potential (ATP)[1] of 100 was extremely

[1] This is the annual total of the estimated individual monthly transmission potentials obtained from the formula:

$$\frac{\text{No. of days in month} \times \text{No. of infective larvae}}{\text{No. of days worked}} \times \frac{\text{No. of flies caught}}{\text{No. of flies dissected}}$$

Calculations for the ATP in the Programme area are based solely on the numbers of infective larvae indistinguishable from O. volvulus in the flies' heads. Where Simulium biting densities are low, as in the Programme area, ATPs calculated in this way are liable to wide fluctuation resulting from the numbers of infective larvae in single flies.

unlikely to result in any untoward medical or socioeconomic effects. Available data also suggested that an ATP of 800+ was likely to be accompanied by severe onchocerciasis. In order to cover the situation where previously uninhabited areas are to be subjected to human settlement, it was also necessary to determine what level of biting fly populations might give rise to unacceptable levels of ATP. The Panel concluded that an Annual Biting Rate (ABR)[1] of less than 1000 was most unlikely to give rise to an ATP of over 100 and this could be considered safe, and that with an ABR of above 8000 a hyperendemic onchocerciasis situation was likely to develop should a human population containing some onchocerciasis carriers be settled. The group clearly appreciated that with knowledge which should become available after the second or third passage of the epidemiological evaluation teams, it might be possible to safely increase the acceptable levels of ATPs and ABRs.

An analysis of the results during three years for the Phase I and II area shows a steadily improving situation.

	% of ATPs below 100		% of ABRs below 1000	
	Phase I	Phase II	Phase I	Phase II
1975	68	70	61	50
1976	81	85	72	80
1977	86	92	79	85

In 1975 Phase I was under insecticidal control whilst Phase II was not. However, it seems most likely that the control activities in Phase I influenced the results in Phase II where, at the few catching points from which several years' data were available, the lowest ever ATPs and ABRs were recorded. The superior results of Phase II in subsequent years arises from the fact that this area is little subjected to reinvasion by epidemiologically significant numbers of flies from outside the control area, whereas about 40% of Phase I is so reinvaded.

In many cases results in the heart of the Programme area are excellent. For example, at Wayen (point 0407) situated on the White Volta river just east of Ougadougou, no vector flies have been caught since the start of the control campaign, yet, in the pre-control times the ABR exceeded 8000 and the ATP exceeded 200. In most of the Black, White and Red Volta, and Sissili valleys in Upper Volta, transmission of onchocerciasis has almost certainly ceased since the start of the control campaign. Further south, in the Black Volta valley, control has improved markedly each year, e.g. at Chache (point 1303)[2] the situation for the three years of control is as follows:

	ABR	ATP
1973-74	34 000	N.A.
1975	12 015	825
1976	1 957	80
1977	657	15

The 1977 data concerning ABRs and ATPs at 157 well-studied points have been analysed and plotted on Figs III-4 and III-5. Similarly all usable pre-control data have been plotted on Figs III-6 and III-7. The ABR data has been plotted for 114 points and ATP data for 96 points.

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[1] This is the annual total of the estimated individual monthly biting rates that have been obtained from the formula:

$$\frac{\text{No. of flies caught x No. of days in month}}{\text{No. of days worked}}$$

[2] See Fig. III-8.

Control in Phase III West was implemented only in March 1977, and for parts of Phase III East only in August 1977 (not at all in the easternmost valley - the Sota valley). Therefore, the data for 1977 in Figs III-4 and III-5 include three or more months of pre-control in these areas. Analysis of the pre-control and 1977 ATPs shows the following breakdown:

	1977		Pre-control	
ATP	No. of points	% of points	No. of points	% of points
0-99	91	58	12	13
100-199	20	13	6	6
200-399	19	12	19	20
400-799	16	10	12	12
800+	11	7	47	49
	157	100	96	100

The pattern of results when ABRs are considered is very similar with a few more points registering results which do not fall below the critical level (1000).

The reinvasion phenomenon

Shortly after the commencement of control in the Phase I area, fly populations dropped sharply and in most cases became zero within three or four weeks. However, with the onset of the rainy season large numbers of flies reappeared at certain sites in the south-west of the Programme area. Detailed investigations showed (a) that there was no active breeding in the area; (b) that virtually all the flies were parous (were in fact several days old and had already taken at least one blood meal before they were caught by the vector collector); (c) flies in many cases were carrying infective stages of the parasite Onchocerca volvulus. The flies appeared to be a reinvading population moving in the same direction as the prevailing monsoon winds. Each year a similar reinvasion has occurred in the same areas which are indicated on Fig. III-9. These are areas where there is an epidemiologically significant influx of infective flies. Flies probably penetrate to all parts of the Programme area but generally in numbers which are epidemiologically insignificant. The results of the reinvasion study are shown in Annex I.

Sources of reinvading flies are probably located to the south-west of the reinvaded zones. Experimental control in the Marahoué and Sassandra valleys in June-July 1977 seemed to greatly curtail the reinvasion of the Upper Bandama and Léraba rivers. Control operations carried out on the Marahoué and Sassandra rivers in Ivory Coast during 1978 have confirmed this observation.

The reinvading flies have proved to be only savanna cytospecies. Extension activity in Ivory Coast to cover all savanna regions should result in an improved situation in the Bandama valley, as already mentioned, and in the Bui region of the Black Volta.

A comparison of the reinvasion map (Fig. III-9) with the map of ATPs in 1977 (Fig. III-4) shows that most of the catching points registering unsatisfactory ATPs fall within the reinvasion zone.

The actual zone affected by reinvasion is less than 30% of the total original Programme area, and with alterations to the southern extension of the Programme area in Ivory Coast this is likely to be considerably reduced.

Epidemiological evaluation

Aim and methods

The outline in the PAG report for the epidemiological work to be done by the OCP was as follows:

(a) surveillance of 0.33% of the population of the Programme area, i.e. 33 000 persons distributed in the seven participating countries of which the population concerned is estimated at about 10 million;

(b) stratification according to endemicity levels of the localities, or regions if these are known, in such a way that two-thirds of the sample are situated in zones of meso- or hyper-endemicity because "the primary aim of the surveys is to determine the effects of the control operations in areas with high levels of endemicity";

(c) initial selection, on the basis of data previously collected, of a random sample composed of N clusters of 300 persons until the required number in each country is obtained;

(d) longitudinal follow-up during the implementation of the Programme, at three-year intervals, of each of the individuals forming the evaluation clusters;

(e) annual detailed examination of 8-10% of the sample; complete ophthalmological examination, complementary laboratory tests.

Sample design

It soon became evident that the focal distribution of the disease would not allow for a valuable random selection.

It was considered that in endemic situations which were far from being homogeneous, and where one could see a distinct pattern of foci in relation to the profile of watercourses, a careful choice was necessary, and in 1975 it was decided to utilize the following criteria, agreed upon by STAC:

(a) The "villages" must be representative of all the ecological, hydrological and geographical zones of the basins and watercourses where breeding places occur. The The villages selected must be representative of all the known foci. As a result they are scattered throughout the 14 000 km of watercourses covered by the Programme.

(b) They should be interdependent with the entomological evaluation programme, i.e. they should be selected close to the permanent collecting points, particularly when entomological considerations so require.

(c) Full attention should be paid to sociological factors, longitudinal studies being incompatible with a high drop-out rate and presupposing social homogeneity and an adequate level of population stability. Accordingly, administrative and commercial centres (which have too high a proportion of foreigners, temporary residents and non-residents), agricultural (including processing) businesses and projects dependent on migrant and seasonal labour, and nomadic communities were all excluded.

(d) The different levels of prevalence need to be represented in the samples. Bearing in mind the PAG mission's recommendation that two-thirds of the villages in the sample should have a prevalence of more than 33%, it was found preferable to select 75% of the sample from hyperendemic villages (prevalence >60%) and the other 25% from villages where prevalence is lower.

(e) As a result, of the total of 300 subjects recommended for the clusters, it was necessary sometimes to combine several small villages to form one cluster, sometimes to restrict the survey in excessively large villages to one or more districts.

(f) As far as possible, the selection of villages should take into account the economic development zones.

(g) Random selection was replaced by selection based on the accepted evaluation criteria.

(h) Communities from non-endemic regions who come to settle in the reclaimed areas, such as the territory of the Volta Valleys Development Authority (AVV) in Upper Volta, and who form a control population not foreseen in the PAG mission report, had to be included in the evaluation programme.

Current methodology

Since the beginning of the campaign, baseline data have been collected in the seven countries. On the basis of the criteria mentioned above, the following conclusions can be drawn:

Geographical dispersal: all river basins treated by the vector control unit are represented in the sample.

Relation with entomology: whenever possible the villages close to a permanent *Simulium* catching point were chosen in order to assess the degree of correlation with the entomological results. In certain cases the investigations were conducted upon the request of the entomologists. The different levels of transmission (ATP) are represented in the sample.

Migrants: in the AVV where there is a population of non-infected immigrants, 3600 individuals have been registered for a special study aimed at checking the persistence of any residual transmission.

Quantitative aspect: the basic sample established in the seven countries in the original Programme area totals 80 000 people, out of a population of 11 million inhabitants. This represents a sample of 0.75% of the population, which is considerably greater than the number originally envisaged (0.33%). This decision was taken in consideration of:

- the need to retain a sufficiently large sample in order to obtain significant results in the longitudinal surveys of villages over a period of 10 years or more, in view of the high absentee rate of 20% at each examination; also, the larger sample initially chosen now contains a sufficient number of villages from which valid conclusions can be drawn on the transmission resulting from infected flies imported from outside the OCP area;
- the need to ensure adequate geographical coverage as required by the entomological control;
- the need for mapping of foci and chemotherapeutic trials.

For operational reasons, the epidemiological evaluation has been carried out at two different levels, simple and detailed. The simple survey consists of a parasitological assessment of prevalence and intensity of onchocerciasis by means of examining two skin snips, plus a screening procedure for visual impairment and blindness. In the detailed survey a careful clinical and ophthalmological examination is also included. Because of the time-consuming technique, the detailed examinations have been carried out on only approximately 15% of the total sample, allowing for certain special studies concerning ocular lesions.

Data concerning the activities of the Epidemiological Evaluation Unit is given in Annex II.

Medical results of entomological operations

(a) Results of preliminary campaigns 1962-1974 in the Programme area

The Sikasso region (Mali)

The basin of the Farako, a small secondary tributary of the Banifing in eastern Mali, was a large and serious focus of onchocerciasis. Its treatment began in 1962. As it covers only 2000 km^2 and has no biological or natural boundaries, the treated area could never be completely protected and was constantly reinvaded by blackflies migrating from nearby basins.

In the central area of this focus, the best-protected part, the theoretical number of bites per man per year (ABR) was kept within the region of 1000 during the control period (extreme values 350 and 2500), whereas during the interruption in 1965 it was 12 000. Medical observations in four villages kept under surveillance for 10 years show that this partial control of the vector was enough to reduce the level of endemicity from over 50% to 10% and less. The maintenance of residual transmission is confirmed by the presence of an infected nine-year-old child; however, the very low level of such transmission is confirmed by the fact that onchocerciasis prevalence in children under 15 years of age fell from 15% to 0.4% between 1968 and 1976.

After 13 years of partial control of the vector in this area, even though the blackfly was not eradicated anywhere, it was found to be impossible for the disease to persist in places where the ABR had been reduced to 1000 or less for 10 years. These villages now contain only residual cases, bearing witness to parasite infection that is dying out, and sporadic cases indicating the persistence of low residual transmission.

The Banfora region

This region in the south-west of Upper Volta along the frontiers with Mali and Ivory Coast was subjected to Simulium control in 1969 because it formed a natural extension of the neighbouring campaigns in Mali (Farako since 1962) and Ivory Coast (Upper Bandama, 1969). Unfortunately, the operations had to be halted for financial reasons from October 1973. During the six years of the campaign protection was never complete. The ABR during the interruption of operations is not precisely known, but no doubt fluctuated around 15 000 bites annually.

Compared with the pre-campaign situation (1967-1969), the surveys carried out in 1973 and early 1974 showed that in six years the level of endemicity had dropped by 15-20% in all the villages, falling from 70-80% to 55-60% in hyperendemic regions and from 60-65% to 35-40% in mesoendemic regions. The fall in prevalence was marked in subjects under 30 years of age and almost imperceptible above that age, confirming that the reduction of transmission was the cause.

In late 1975 a further series of surveys showed that endemicity had almost returned to its original level. The deterioration was particularly marked in males between the ages of 10 and 30, and the infection rate in children under 10 years had increased slightly instead of continuing its rapid fall. A one-year break in entomological control, which brought a massive quantity of blackflies into contact with a parasite reservoir that had not been reduced sufficiently, was enough to wipe out the benefits of six years of work almost completely.

(b) Preliminary results of OCP

The first check of the results of operations in Phase I began in 1978. Sixteen Upper Volta villages were re-examined and the reliability of survey and diagnostic methods confirmed: the disease was found again in more than 99% of the people where it had been observed three years earlier; the few negative cases can be accounted for either by an error of identification or by mishandling, or by carriers with a very low parasitic load that randomizes the demonstration of microfilariae (the diagnostic error risk is lower than 1%).

Eight hyperendemic villages were re-examined along the Bougouriba and Black Volta rivers, in an area where vector control was not completely successful in 1975 (ATP = 183 in 1975 in Mabere village), but where as early as 1976 ATPs were below the threshold of 100 larvae/man/year.

In the 0-4 years age-group, the prevalence of onchocerciasis had decreased from 5.3% to 1.6% within three years and among the 140 children born since the beginning of operations, only two were found infected (they were born in early 1975). A slight decrease even tends to appear in the 5-9 years age-group.

Seven other villages were visited again in late 1977 in the Upper Comoë basin where the control is reported to be excellent since January 1975, that is for almost three years. No positive cases were found among children born during that period. Of the 277 children examined in the under five age-group, none had onchocerciasis whereas three out of 267 (1.1%) were infected before the campaign began. In the meantime, the prevalence had dropped from 9% to 6% in the 5-9 years age-group.

Finally, in Dangouadougou, a village located on the route of the reinvasion phenomenon, the ATP is still higher than 1000. The disease in the village is becoming more severe: the overall prevalence is increasing slightly, but the individual microfilarial loads are growing on an average of one-third (32 mf. instead of 20), two children under four were found infected and the prevalence has increased from 3.5% to 7% in this age-group.

These medical results clearly confirm the validity of the findings of the entomological evaluation. The tendency to a setback of the disease is still more significant if one considers that the transmission has been reduced to a lower level. The ATP values established in 1976 allow an optimistic view of the overall epidemiological results which will be observed after a five or six-year period of control. The aging of adult worms will then lead to a significant decrease of the parasitic load to which will be added the effects of the renewal of generations among the population.

In terms of ophthalmology, four villages in Upper Volta have been re-examined (Mouvielo, Kimpeo, Pendie and Dangouadougou) after a three-year period. Preliminary results do not show any significant difference as regards the prevalence of ocular onchocerciasis or the number of severe cases, but, generally speaking, overall rates have diminished slightly. However, in three of these villages (Mouvielo, Kimpeo and Pendie) where entomological results are satisfactory, there is a tendency to a decrease of ocular microfilarial loads in data for 1978, as compared to 1975 data. Also, the number of patients with aggravated ocular impairment is remarkably low. This might explain why the blindness rate has decreased from 12.3% to 8.2% in one hyperendemic village (Dangouadougou): the number of new cases of blindness was low and the blind of the village had been subjected to high mortality.

All these results, and especially the assumption that the interruption of the transmission of onchocerciasis might already have had a favourable stabilizing impact on the ocular lesions, must be checked on a statistically reliable sample. This will be done in 1979. A study of the risk factors of blindness among onchocerciasis patients in a protected area will be undertaken. Such a study will be most valuable for the future assessment of the number of blind people in the OCP area.

In order to evaluate the effects of the vector control operations in the Programme area, a subsample of 150 to 200 villages was chosen, according to criteria defined by STAC, and will form the reference sample for longitudinal evaluation. These villages will be re-examined at fixed intervals independent of any other possible factors likely to alter their representative character.

The other villages will form a data bank which can serve either for special evaluations (need for a greater number in certain areas, local residual transmission, reinvasion, agricultural development, etc.) or for certain specific studies (therapeutic trials, mono-vectorial transmission).

Finally, other villages could be included in the future sample if the boundaries of OCP are modified.

As a first approach, the sample selected for regular evaluation of the Programme will be made up as follows:

Upper Volta	56 villages out of	117 visited
Mali	36	65
Ivory Coast	39	57
Niger	8	17
Togo	15	27
Benin	23	27
Ghana	30	54
Total	207	364

FIG. III–4

ANNUAL TRANSMISSION POTENTIALS – 1977

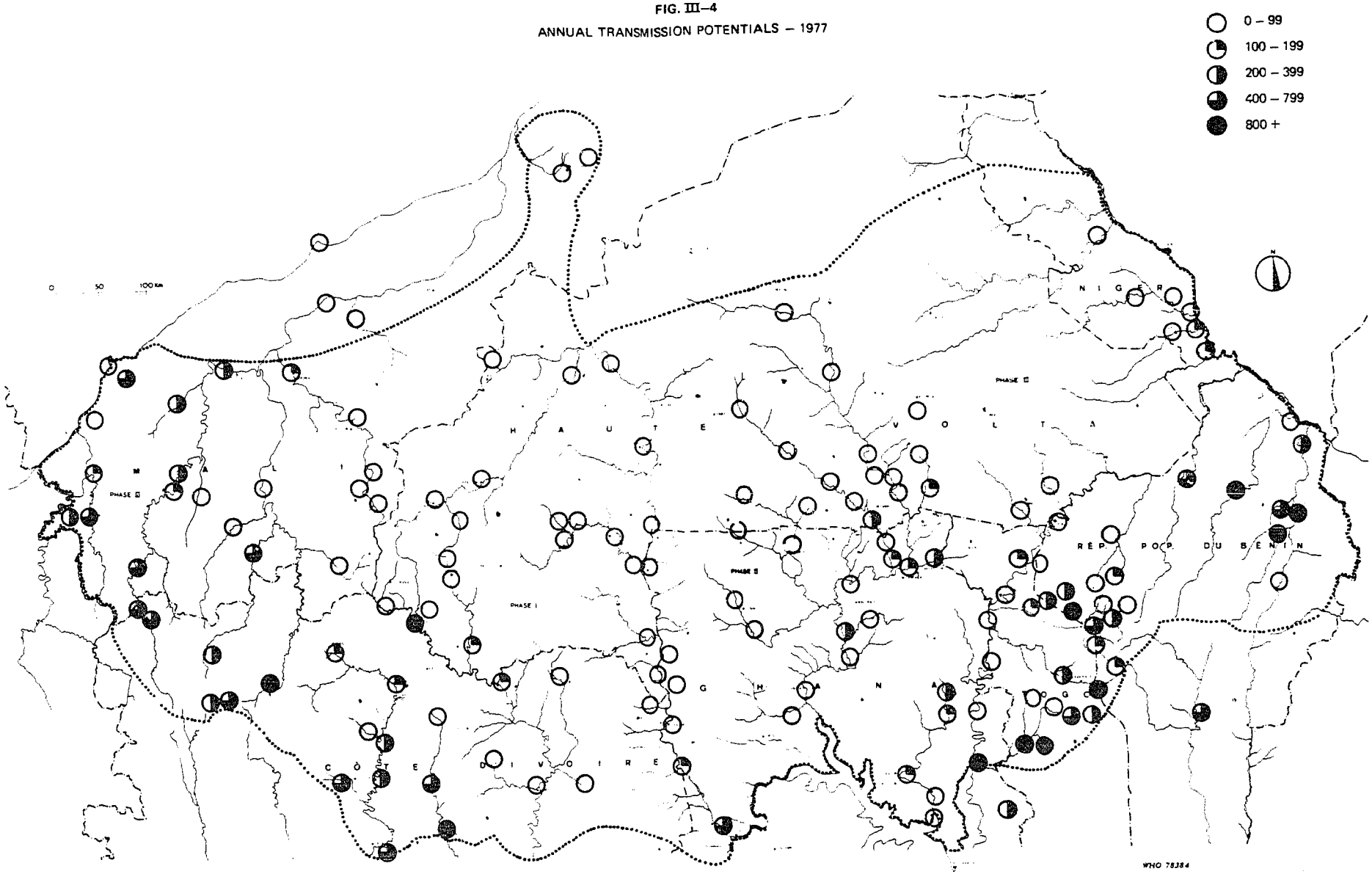
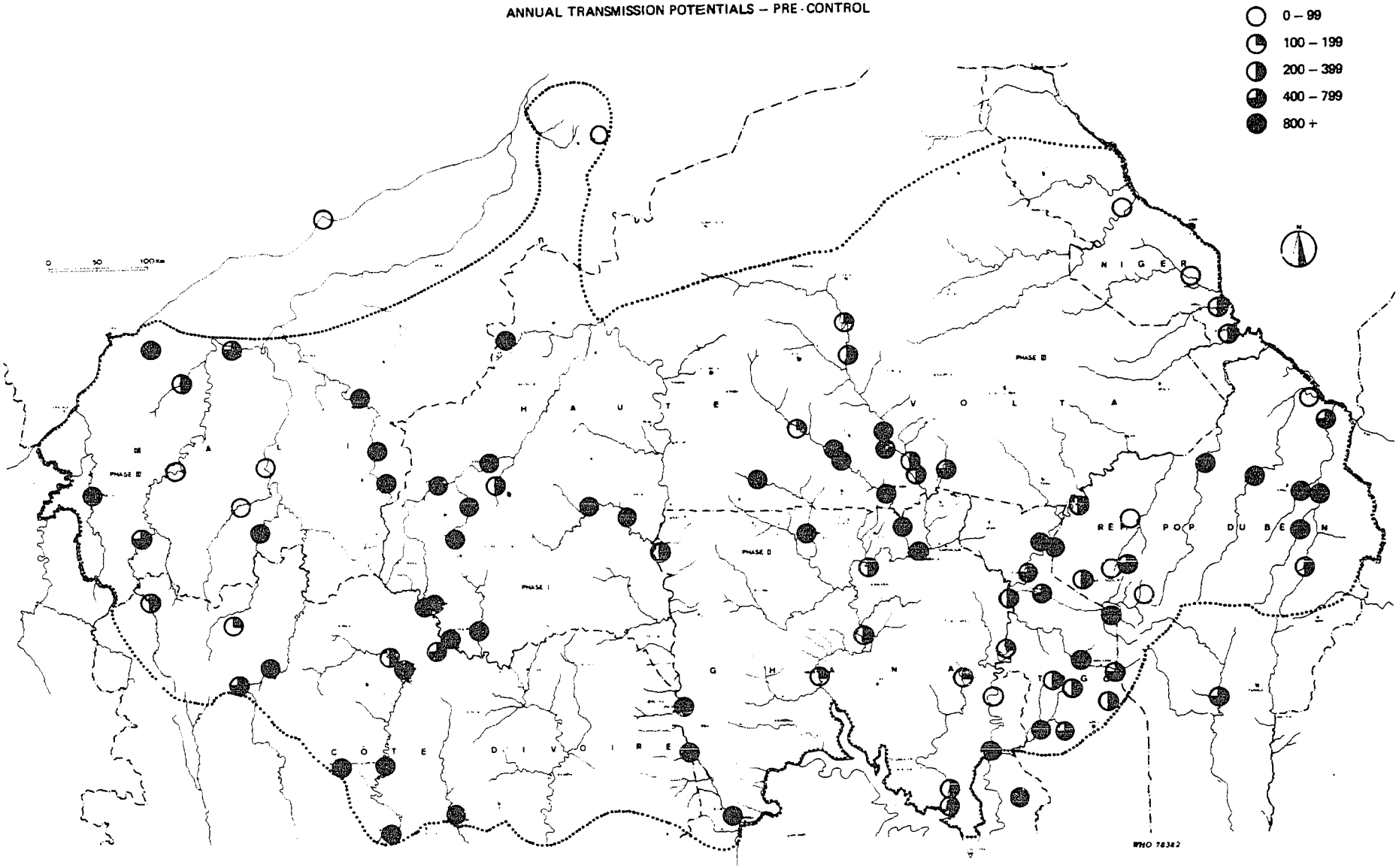


FIG. III–6
ANNUAL TRANSMISSION POTENTIALS – PRE-CONTROL



Wickland

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0399 Fin'an Statements

January 25, 1980

Mr. Dennis E. Conroy
Director
Office of Regional Affairs
Bureau for Africa
Room 3327A
Agency for International Development
Washington, D.C. 20523

Dear Sir:

Our auditors, Price Waterhouse & Co., 1801 K Street, N. W., Washington, D. C. 20006, are conducting an examination as at December 31, 1979 of the accounts of the Onchocerciasis Fund for which the International Bank for Reconstruction and Development has agreed at the request of the donors to establish and administer a special account.

It would be appreciated if you would return a signed copy of this letter together with any attachment, if necessary, confirming directly to them the information noted below.

Amount contributed from January 1 to December 31, 1979	$ 1,700,000

An addressed envelope is enclosed for your reply.

Sincerely yours,

David W. Gray
Deputy Chief, Accounting Division
Controller's Department

Enclosure

Price Waterhouse & Co.
1801 K Street, N. W.
Washington, D. C. 20006

Gentlemen:

We are (are not) in agreement with the above information. (The details, if in disagreement, are provided below.)

February 27, 1980
Date

E. Alexis Conroy
Authorized Signature

OPTIONAL FORM NO. 10
JULY 1973 EDITION
GSA FPMR (41 CFR) 101-11.6

UNITED STATES GOVERNMENT

Memorandum

-0399/II/80

TO : See Distribution

DATE: January 15, 1980

FROM : AFR/RA, E. Dennis Conroy - Director

SUBJECT: Onchocerciasis Control Program (OCP) 698-0399

Attached are the pertinent papers prepared for the sixth annual session of the Joint Coordinating Committee of the OCP held December 3 - 5 in Geneva.

A brief summary of the meeting has been sent by cable. The official report of the session will be sent as soon as received from the Independent Chairman.

Attachments:
1. List of Participants
2. JCC 6.1 Provisional Agenda
3. JCC 6.2 Progress Report of the World Health Organization for 1979
4. JCC 6.3 Annual Report of the Scientific and Technical Advisory Committee
5. JCC 6.4 Report of the Ecological Panel
6. Socio-Economic Development Aspects of the Program
   - Part 1: Niger
   - Part 2: Benin
   - Part 3: Upper Volta
   - Part 4: Mali
   - Part 5: Togo
   - Part 6: Ivory Coast
   - Part 7: Ghana
7. JCC 6.6 Plan of Action and Budget of the Programme for 1980
8. JCC 6.7 Report on the extension of the Program Area in Benin, Ghana and Togo

DISTRIBUTION (with attachments)
Mr. Jay Johnson, Director, US AID/Niamey
Mr. John Lundgren, AID Representative Lome/Cotonou - 2 copies
Mr. Richard Meyers, Acting Director, US AID/Ouagadougou
Mr. Ronald Levin, Director, US AID/Bamako
Mr. Gordon Evans, Director, REDSO/WA
Mr. Irvin Coker, Director, US AID/Accra

cc:AFR/RA,BWickland (w/o attachments)
DS/HEA,ABuck, M.D. (w/o attachments)
AFR/DR,JStockard, M.D. (w/o attachments)

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5010-110

BRIEFING PAPER

CONGRESSIONAL HEARINGS FY 80

REGIONAL ONCHOCERCIASIS-FREE AREA PLANNING

(See Africa Regional C.P., p. 481)

Purpose: There are three elements in the approach to surmounting the problem of onchocerciasis (river blindness) in West Africa: disease control, economic planning, and project implementation. ROAP is the second of these elements, and complements the long term multi-donor onchocerciasis control project for the Ivory Coast, Ghana, Togo, Benin, Niger, Mali, and Upper Volta to which AID is contributing under Project 698-0399. ROAP comprises economic planning, including pre-project feasibility studies, as distinct from any subsequent project implementation efforts which might be undertaken by AID or other donors.

-- ROAP was conceived in FY 1976 as an "umbrella" project, to serve as a funding base for various economic planning sub-projects which might subsequently be put forward by the governments of the participating African states.

-- This project has lasted longer than originally intended. This is due to the unrealistically short project life envisaged by the original project proponents (who anticipated final funding in FY 1977, scarcely one year after the project's inception), combined with much later-than-anticipated submission of viable development study proposals and time-consuming processing of such proposals both by host country officials and by AID.

-- Current status and a brief description of the constituent sub-projects and their estimated cost follows:

Description	Amount	FY
1. LANDSAT study Mapping of oncho-free zones through enhancement and analysis of LANDSAT imagery by U.S. firm of TAMS/Earthsat	1,415,000	77
2. Volta Valley Planning (Upper Volta) For relocation of farmers from the overcrowded plateau region to oncho-freed lands in the southwest	110,00	77
3. Tchiri Development (Togo) Topographic survey of a development area in Northern Togo to be followed by detailed project planning.	210,000	77

	Description	Amount	FY
4.	LANDSAT Study: Additional contract costs not funded in FY 77.	257,000	78
5.	Socio-Economic Study (Benin) Analysis of most favorable areas of Atacora and Borgou regions of Northern Benin for population resettlement.	835,000	78
6.	Health Sector Study (Togo) Development of health structure for Lama Kara region of Northern Togo, as a model meeting health needs in an oncho-free area.	236,000	79
7.	LANDSAT Study To provide additional mapping of oncho-zones in Northern Ghana and Benin.	164,000	79
8.	Soil and Water Management (Upper Volta) Experimental soil and water management research in oncho-free areas.	550,000	79
9.	(a) LANDSAT Study (possible additional large scale mapping for Ghana), or	200,000	79
	(b) Project Planning Tchiri (Togo)	(200,000)	79
10.	Additional project and/or additional funding for on-going projects.	385,000	80
	Total LOP	4,362,000	

Clearance:
AFR/RA:EDConroy
AFR/RA:JDKraus
AFR/RA:EGRuoff

AFR/RA:BWickland:3/16/79:X28094

BRIEFING PAPER

CONGRESSIONAL HEARINGS FY 80

ONCHOCERCIASIS CONTROL

(See Africa Regional C.P. - p. 487)

Purpose: To support an international and multi-donor effort to control onchocerciasis (river blindness) in the Volta River Basin area of Benin, Ghana, Ivory Coast, Mali, Niger, Togo and Upper Volta.

-- The overall effort envisages a lifespan of nearly twenty years and the financial and technical participation of more than a dozen other donors.

-- The project entails the following actions:

* Systematic application of larvicides to water surfaces to destroy the black fly vector.

* Surveillance and re-application of larvicides.

* Research into the development of new and more cost effective measures both for destroying the black fly larvae and for the treatment of onchocerciasis.

* The training of African medical staff.

-- Current status is as follows:

* $1.7 million A.I.D. funds obligated February 1979.

* Control of the black fly vector through aerial application of larvicide has been successful in about 80% of the program area.

* Transmission of the disease to children has been arrested in about 80% of the population samples.

* Reinvasion of black flies into previously treated breeding sites has occurred along the southern and western edges of the program zone.

  - Studies are underway to determine the need, feasibility and methodology for a possible southern extension of the control zone further into Benin, Ghana and Togo.

* Additional countries have requested assistance. A.I.D. has agreed to participate in a study of the area to see if a control program is feasible in:

  - Guinea
  - Guinea Bissau
  - Senegal

AFR/RA:EGRuoff:2/28/79:X28964
Clearance:AFR/RA:EDConroy

March 15, 1979 - Butcher HAC Testimony

Questions at Hearing (in testimony)

1. p. 26 pipeline for SA 78-79?

2. p. 29 Specific examples on Sahel - number of hectares in food now as opposed to last year - food per person increased (p. 28) - improved institutional planning?

p. 30 List of all countries and agencies of our country, include A.I.D., involved in Sahel (similar to last year) - more or less now than last year?

p. 31 Include weather factor.

3. p. 52 What is per capita assistance for DA and economic security support for Africa?

4. p. 57 PL 480 in Africa - Butcher wants to put as insert to record innovative efforts in this - Long asked for comment also on Mennonite report re corruption, waste, discouraging local food production.

5. p. 62 How many cases of river-blindness did there used to be? List difficulties in dealing with it?

p. 70 Scholarly analysis of dimensions of problem (areas and people affected - state of art of technology - size of program).

p. 84 Mrs. Butcher asked to be able to submit an insert on Mozambique, particularly the food situation.

p. 94 Moose agreed to give committee results of State Dept. review on Ethiopia prior to May 8 hearing.

8. p. 95 Mrs. Butcher asked to submit a statement on the justification and rationale for Ethiopia program.

9. p. 96 Mrs. Butcher would also like to submit a statement generally on the increase in our program for Southern Africa.

10. p. 101 Mrs. Butcher promised update on Chad situation prior to mark up.

Affected 1 mil/10 mil pop 73 PM 100,000 exp'd totally

See pp 17-29

392,000 km river system treated on demand as flies rates produce proper conditions for black fly breeding.

Contact Sinha

Insert for page 62
Subcommittee on Foreign Operations
House Appropriations Committee
Mrs. Butcher's Testimony
March 15, 1979

ONCHOCERCIASIS CONTROL (698-0399)

Difficulties in Dealing with Number of Cases of River Blindness

In its 1973 report to the Governments of Benin, Ghana, Ivory Coast, Mali, Niger, Togo, and Upper Volta, the U.N. Preparatory Assistance Mission estimated that, out of a total population of ten million persons in the proposed program area, some one million persons were affected by onchocerciasis. Of these some 100,000 were reported totally blind.

Apart from inevitable difficulties in obtaining detailed baseline data (e.g. river flow rates) and in meeting logistical requirements - all of which have been surmounted - the most serious problems center around developing more effective methods to treat infected persons and in combatting re-invasion of the black fly vector from areas outside the control zone.

Medical science has so far been unsuccessful in efforts to develop effective large-scale methods to treat human carriers of the disease. Once entered into a human host, the infection-bearing worms live from 11 to 18 years and continue to reproduce themselves, enhancing the chances of black flies carrying the infection from one stricken person to others not previously infected. Drugs currently available to the program are not suitable for effective use in mass treatment operations. Under the control program provision is made for research into new forms of treatment which it is hoped will eventually provide a potent and cost-effective solution to this problem.

In the meantime the control program emphasis continues to be placed on killing the larvae of the vector black fly by aerial application of larvicides to the turbulent waters where the black flies are known to breed. Owing to the lack of roads and easy access to much of these waters, reliance continues to be placed on aircraft for larvicide operations.

The danger of re-invasion from areas outside the originally defined control zone is a real one. It is now clear that black flies aided by south-westerly winds have a far greater dispersal range than was originally suspected. A study is underway with respect to extending the control zone in order to reach the external sources of breeding and re-invasion. Also under study is a WHO proposal for a second major control operation to be undertaken to the West, extending into Western Senegal, Guinea, Guinea-Bissau, and Gambia.

This elaboration of problems is not intended to diminish the importance of achievements already observed within the control zone. As previously indicated in my testimony, this program can be regarded as highly successful in controlling the vector fly. To give just one example, in the Sikasso region of Mali, where control operations began in the 1960's and have been continued under the OCP program, some villages now contain only residual cases, with parasite infection dying out and residual (human) transmission persisting at only a low level. In more human terms, the disease cannot persist in areas where protracted spraying over ten years has reduced the fly bite count to 1,000 or less per person per year. Medical observations in four villages kept under surveillance for 10 years in the Sikasso region confirm that the level of endemicity was reduced from over 50% of the population to 10% or less. The onchocerciasis prevalence in children under 15 years of age fell from 15% to 0.4% between 1968 and 1976.

Clearance:
AFR/DR:JLStockard (draft)
AFR/RA:EGRuoff
AFR/RA:EDConroy

AFR/RA:BWickland:rg:3/28/79:X28094

DRAFT:AFR/CWR:HMarshall:abs 9/5/74

PROJECT TITLE: ONCHOCERCIASIS CONTROL PROGRAM
625-11-510-908

APPROPRIATION: Population Planning and Health

Onchocerciasis (river blindness) is a parasitic disease caused by a filarial worm that lodges in the body and is transmitted by the black fly (Simulium damnosum). Onchocerciasis affects over one million persons in the zone covered by the proposed control program (a river basin area shared by Dahomey, Ghana, Ivory Coast, Mali, Niger and Upper Volta). Apart from the great human suffering and generally debilitating effects, onchocerciasis frequently causes severe impairment of vision and in this zone an estimated 60,000 persons may be blind from onchocerciasis. Fear of onchocerciasis has led to abandonment of extensive areas of fertile river valleys in the Volta River Basin. Control of the disease is a prerequisite for bringing these valleys back into production of badly needed staple food supplies.

In July 1968 the World Health Organization acting in conjunction with the West Africa OCCGE and the Agency for International Development convened a technical conference in Tunis, Tunisia, to consider the problem of onchocerciasis. The conference concluded that control of the disease was technically feasible. Subsequently the seven governments of the affected

Volta River Basin area confirmed their desire to participate in an onchocerciasis program. A Preparatory Assistance Group (PAG) prepared a plan of work to achieve control of onchocerciasis over the project zone and to work out expected costs and benefits of the scheme. The operational plans for the onchocerciasis control program have been worked out. On the economic development side PAG was to identify areas within the zone (approximately 65,000 km^2) which offered development possibilities.

PAG's report was completed in the spring of 1973 and at the end of June 1973, the World Bank (IBRD), fiscal agent, and WHO, the executing agency for the proposed program, convened a preliminary meeting in Paris of the participating African countries, interested Governments, and international agencies for purposes of organizing the programing and implementation of an international effort with regard to onchocerciasis. There was general support for the program and the recognition of the need to mobilize the necessary grant funds in time for the control operations to go forward in 1974.

Total costs for the twenty-year control program are estimated at $120 million. Within this total the cost for the first six years phase is

estimated (at 1974 prices and exchange rates) at $57 million. In response to the need for an immediate source of funds to insure uninterrupted progress in effecting the program the Onchocerciasis 1974 Fund Agreement was promulgated. Delay in funding the program would have caused a slowing of the momentum of current activities and the loss of a whole year in the spraying operations, ~~which are an~~ essential part of the onchocerciasis control ~~program.~~

Funds to cover the first year costs of an onchocerciasis control program in West Africa have been mobilized. The 1974 Onchocerciasis Fund Agreement ($7.5 million) has been signed by Canada, the Netherlands, the United Kingdom, the United States and by the World Health Organization and the World Bank, and recently by the Federal Republic of Germany, thus assuring financing for the first year operations. The total U.S. contribution to the six-year phase of the program is estimated at $8.2 million, or not to exceed 20 percent of total program costs.

Progress to date

The strategy of the control program is described in the PAG report, and AID rationale for participating in the program, in the form of a

Planning Paper, was approved on May 31, 1974.

1. Onchocerciasis 1974 Fund Agreement signed on March 1, 1974, assuring funding for the first year operations of the onchocerciasis program.

2. Review made of the management structures required for overseeing the program for the first six-year phase and general agreement was reached. A Joint Coordinating Committee (for overall control and policy guidance), representing donors, participating African Governments and associated international agencies, will be established. The first meeting of this committee is scheduled for early CY 1975 at which time detailed management shortcomings will be [illegible] and arrangements for [illegible] of the air system / [illegible] will be [illegible].

3. Appointment of the Director of the program has been made. All personnel necessary for ~~monitoring~~ monitoring the operational larviciding campaign in the first phase will be on board by October 1974.

4. Bid responses of potential contractors for aerial application of larvicide are now received, and ABATE, the selected insecticide, is ordered and sufficient quantities are in place.

5. Research proposals are being developed. A multidisciplinary ecological panel is satisfied with the envisaged plans for spraying.

6. An Economic Development Unit is to operate within the structure at

headquarters in Ouagadougou. An Economic Development Advisory Panel is also to be organized.

7. All agreed that economic development planning for the affected area, concurrent with the control program, was essential. National Onchocerciasis Control Committees are being set up in each of the participating countries. UNDP is providing special assistance in devel pment of economic development projects.

Congress has declared its concern for the humanitarian aspects of development. Congress has also expressed an interest in undertaking aid through multilateral arrangements. The onchocerciasis project provides an effective mechanism for accomplishing both of these objectives. The Agreement provides an effective mechanism for mobilizing funds and the technical personnel necessary to launch the seven-country onchocerciasis West Africa program. The fact that the program is within the mandate of International Onchocerciasis sponsorship greatly enhances the prospects for successful completion of all phases of the program on schedule.

Onchocerciasis impacts in a vast area that is potentially highly productive. But the cost of controlling the disease and laying the groundwork

for the subsequent social and economic development of the region is so high as to be prohibitive except by a multidonor, multicountry approach. The ~~Agreement~~ onchocerciasis program provides for parallel programs focusing both on the control aspects of the disease and on the socioeconomic development of the area. Thus, the ~~Agreement~~ program is aimed at alleviating human suffering and at rehabilitating the onchocerciasis infected areas.

Success in the onchocerciasis program could have a significant effect in relieving some of the pressures faced by Sahelian Governments. Given the considerable worldwide interest in meeting the problems faced in the Sahel and the likelihood that this would lead to important levels of investment, planning for such investment should clearly take into account expectations related to the onchocerciasis program. ~~For example, the United States is engaged in discussions with the Upper Volta Government concerning rural development, and any such planning should clearly take into account prospects for river valley development when onchocerciasis control has been achieved.~~

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E. O. 12065: N/A
SUBJECT: ONCHO CONTROL PROGRAM (698-0399) LENNON VISIT

REF: (A) STATE 120185; (B) STATE 113825

INFO CONTAINED REFS A AND B PASSED TO MARC BAZIN OCP WHO PROVIDED FOLLOWING REPLY REF. B QUOTE FOR CHRISTOPHER REYR 30 APRIL TELEGRAM (STATE 113825) CONCERNING RESEARCH ON IMMUNOLOGY OF ONCHOCERCIASIS. OCP PROVIDED SOME 10,000 DOLS TO JOHNS HOPKINS IN 1976-1977 FOR RESEARCH ON CULTIVATION O. VOLVULUS IN VITRO. PROPOSED STUDIES DO NOT DUPLICATED PRESENT OCP RESEARCH ACTIVITIES AND WE STRONGLY ENCOURAGE USAID SUPPORT JOHNS HOPKINS PROPOSAL. WISH TO CONFIRM OUR READINESS ASSIST AND COOPERATE FIELD TESTING ACTIVITIES AND TRIALS WITH DEC IN OCP AREA. REGARDS. MARC BAZIN ONCHO OUAGA. UNQUOTE.

informed 1045

action Dr Stockhard

Denny should also note

2. REGARDING LENNON ITINERARY REF. A BAZIN ADVISES THAT NATIONAL ONCHOCERCIASIS COMMITTEES SCHEDULED TO MEET IN OUAGA JUNE 10-12 AND ASKS THEREFORE IF LENNON CAN CHANGE DATES OF PLANS TO BE HERE. BAZIN PROPOSES THAT LENNON ARRIVE IN OUAGA ON FRIDAY JUNE 13TH FLIGHT FROM PARIS, REMAIN IN OUAGA ON JUNE 14 AND 15, FLY TO ABIDJAN AND GO FROM THERE TO BOUAKE ON MONDAY JUNE 16TH AND RETURN TO OUAGA FROM BOUAKE BY TRAIN-LEAVE BOUAKE SAT. JUNE 21 AND ARRIVING OUAGA SUNDAY JUNE 22. JUNE 23 AND JUNE 24 HE WILL STAY IN OUAGA. OCP COULD SEND HIM BY CAR TO THEIR REGIONAL OFFICE IN TAMALE GHANA ON JUNE 25TH AND FROM THERE HE COULD PROCEED TO ACCRA BY ROAD.

i.e. no overnight in Abidjan 15th

3. IF ABOVE ITINERARY NOT SUITABLE FOR LENNON BAZIN SUGGESTS THAT LENNON GO TO BOUAKE FIRST (AFTER PARIS-ABIDJAN FLIGHT), ARRIVING THERE MON. JUNE 16TH. FOLLOWING STAY IN BOUAKE HE COULD TAKE TRAIN TO OUAGA AND PROCEED TO GHANA AFTER HE HAS COMPLETED HIS WORK IN OUAGA.

4. PLEASE ADVISE WHICH OF THESE ITINERARIES LENNON PREFERS. FYI BAZIN DEPARTING ON LEAVE O/A JUNE 20TH. BOYATT

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AFDA-01 /033 A4

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AIDAC

E.O. 12065N/A

TAGS:

SUBJECT: RESEARCH ON IMMUNOLOGY OF ONCHOCERCIASIS

1. AFR IS CONSIDERING SUPPORT OF RESEARCH ON ONCHOCERCIASIS PROPOSED BY INVESTIGATORS AT JOHNS HOPKINS IN BALTIMORE AND UNIVERSITY CENTER FOR HEALTH SCIENCES IN YAOUNDE IF WORK IS NOT DUPLICATED BY OCP.

2. INVESTIGATORS AT JOHNS HOPKINS HAVE DEVELOPED A METHOD FOR CULTIVATING O. VOLVULUS IN VITRO. THIS HAS ENABLED THEM TO ISOLATE AN ANTIGEN WHICH IS EXCRETED BY THE CULTURED MICROFILARIAE. PRELIMINARY STUDIES HAVE INDICATED THAT HUMANS WITH PRIOR EXPOSURE TO O. VOLVULUS EXHIBIT TYPE I HYPERSENSITIVITY WHEN TESTED WITH THIS ANTIGIN, WHILE HUMANS WITHOUT PRIOR EXPOSURE DO NOT.

3. RESEARCH UNDER CONSIDERATION FOR FUNDING BY AFR PROPOSES, FIRST, TO PERFORM EXTENSIVE FIELD TESTING OF THE EXOANTIGEN DESCRIBED ABOVE AS AN IMMUNODIOGNOSTIC AGENT FOR ONCHOCERCIASIS AND, SECOND, TO CHARACTERIZE THE REACTION WHICH FOLLOWS THE ADMINISTRATIVE OF DIETHYLCARBAMAZINE TO INDIVIDUALS WHO ARE INFECTED BY O. VOLVULUS.
4. AFR WISHES TO ENSURE THAT THIS PROPOSED RESEARCH DOES NOT DUPLICATE ANY EFFORTS BEING SUPPORTED BY OCP.
5. PLEASE CONFIRM. CHRISTOPHER

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Department of State

OUTGOING TELEGRAM

-0329

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INFO OCT-00 /035 R

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APPROVED BY DS/HEA:JAEBLN
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AFR/SFWA, CROBINSON (PHONE)
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AMEMBASSY NIAMEY
AMEMBASSY OUAGADOUGOU

UNCLAS STATE 105934

ADM AID

E.O. 12065: N/A

TAGS:
SUBJECT: INFORMATION ON BILTRICIDE (PRAZIQUANTEL)

REF: (A) 01189

1. PRAZIQUANTEL (BILTRICIDE, EMBAY 8440) IS A NEW ANTI-SCHISTOSOMAL DRUG EFFECTIVE AGAINST SCHISTOSOMA HEMATOBIUM, S. MANSONI, S. JAPONICUM AND S. INTERCALATUM. IT IS ALSO EFFECTIVE AGAINST THE ORIENTAL LIVER FLUKE (CLONORCHIS SINENSIS) AND THE LUNG FLUKE (PARAGONIMUS WESTERMANI AND RELATED P. SPECIES).

2. THE DRUG HAS BEEN SUBJECTED TO CLINICAL TRIALS (PHASE 2) IN ZAMBIA AGAINST S. HEMATOBIUM, BRAZIL (S. MANSONI) AND THE PHILIPPINES (S. JAPONICUM). CURE RATES WERE RELATIVELY HIGH IN ALL THREE TYPES OF INFECTION (72 TO 95 PERCENT) AND DRUG TOLERANCE WAS GENERALLY GOOD. THE MOST FREQUENTLY OBSERVED SIDE EFFECTS INCLUDED ABDOMINAL CRAMPS, NAUSEA, DIZZINESS AND PYREXIA. THE PROTOCOLS OF THE CLINICAL TRIALS WERE COORDINATED BY THE WORLD HEALTH ORGANIZATION. THE RESULTS OF THE TRIALS ARE PUBLISHED IN FIVE PAPERS IN THE BULLETIN OF THE WORLD HEALTH ORGANIZATION 1979, VOL. 57: 767-789.

3. GENETIC ACTION OF PRAZIQUANTEL AS A MUTAGEN OR CARCINOGEN WAS STUDIED BY THE INTERNATIONAL AGENCY FOR RESEARCH ON CANCER IN LYON AND FOUND TO BE ABSENT IN THERAPEUTIC DOSES (REF: MUTATION RESEARCH, 58 (1978) 133-142). IN CONTRAST, INVESTIGATORS OF THE JOHNS HOPKINS UNIVERSITY, BALTIMORE, MD FOUND THAT PRAZIQUANTEL MAY ACT AS A CO-MUTAGEN FOR AFLOTOXIN AND OTHER MUTAGENS (REF: BATZINGER ET AL. CANCER RESEARCH 38 (1978): 4478-4465). FURTHER INFORMATION ON MUTAGENICITY STUDIES IN PROGRESS WILL BE PUBLISHED LATER IN 1980.

4. THE CURRENT STATE OF KNOWLEDGE ON USE OF PRAZIQUANTEL IN SCHISTOSOMIASIS TREATMENT WAS RECENTLY REVIEWED IN A SYMPOSIUM HELD IN NAIROBI. THE PROCEEDINGS OF THE SYMPOSIUM WILL BE PUBLISHED AT THE END OF 1980 IN

PAGE 02 STATE 105934 1447 AID0583
ARZNEIMITTELFORSCHUNG.

5. A LARGE SCALE FIELD TRIAL INVOLVING TREATMENT OF 3,000 PATIENTS WITH S. HEMATOBIUM AND S. MANSONI INFECTIONS IS IN PROGRESS IN EGYPT. FINAL RESULTS CAN BE EXPECTED AT THE END OF 1980.

6. PRAZIQUANTEL IS NOT YET LICENSED AS AN ANTISCHISTOSOMAL DRUG BY THE US FDA. AT PRESENT NO CLINICAL RESEARCH IS BEING CARRIED OUT IN THE USA. PRAZIQUANTEL IS NOT AVAILABLE TO PHYSICIANS FROM THE US PUBLIC HEALTH SERVICE UNDER IND ARRANGEMENTS.

7. CURRENT ESTIMATES OF CUT RATE PRICES FOR PRAZIQUANTEL FOR SINGLE TREATMENT (DOLLARS 3.50 TO 5.00) MAKE IT UNLIKELY THAT THE DRUG CAN BE USED IN MASS TREATMENT CAMPAIGNS. VANCE

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