Provisional Agenda, item 10

Proposal for the Plan of Operations for the fourth Financial Phase
(1992-1997)

The attached proposal for the Plan of Operations for the fourth Financial Phase (1992-1997) is submitted to the Joint Programme Committee for its consideration and eventual approval.

A draft which was before the Committee at its eleventh session in December 1990 was subsequently adjusted to reflect the comments and suggestions made by members of JPC as well as the recommendations of the External Review Group approved by the Committee at the same session.

Since then, the Expert Advisory Committee during its June 1991 session examined the draft in some detail and recommended a number of modifications which are contained in the proposal now before the Joint Programme Committee.

WORLD HEALTH ORGANIZATION
ONCHOCERCIASIS CONTROL PROGRAMME IN WEST AFRICA

PLAN OF OPERATIONS FOR THE FOURTH FINANCIAL PHASE (1992-1997)

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October 1991
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ONCHOCERCIASIS CONTROL PROGRAMME IN WEST AFRICA


A. EXECUTIVE SUMMARY

1.1 The main features of OCP operations during the 1992-1997 period as reflected in the present Plan of Operations are: continuation of larviciding to control transmission; community-wide application of ivermectin for the purpose of control of manifestations of the disease including prevention of ocular manifestations; and preparation for, and implementation/consolidation of, the devolution process.

Vector control

1.2 It is expected that what little is left of larviciding in the non-reinvaded part of the Original Programme area will cease by 1994. OCP operations will then be withdrawn from the Original area, and what remains of larviciding in the formerly reinvaded zones will become part of vector control activities in the Extension areas (paragraph 10.16).

1.3 Larviciding in the Southern and Western Extension areas will continue to be conducted according to seasonal variations in transmission and on a selective basis. The aim will remain virtual interruption of transmission wherever there exist significant human reservoirs of onchocercal parasites with a potential for causing the blinding form of the disease (paragraph 10.1).

1.4 Final decisions regarding cessation of larviciding in any given area will be taken on the basis of such criteria as the duration of vector control, the community microfilarial load (CMFL) and the prevalence having reached an epidemiologically insignificant level conforming with model predictions. Also, there should have been no significant incidence of infection (paragraph 10.6). Entomological surveillance will continue in the area two years after larviciding has come to an end (paragraph 10.8).

1.5 Monitoring of the possible effect of larviciding on the aquatic environment will be focussed on the Southern and Western Extension areas (paragraph 10.10). The Programme will encourage national investigations of the impact of human resettlement on the riverain milieu and of the broader environmental aspects in onchocerciasis controlled areas (paragraph 10.11). Also, OCP will monitor eco-environmental changes in the onchocerciasis-controlled zones in respect of any potential impact which may exacerbate the potential for recrudescence.
Ivermectin treatment

1.6 OCP will continue its large-scale ivermectin distribution programme in villages where populations were at risk of onchocercal blindness, and this with an increasing national participation (paragraph 12.4). The collaboration with Non-governmental and Private Voluntary Organizations will be further strengthened (paragraph 12.12). It is expected that OCP-conducted ivermectin distribution will come to an end before 1997 (paragraph 12.5).

Devolution

1.7 Insofar as the ultimate success of the Programme will depend on the extent to which the Participating Countries will eventually detect and control recrudescence once OCP ceases operations, particular attention will be given to the preparation for devolution and support to its implementation (paragraph 18.2).

1.8 Special efforts will be made to ensure that devolution-connected activities in the Participating Countries are developed on the basis of continuity and sustainability (paragraphs 9.3 and 18.3). The availability of a macrofilaricide would greatly facilitate the control of recrudescence and thus help to sustain the devolution process (paragraph 18.10).

1.9 The Devolution Unit of the Programme will provide active support to the Participating Countries concerned in such fields as training (paragraphs 15.2-3), preparation of devolution plans and their implementation. The last of the Participating Countries to complete preparations for devolution should have done so early during the Phase (paragraph 18.19).

1.10 OCP will also institute an inter-country information exchange which will help to ensure active collaboration among the Participating Countries in the field of devolution before and after the Programme ceases operations (paragraph 18.23). The fourth Financial Phase should be seen as a period of "learning by doing" leading in the end to effective devolution throughout the whole Programme area (paragraph 18.20).

Other activities

1.11 Epidemiological evaluation will continue to assess the impact of vector control in pre-selected indicator villages, with emphasis on the Extension areas (paragraph 11.1), and to provide the information necessary for decision-making in respect to cessation of vector control (paragraph 11.5).

1.12 The unit concerned, OCP/EPI, will also give support to epidemiological surveillance and recrudescence control as carried out by national health administrations in the context of devolution (paragraph 11.11).

1.13 In the field of biostatistics and information systems, the competent unit, OCP/BIS, will play a key role in final decisions concerning cessation of vector control in areas where larviciding has lasted 14 years (or more) (paragraph 13.1), a decision-making process for which the epidemiological model will be of particular use (paragraph 13.5).

1.14 OCP/BIS will continue to improve upon the model with a view to making it increasingly comprehensive so as to be able to deal with such issues as recrudescence control (paragraph 13.8) and the eventual impact of a macrofilaricide in addition to allowing for decisions related to cost-effectiveness control (paragraph 13.7).
1.15 The role of OCP as regards socioeconomic development will remain limited to an assessment of the effect of onchocerciasis control in this field and to liaison functions with the Committee of Sponsoring Agencies, entrusted with the actual support to socioeconomic development, and with the Participating Countries (paragraph 14.4).

1.16 OCP-conducted research will continue to be guided by recommendations of the Expert Advisory Committee. The priorities will relate to the following issues: vector control, bionomics, Onchocerca volvulus identification, immunodiagnostic testing, chemotherapy (search for macrofilaricide), modelling and operational research (paragraph 17.1).

1.17 The Programme will make all possible efforts to attain the most satisfactory cost/effectiveness ratio (paragraph 19.1) and thought will be given to how the OCP infrastructure could eventually help to strengthen the health systems of the Participating Countries (paragraph 19.4).

Benefits and risks

1.18 The benefits expected to accrue from implementing the present Plan of Operations can be summarized as follows: the Programme objective will be reached before 1997 in the Original OCP area, which will remain protected from reinvasion; populations in endemic regions within the Extension areas will no longer be at risk of acquiring onchocerctal blindness; the human Onchocerca volvulus reservoir in the Extension areas will be well on its way to virtual elimination; there will be considerable reduction of morbidity and of risk of blindness among originally infected persons after at least six years of ivermectin treatment; riverain land will be made available for resettlement; and devolution will be fully operational in the Original Programme area with preparations completed in the Extension areas (paragraph 21.3).

1.19 It is thus estimated that OCP operations until 1997 will have resulted in a total of 2 million persons having been spared onchocerctal disease and 150,000 cases of onchocerctal blindness having been averted. Furthermore, control operations during the 1992-1997 period are expected to allow 6 to 7 million newborn to grow up without risk of onchocerctal blindness, thus bringing the total since the start of operations to 14 to 15 million, and to make about 10 million hectares of tillable riverain land available for cultivation (total of 25 million hectares since 1974), potentially sufficient to feed 17 million people using traditional technologies and agricultural practices (paragraph 21.4).

1.20 The risks that may be attached to or impede the implementation of the Plan of Operations (and their safeguards) could be: aggravation of larvicide resistance (search for new larvicides and improved formulations); lowered microfilariae susceptibility to ivermectin (routine testing for resistance; search for a macrofilaricide); geographical extension of vectors carrying the blinding form of O. volvulus due to modification of the environment (deforestation) (reinforced entomological surveillance and control); reinvasion of infective blackflies from foci outside the Programme area (entomological surveillance and prompt control); delayed detection of, and failure to control, recrudescence (full support to devolution, eventual availability of an immunodiagnostic test and a macrofilaricide); migration (epidemiological surveillance) and complacency (continuing involvement of all parties) (paragraphs 22.1-22.8).

1.21 The budgetary requirements for the fourth Financial Phase will be in the order of US $175 million including price contingencies to meet projected cost increases (paragraph 20.1).
PART I
(the past)

B. BACKGROUND

2. Onchocerciasis, its transmission and control

The parasite

2.1 Onchocerciasis is caused by a parasitic, filarial worm, Onchocerca volvulus, of which the adult female (macrofilaria, 40-45 cm long) lodges in nodules under the skin and produces millions of microscopic embryos (microfilariae) during its lifespan which rarely exceeds 14 years, a finding of importance in designing the vector control strategy. The microfilariae, which live about two years, give rise to intensely itching rashes, to wrinkling, thickening and depigmentation of the skin, to lymphadenitis resulting in hanging groins and elephantiasis of the genitals, to loss of weight and general debilitation, and, eventually, to severe eye lesions including blindness. The life expectancy of the blind is reduced by 10 to 15 years. This clinical picture is commonly found in savanna areas while the infection only rarely gives rise to blindness in forest zones.

The vector

2.2 The vectors in West Africa are blackflies of the Simulium damnosum species complex. The female lays its eggs at, or below, water surface in fast-flowing rivers where they hatch after 36 to 48 hours. The larval stage lasts five to ten days (depending on the water temperature) and is followed by pupation. Adult blackflies emerge after further two to four days and live up to four weeks during which time they can cover up to several hundred kilometers in flight.

The transmission

2.3 When a female blackfly takes a bloodmeal (necessary for the maturation of its eggs) from a person with an onchocercal infection, it ingests microfilariae which are transformed within the blackfly to infective larvae (L3) and transmitted to other persons during subsequent bloodmeals. The L3 larvae develop in the human host into adult male and female worms, and the life cycle of the parasite is completed (Annex 1).

Note: PART I of this document is first and foremost intended for readers who are unfamiliar with the history, operations and achievements of the Programme, the knowledge of which will facilitate the understanding of the Plan of Operations contained in PART II. Readers familiar with OCP might confine themselves to a scrutiny of PART II with occasional references to PART I.
2.4 The incubation period, i.e. the time between the entry of larvae (L3) and the appearance of onchocercal symptoms, varies between one and three years. The severity of the disease, and the probability of ocular manifestations occurring, correlate with the intensity and frequency of infection, the risks being the highest in areas with a high prevalence of onchocerciasis (hyperendemicity) and a dense blackfly population.

Transmission control

2.5 Larviciding of the breeding sites of the blackfly larvae is, presently, the only means of interrupting transmission to the extent that the human reservoir of *O. volvulus* will eventually die out, and will remain so until such time as elimination of the adult worm can be achieved by community-wide application of, as yet unknown, chemotherapeutic agents.

Morbidity control

2.6 Until recently, only two anti-onchocerciasis compounds were available: diethylcarbamazine (DEC) which kills microfilariae (microfilaricide), and suramin, a macrofilaricide (kills the adult worm). However, both have serious side-effects and are therefore unsuitable for community-wide application.

2.7 Since 1987 ivermectin, a microfilaricide, has become available for large-scale distribution in human populations and has proved itself to be a valuable therapeutic agent, easily dispensed under field conditions, but without the originally hoped for, decisive impact on transmission.

3. The importance of onchocerciasis, the origin of the Onchocerciasis Control Programme and characteristics of the Programme area

Magnitude of the onchocerciasis problem - worldwide

3.1 Onchocerciasis is found along rivers (therefore its colloquial name "river blindness") in tropical zones in Africa, the Middle East and Latin America. Globally, 85.5 million people are exposed to the risk of the disease, 17.5 million are infected and 340 000 have been blinded by onchocerciasis (WHO estimates 19861).

The origin of the Onchocerciasis Control Programme

3.2 In addition to being a serious public health problem, onchocerciasis is an impediment to socioeconomic development insofar as the widespread disability caused by the disease leads to lowered productivity, and the afflicted populations move away from riverine, fertile land in fear of contracting onchocerciasis.

1 WHO Expert Committee on Onchocerciasis, Technical Report Series (TRS) 752.
3.3 Therefore, when a Joint USAID\(^1\)/OCCGE\(^2\)/WHO Technical Meeting on the Feasibility of Onchocerciasis Control concluded in Tunis, Tunisia, in 1968 that large-scale *Simulium* control through aerial larviciding was feasible, seven West African countries\(^3\), together with bilateral and multilateral donor agencies, established the Onchocerciasis Control Programme in the Volta River Basin area (since 1986: the Onchocerciasis Control Programme in West Africa - OCP).

### The area of OCP operations and its population

3.4 The boundaries of the original seven-country Programme area (map in Annex 2) were determined in 1973 by the PAG Mission\(^4\) on the basis of the prevalence of the blinding ("savanna") form of the disease and excluded areas where the non-blinding ("forest") form prevailed as the mandate of OCP was limited to the control of savanna onchocerciasis.

3.5 Vector control operations, launched in 1974/75, expanded over the following two years to cover all of the original seven-country area (654 000 km\(^2\)) which was extended in 1978/79 into the south of Côte d'Ivoire (Annex 2) thereby increasing the Original area to 764 000 km\(^2\) with more than 18 000 km of river under vector control.

3.6 The total population of the Original Programme area exceeded 10 million and it was estimated that more than one million people were infected by onchocerciasis with 100 000 suffering from serious ocular manifestations including 35 000 blinded by the disease. Since then, the level of infection in that Original area has come close to zero as a result of 12 to 14 years of vector control.

3.7 The expansion of OCP operations into the Southern and Western Extension areas as from 1986 (see paragraph 6.1 below and Annex 2) increased the Programme area to 1 235 000 km\(^2\), the total population to 30 million and the length of rivers under control to about 50 000 km. The number of Participating Countries reached eleven by the addition of Guinea, Guinea Bissau, Senegal and Sierra Leone.

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1 Agency for International Development of the United States of America.

2 Organisation de Coordination et de Coopération pour la lutte contre les Grandes Endémies

3 Benin (then Dahomey), Burkina Faso (then Upper Volta), Côte d'Ivoire, Ghana, Mali, Niger and Togo.

4 The Preparatory Assistance Mission to the Governments of the Participating Countries (fielded by WHO in association with FAO and funded by UNDP).
3.8 In the present eleven-country Programme area (essentially in the Extension areas), 2.4 million people are currently infected by onchocerciasis with close to 100 000 blinded by the disease.

Population statistics

3.9 Within the Programme area, life expectancy at birth ranges from 43 to 50 years as compared to 70 plus in most of Europe. The infant mortality rate (the number of infants who fail to survive the first year of life out of 1 000 live born) varies from 100 to 200 as against 7 or 8 in a number of European countries.

3.10 Children aged less than 15 years make up 45% of the total population, of whom 60 to 90 per cent live in rural areas. Enrolment in primary school ranges from 20 to 70 per cent of children at school age.

Economic conditions

3.11 The economy of the Participating Countries is first and foremost agricultural and pastoral, accounting for the employment of 70 to 80 per cent of the labour force. The majority of the countries fall into the low-income bracket with an average per capita GNP at the level of US $200 to 350 per annum; only one or two countries reach the middle-income bracket (annual per capita GNP above US $410).

Climate

3.12 The greater part of the Programme area is situated in the dry and humid savanna belt. The wet season, when blackfly breeding and OCP larviciding are at their maximum, extends from May to September with the highest rainfall in August. The annual rainfall varies from 600 mm in the North to 1 300 mm in the South. The persistent drought since 1974 when the Programme started, accompanied by deforestation, has led to a southward extension of savanna conditions necessitating an expansion of the area covered by OCP vector control.

4. Organization, financing and management of the Programme

Structure

4.1 The overall authority for policy-making and the planning, programming, implementation and financing of OCP operations is vested in the Joint Programme Committee (JPC) composed of representatives of the Participating Countries, of the Donors and of the Sponsoring Agencies (UNDP, WHO, FAO and the World Bank). JPC normally meets once a year to consider the annual progress report, to approve next year's Plan of Action and Budget, and to deal with other important Programme matters.

4.2 The Expert Advisory Committee (EAC) with a membership of not more than 12 scientists carries out annual, independent evaluations of OCP operations and gives technical and scientific advice to JPC, through CSA (see following paragraph), and to the Programme Director. The five-member Ecological Group, a sub-committee of EAC, monitors the effect of vector control on the aquatic environment.
4.3 Representatives of UNDP, WHO, FAO and the World Bank meet several times a year as the Committee of Sponsoring Agencies (CSA) to monitor Programme operations, consider management issues and review documentation for JPC. CSA can provisionally authorize supplementary budgets and approve budget transfer between budget lines. The Committee also supports socioeconomic development of the oncho-controlled zones.

4.4 National Onchocerciasis Committees (NOCs) in the Participating Countries promote OCP sponsored activities, such as devolution. Representatives meet as required, usually once a year. NOCs are non-statutory bodies. (Annex 4a summarizes the Programme structure).

Financing

4.5 OCP is financed by donor countries, international development banks, multilateral institutions and UN agencies (list of Donors in Annex 3), as well as by the Participating Countries which contribute 1.4% of the budget, make staff available to the Programme, provide office space and offer operational facilities. The World Bank has statutory responsibility for determining the level of funding required to finance OCP operations and for soliciting contributions from individual Donors. All contributions are deposited in the Onchocerciasis Fund which is administered by the World Bank and audited by its external auditors. The annual Plan of Action and Budget is approved by the Joint Programme Committee followed by pledging of Donor contributions.

4.6 Since OCP became operational, a system of "Financial Phases" has facilitated medium-term planning and budget forecasting. Each six-year "Phase" is covered by an Onchocerciasis Fund Agreement, signed by the "Contributing Parties", which constitutes the legal basis for the funding and operations of the Programme. A Memorandum of Agreement, describing the institutional and operational arrangements of OCP and signed by WHO and each of the Participating Countries, forms part of the Onchocerciasis Fund Agreement. In addition, individual protocols are established by OCP with each government of the Participating Countries.

Management

4.7 The Programme, executed by the World Health Organization, is managed according to WHO procedures and is technically and administratively assisted by that organization.

4.8 The Director of OCP is supported at Programme HQs in Ouagadougou, Burkina Faso, by five technical and administrative units (vector control, epidemiological evaluation, biostatistical analysis and information systems support, support to devolution, and administration and support services) each headed by a chief assisted by operational/scientific and General Services staff (organigramme in Annex 4b). A Liaison Office is situated at WHO/HQ in Geneva.

Planning, programming and evaluation

4.9 The basic strategy for OCP's activities, centered on larviciding for the control of transmission, was laid down by the PAG Mission which also went into some details regarding Programme structure, methodologies, time tables and resource requirements. This was developed further by a UNDP-funded interim project during 1973.
4.10 More specifically, the Preparatory Mission insisted on a 20 years' timespan for Programme operations in the original seven-country OCP area as it was considered at that time that "the cumulative lifespan of adult O. volvulus filariae and of the last microfilariae produced by these adults (was) in the region of 16 to 18 years". Donors and Participating Countries alike subscribed in principle to the PAG requirements.

4.11 In 1978, WHO, at the request of the Joint Coordinating Committee (the precursor to the Joint Programme Committee), submitted an evaluation report as the basis for preparing for the second Financial Phase (1980-1985). The report concluded that control activities had developed satisfactorily, that research had been carried out according to operational requirements, and that the training component met the needs of the Programme.

4.12 A WHO Independent Commission on the Long-Term Prospects of the Onchocerciasis Control Programme, set up in 1979, recommended inter alia in its 1981 report that OCP operations be gradually extended westwards (the southward extension had already been approved in principle); that funds be provided to pharmaceutical companies to search for a macrofilaricide; that a transmission/control mathematical model be elaborated; that devolution start as from 1991; and that the Programme be eventually transformed into an inter-country disease surveillance training and advisory centre.

4.13 In 1985 the USAID undertook an impact assessment of the Programme with a view also to examining the extent to which OCP experience might be of use in planning future AID-supported programmes. The Agency concluded that "... the OCP, to date, must be considered one of the more successful multi-donor programmes in the short history of development assistance."

4.14 The AID Mission suggested that lower-cost vector control methodologies, more amenable to devolution, should be looked for; that national involvement should be increased with a view to full integration of the OCP vertical operations within the national health delivery systems; that collaboration with private pharmaceutical companies in the search for chemotherapeutic agents be continued; that a comprehensive training programme be instituted; that an immuno-diagnostic test be developed; and that, eventually, there would be a need for an OCP successor body, an "Inter-country Facility", to assume quality control, coordination and training functions, as required, once the Participating Countries had become responsible for "maintenance" activities.

4.15 In 1990 an external review of the Programme was carried out in order to take stock of OCP's progress to date, examine the reasons for the Programme's achievements and draw lessons applicable to other programmes; to assess the progress made towards devolution; to assess progress towards promoting future socioeconomic development in onchocerciasis-controlled areas; to highlight relevant issues for OCP's future and make recommendations for the attainment of the Programme objective; and to examine OCP's potential contribution to health systems development in the Participating Countries.

4.16 The findings concerning lessons of potential interest to other programmes are summarized in paragraph 4.17 below, while the findings and recommendations regarding devolution, promotion of socioeconomic development, issues relevant to OCP's future and its contribution to health systems development are reflected in the corresponding sections of Part II of the present document.

1 PAG report, page 43
4.17 The External Review Team concluded that the success and achievements of the Programme could be ascribed to a clear objective and defined operational targets; a realistic time frame; a technology geared to what can effectively be done and afforded; the contracting-out of services whenever cost/effective; a strong build-in operational research element; a pronounced autonomy in programming and operations; a system of checks and balances; and a clear and transparent accountability.

4.18 Apart from ad hoc reviews and evaluations, the Expert Advisory Committee (EAC) undertakes annual audits of operational, scientific and research activities of the Programme. EAC recommendations, based on such audits, constitute one of the main elements in the planning, programming and implementation of OCP operations.

4.19 A Long-Term Strategy for the Programme was adopted by the Joint Programme Committee (JPC) in 1984 and a Plan of Operations for the third Financial Phase (1986-1991) was approved by JPC in 1985 (both documents are reviewed in section 6 below).

4.20 Annual programme proposals contained in the Plan of Action and Budget (PAB) translate medium-term programmes into detailed activities and corresponding budgets. The consideration of the WHO Progress Reports and the PAB's by the Joint Programme Committee affords yet another opportunity to assess the achievements of the Programme and to determine its future direction.

5. OCP operations and achievements until the end of the third Financial Phase (1986-1991)

Programme objective

5.1 All OCP activities are oriented towards the attainment of the Programme objective as defined by the PAG Mission, and clarified by the Expert Advisory Committee in 1983: "to eliminate onchocerciasis as a disease of public health and socioeconomic importance throughout the OCP area and to ensure that there is no recrudescence of the disease thereafter" (within that area).1

Vector control: operations

5.2 Aerial operations are carried out by a fleet of up to 11 helicopters and 2 fixed-wing aircraft, available on commercial contract. Weekly flight plans and dosage schedules for larvicides are worked out on the basis of entomological and hydrological data collected by the Programme-wide entomological surveillance network, and communicated to the operational bases and OCP HQs by means of the OCP radio system.

5.3 The surveillance network consists of sectors and subsectors manned by entomologists, laboratory technicians, vector collectors, radio operators and drivers. Hydrological conditions (water level and discharge rates) are monitored by automatic devices in rivers and teletransmitted via satellite to the operational centres.

1 See also paragraphs 8.1 and 8.2 below
5.4 Until the end of the third Financial Phase (1986-1991) the sector and subsector staff in the Original and Southern Extension areas was employed by the Programme, while the sectors and operational bases (equivalent to subsectors) in the Western Extension area were manned by government-employed personnel receiving allowances for added responsibility and travel per diem from OCP (see paragraph 9.4 below).

5.5 Since 1987 when larviciding became a permanent feature in the Extension areas, the Programme area has, for the purpose of vector control, been divided into the Eastern Operational Area (EOA) with operational headquarters in Kara, Togo, and the Western Operational Area (WOA) with headquarters in Bamako, Mali (map in Annex 2). The aerial bases are located in Kara and Odienné, Côte d'Ivoire. The OCP centre for testing of larvicides is located in Bouaké, Côte d'Ivoire. Routine monitoring of larval susceptibility to larvicides in current use is carried out with the aid of field teams located in Kara, Bouaké, Odienne, Bamako and Bobo Dioulasso, Burkina Faso. New compounds and formulations are tested at a field station in Soubre on the Sassandra river in Côte d'Ivoire.

5.6 The number of river kilometers under vector control in the Original Programme area, at a maximum of 18 000 during the rainy season in 1982, was more than halved by 1990. Correspondingly, the number of flying hours in the Original OCP area1 has declined from a maximum of 7 500 in 1982 to 1 500 in 1990 while it increased from 1 400 in 1987 to 6 800 in 1990 in the Extension areas.

5.7 The annual consumption of larvicides in the Original area reduced from 250 000 to 125 000 litres2 between 1981 and 1990, while the consumption increased in the Extension areas from 65 000 litres in 1987 to 500 000 litres during 1990.

5.8 Concomitantly with the changes in intensity of operations, the number of sectors and subsectors in the Original OCP area has diminished from 7 and 19, respectively, in the early eighties to 4 and 12 at the end of the third Financial Phase (1991). The network in the Southern Extension area remained stable (1 sector and 5 subsectors since 1979) while it has grown to 3 sectors and 12 operational bases in the Western Extension area.

5.9 Since its inception, OCP has had the benefit of the advice of the Ecological Group and the support of a Programme-wide network of aquatic monitoring stations in its efforts to ensure that the effect of larviciding on the non-target fauna remains insignificant. Presently, the OCP hydrobiological service monitors invertebrates at 8 points while national teams survey fish populations at 9 stations.

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1 In order to allow for comparison with resource requirements during the fourth Financial Phase (1992-1997), the 1990 figures for flying hours and consumption of larvicides in the Original area exclude those pertaining to the 1979 extension into the south of Côte d'Ivoire (para. 3.5 above) which are included in the figures given for the Western Extension area. See also footnote to paragraph 10.13 below.

2 For ease of presentation, larvicide consumption is given in global litre figures, rather than specified by individual products.
5.10 As early as 1978, the Annual Transmission Potential (ATP)\(^1\) had dropped from 800 to below the acceptable level of 100\(^2\) in two thirds of the area under larviciding. Rapidly, a similar situation extended to the entire Original area, except the reinvaded zones in the West and in the South-east and in a few circumscribed zones where vector control had met with operational difficulties (see map in Annex 5).

5.11 Thus, in 1985 the last year of larviciding in the whole of the Original OCP area, more than 90% of the insect capture points reported ATP's less than 100 and in many cases zero. Since then, larviciding has practically ceased in that Original area with the exception of the reinvaded zones and the areas where operational problems temporarily impeded effective control.

5.12 The situation in the reinvaded zones in the Original Programme area has greatly improved since larviciding extended to sources of reinvasion beyond its boundaries. For example, after treatment of the Upper Sassandra Basin in south-eastern Guinea, biting rates and transmission potentials in northern Côte d'Ivoire and south-western Burkina Faso were reduced by over 90%. The reinvasion of Mali is now finally under control but this entailed treatment of sources up to 600 km upwind in Guinea and Sierra Leone.

5.13 Another important achievement has been the handling of lowered susceptibility of the Simulium larvae to temephos, an organophosphorous insecticide which until 1986/87, when resistance appeared on a massive scale following circumscribed instances since 1978, had been the universally applied larvicide within OCP. Since then lowered susceptibility to organophosphorous larvicides has spread throughout the Programme area. However, this temporarily impeding effect on control operations was overcome by rotation of the six larvicides available to the Programme, i.e., temephos, chlorphoxim\(^3\) and pyraclofos\(^4\) (all organophosphorous compounds), Bacillus thuringiensis, H-14 (a biological control agent), permethrin (a pyrethroid) and carbosulfan (a carbamate).

5.14 In spite of extensive larviciding by OCP there has been little effect on the aquatic environment and the record of the Programme in this respect can be said to be unblemished. No disappearance of fish and invertebrate species has been recorded and the observed modifications have been of minor importance, and anyhow reversible. It can therefore be safely concluded that a system of strict monitoring and surveillance of vector control conducted by the Programme during more than 15 years has shown no adverse impact of larviciding.

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1 The theoretical number of onchocercal larvae (L3) received by a person stationed at an insect capture point during one year.

2 The upper tolerable limit for occupying the river valleys without risk of contracting serious onchocercal ocular lesions.

3 Phased out in 1990

5.15 Until 1988, the activities of the Epidemiological Evaluation Unit (EPI) were essentially oriented to an assessment of the impact of vector control by means of repeated examination of indicator villages consisting of "simple evaluations" (search for microfilariae in skin-snips and visual testing) and "detailed evaluations" (ophthalmological examination added). Much of this work has since 1989 been carried out by OCP-trained national teams, supervised by EPI and supported materially and financially by the Programme.

5.16 The data obtained from the evaluations in indicator villages allow for the computation of the incidence, prevalence and community load of infection. These indices which constitute the elements for trend analysis have taken on added importance in the Original Programme area where they are used to determine where and when onchocerciasis has reached the level below which larviciding can cease.

5.17 The Programme also carries out dissection of onchocercal nodules in order to ascertain the proportion of dead female worms in communities under vector control.

5.18 OCP/EPI, with substantial help from national epidemiological teams, has since 1990 completed a comprehensive programme of epidemiological mapping in the Extension areas with a view to establishing baselines for future assessment of control operations, estimating the number of people infected and blinded by onchocerciasis, and identifying communities in need of large-scale ivermectin treatment. In addition to skin-snip examination, EPI has undertaken special ophthalmological surveys to determine the seriousness of the infections transmitted, and to eventually evaluate the effect of ivermectin treatment.

5.19 Finally, OCP/EPI supports community-wide ivermectin distribution programmes in villages with populations at risk of onchodermal blindness (CMPL above 10), carried out by national teams with the assistance of Non-governmental Organizations. Other approaches to ivermectin distribution in affected villages are under study by OCP together with national health authorities.

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1 Community Microfilarial Load: the geometric mean of microfilariae per skin-snip among persons aged 20 years and more, including those with zero count.
Epidemiological evaluation: findings and results

5.20 As a result of the interruption of transmission during up to 14 years of vector control, the CMFL has come close to zero in all of the Original Programme area, excepting the reinvaded zones and a few circumscribed areas where larviciding met with operational problems.

5.21 Once the CMFL approaches the zero level in a given area it can no longer be used for trend analysis and is replaced by other indicators. The prevalence in the major part of the Original OCP area is now insignificant and larviciding has been discontinued in more than 80% of that area.

5.22 Another success of vector control, confirmed by epidemiological evaluation, is the fact that no onchocercal infections occurred in the Original area among children born since the start of vector control, except in the reinvaded zones and in the few areas where transmission temporarily relapsed. In these areas, only 10 to 20 per cent of the infections expected in the absence of larviciding were recorded.

5.23 It is estimated that by 1991 approximately nine million children born after OCP operations started have been spared the risk of contracting onchocercal blindness, that 30 million people (including the population of the Extension areas) are protected from onchocercal disease, that 1.25 million initially seriously infected are no longer so and that over 100 000 have been prevented from going blind.

Large-scale ivermectin application

5.24 The progress made in OCP-conducted large-scale ivermectin distribution within the Programme area is summarized in the below table (see also map in Annex 10):

Table 1

<table>
<thead>
<tr>
<th>Number of persons included in OCP-conducted ivermectin distribution programmes, by area and calendar year.</th>
</tr>
</thead>
<tbody>
<tr>
<td>-------------------</td>
</tr>
<tr>
<td><strong>Original area</strong></td>
</tr>
<tr>
<td>28 482</td>
</tr>
<tr>
<td><strong>Western Ext. area</strong></td>
</tr>
<tr>
<td>8 123</td>
</tr>
<tr>
<td><strong>Southern Ext. area</strong></td>
</tr>
<tr>
<td>14 324</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>

Note: coverage of total population in average around 60% (see paragraph 5.33 below for exclusion criteria).

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1 See footnotes under 5.6 above and 10.13 below
Biostatistical analysis and information system

5.25 The unit concerned with biostatistical and information systems (BIS) supports other units in the analysis of operational data and in the planning and evaluation of field studies; provides technical backstopping for the OCP computerized information system; and trains Programme staff in its use. The computer network covers OCP HQs and all operational stations.

5.26 The graph in Annex 6 illustrates the epidemiological effect of larviciding in the Original OCP area, predicted and observed. The prediction emanates from a transmission model developed by OCP/BIS. This model is capable of producing epidemiological forecasts under varying control scenarios, including the risk of recrudescence of infection and disease after cessation of vector control.

5.27 The main conclusion of model simulations is that 14 years of larviciding is required to virtually eliminate the human reservoir of the onchocercal worm, and thus to practically preclude any risk of recrudescence emanating from inside the area under control.

5.28 Furthermore, simulations and field observations have demonstrated that community-wide application of ivermectin does not reduce transmission sufficiently to eliminate the human parasite reservoir, even if continued regularly at a high level of coverage for a prolonged period as repopulation of microfilariae commences fairly soon after treatment. At the same time preliminary model predictions are that effective ivermectin distribution can cope with recrudescence, provided such distribution is instituted soon after the appearance of recrudescent infection (Annex 7).

Assessment of socioeconomic development

5.29 Programme activities in this field have been limited to the collection of data required for assessing the impact of OCP operations on socioeconomic development. The OCP officer concerned also liaises with the Participating Countries and facilitates studies undertaken by the Committee of Sponsoring Agencies (CSA).

5.30 As a first step, CSA sponsored a regional study to identify, within areas under OCP control, the zones with promising development potential, and to prepare follow-up action. The second step was a study of resettlement designed to provide guidelines for promoting settlement-related development in oncho-controlled zones. The third activity consisted of an in-depth analysis at the national level to serve as the basis for the formulation of development plans for each country’s onchocerciasis area.

5.31 So far, 15 million hectares of riverain, tillable land have been made available for resettlement and cultivation, in part as a result of OCP operations. This has provided foodstuffs enough to feed 10 million people per annum. It is expected that the land available for resettlement will come close to 25 million hectares before the end of this century.

Onchocerciasis Chemotherapy Project

5.32 A special OCP research endeavour is the Onchocerciasis Chemotherapy Project (OCT) which since 1982, in collaboration with the Special Programme of Research and Training in Tropical Diseases (WHO/UNDP/World Bank) and the pharmaceutical industry, has been engaged in the search for anti-onchocercal drugs with the focus on macrofilaricides.
5.33 As a result of these collaborative efforts, ivermectin became available for human use in 1987. Ivermectin is administered orally, it gives rise to few, and only mild, adverse reactions and its clinical effect is pronounced. The discomforts, such as itching, disappear rapidly, and the risk of ocular manifestations, including blindness is significantly reduced. The drug should not be dispensed to pregnant women, mothers during the first week of lactation, children less than five years old, and patients suffering from severe diseases.

5.34 Being a microfilaricidal, ivermectin needs to be given regularly, once or twice annually, during several years. As already mentioned (paragraph 5.28) the reduction in transmission following large-scale application of the drug, is insufficient to bring the human parasite reservoir to an epidemiologically insignificant level. It should be stressed in this connection that ivermectin has no effect on the infective larvae (L3) after entering the human skin and can therefore not be used as a means of prevention.

Research

5.35 The OCP research programme is entirely operations-oriented and follows closely the recommendations made by the Expert Advisory Committee. Recently, the research priorities fall into six major groups: vector control (Simulium bionomics and larvicides), identification of parasite strains, immuno-diagnostic testing, chemotherapy (search for a macrofilaricidal (see preceding section), effect of ivermectin on transmission - alone or in combination), modelling and health systems research (epidemiological surveillance and recrudescence control).

5.36 Applied research related to operational imperatives is undertaken as an integral part of ongoing Programme activities, including the continuing search for improved cost/efficiency of operations. In addition, OCP relies on a number of institutions and consultants for carrying out studies in more specific areas. The ability of the Programme to respond rapidly to research findings has in large part been the reason for its success.

5.37 The results of OCP conducted/supported research have helped to enhance the quality of Programme activities and allowed OCP to cope with operational obstacles. Examples are the increased availability and improved formulations of larvicides to overcome resistance, the steadily improved understanding of the bionomics and vectorial behaviour of the blackfly as related to patterns of blindness, the progress made in developing a test to detect early infection, and, not the least, making ivermectin available for large-scale treatment of the disease.

Training

5.38 The training programme funded by OCP awards fellowships to nationals of the Participating Countries in disciplines of direct relevance to onchocerciasis control. The programme has over the last few years become increasingly oriented towards training in subjects related to devolution. OCP also arranges in-service training for its own staff.

5.39 Between 1974 and December 1990, 338 OCP fellows have been trained in such disciplines as entomology, hydrology, hydrobiology, epidemiology, parasitology, ophthalmology and public health, practically all in African institutions (see Annex 8).
Devolution

5.40 After a period of doubt and uncertainty concerning devolution, the concept, nature and implications of this process, essential for attaining the Programme objective, have been clarified following the advent of ivermectin. Conceptually, devolution should be seen as national maintenance of OCP achievements through active epidemiological surveillance aiming at early detection of foci of recrudescence infection/disease, and the control of such recrudescence by ivermectin treatment.

5.41 So far, the seven Participating Countries which together make up the Original Programme area, have prepared devolution plans which have been submitted to, and endorsed by, the Joint Programme Committee (JPC). In all of them, surveillance of onchocerciasis has been combined with that of other diseases of public health importance and provision has been made for coping with recrudescence of the disease. Recently a Devolution Unit has been set up at OCP HQs.

Management

5.42 The overall direction of OCP, including implementation of general policy and Programme management, is entrusted in the Director's Office which also handles external relations, coordination of research, support to devolution information of the public, training meetings and the Geneva Liaison Office. Chief, Administration and Support Services, is on his side responsible for budget and finance matters, personnel, equipment and supplies, transport and buildings.

5.43 To obtain the best possible cost/efficiency ratio of Programme operations, a close watch is kept on all activities at all levels to ensure the greatest benefit at the lowest cost. In this connection, annual Staff Seminars serve as occasions to imbue operational and administrative staff with a high degree of cost-consciousness.

5.44 More specifically, good management practice has allowed for a reduction of staff by 30% between 1987 and 1990 to some extent compensated for by the use of nationally employed personnel. Also, the Programme direction has succeeded, through negotiations with industry, in lowering the price of larvicides, in one case by as much as 50%.

5.45 In the field of institution building, OCP has created a highly efficient, regional administration and communications network in support of all Programme activities, based on a complement of well-trained, competent and motivated staff, by far the majority recruited from the Participating Countries, and supported by a region-wide radio system and computer link-up.


6.1 The main thrust of the Long-Term Strategy (LTS) and of the Plan of Operations for the 1986-1991 period was the expansion of OCP operations into the Southern and Western Extension areas (see map in Annex 2) intended both to protect the populations in those areas and to prevent reinvasion into the Original area. Vector control was planned to start in 1986 and was expected to come to an end in 1997 as, at the time of preparing the LTS, the lifespan of the female worm was believed to be on the average 11 years, so that eleven years of larviciding would suffice to eliminate the human reservoir of O. volvulus.
6.2 The Long-Term Strategy further predicted that OCP would cease its activities in the original seven-country area by 1993/94 after which the Participating Countries would assume responsibility for maintenance operations as they would in the Extension areas starting in 1997. What was referred to as "maintenance" at the time of preparing the LTS and the Plan of Operations in 1984 and 1985 has since been clarified in operational terms as the process of devolution.

6.3 The success of the Programme in the Original area has been complete. The human parasite reservoir has been virtually eliminated throughout the area already by 1990 (and even before) with the exception of the previously reinvaded zones and one or two circumscribed areas where vector control had met temporary problems. This result was obtained in less than 20 years originally agreed upon as the timeframe for OCP operations in the Original Programme area.

6.4 As regards the Extension areas OCP control should be seen as a successor programme to that in the Original area, distinct from it in operations and in its timeframe, but necessary to protect the achievements in that Original area as well as the concerned populations.

6.5 The start of vector control operation in the Extension areas has suffered a delay of up to three years due to serious resistance problems with which the Programme has been faced since the first half (1986-1988) of the third Financial Phase.

6.6 Furthermore, epidemiological investigations in areas where larviciding has been conducted since 1974, supported by predictions of the epidemiological model, have now established that up to 14 years of larviciding is required to eliminate the human reservoir of the onchocercal parasite, i.e. for the longest living adult worms and the last batch of microfilariae to die out. This is in contrast to the 11 years estimated when the LTS was prepared.

6.7 As a result of the delay in commencing larviciding and the underestimate of the duration of vector control necessary to eliminate the parasite, OCP will need to continue larviciding beyond 1997 in parts of the Extension areas, although on a gradually diminishing scale.

7. Milestones in the development of the Programme and its cost until the end of the third Financial Phase

7.1 During the first Financial Phase (1974-1979) vector control, based exclusively on temephos, expanded gradually throughout the Original Programme area with the result that transmission was controlled in two thirds of that area. The second Financial Phase (1980-1985) was characterized by continuing successful larviciding with some operational problems created by reinvasion and circumscribed instances of resistance to organophosphorous compounds. These problems were accentuated at the beginning of the third Financial Phase (1986-1991) but successfully overcome by the extension of vector control to the sources of reinvasion in the South-east and in the West and by instituting a rotational scheme for the application of the five larvicides then available. Also, the end of that Phase saw the advent of ivermectin as an effective means of control of onchocercal manifestations.
7.2 The total cost of OCP operations during the first Financial Phase amounted to US $ 56.2 million and came to US $ 104.5 million for the second Phase. The expenditures for the third Phase totalled US $179.6 million. (All amounts are given in nominal $ values).

7.3 The proportion of the budget spent on vector control has remained fairly stable at the 65 to 75 per cent level, while epidemiological evaluation has accounted for 3 to 5 per cent and management, including the Director's Office, for 11 to 13 per cent of the total expenditures.
PART II
1992-1997


Introduction

a. The following Plan of Operations has been developed within the framework of, and in conformity with, the OCP Long-Term Strategy whose main features were: continuation of transmission control by larviciding, expansion of vector control into the Extension areas and an intensified search for a macrofilaricide which, if and when available, could alter the control strategy. Already, the availability as from 1987 of the microfilaricide, ivermectin, has enlarged the scope of Programme operations by making an important contribution to morbidity control, including reduction in ocular pathology.

b. The Onchocerciasis Control Programme has consistently adhered to a number of operational policies and managerial principles which have been instrumental in making the Programme progress in a cost/effective manner. The future operations under the Plan of Operations should be viewed in the context of these policies and principles some of which are mentioned in the following.

c. OCP is pre-eminently a field operation. It has succeeded in maintaining its momentum and overcoming technical and other obstacles essentially because in-built scientific and operational research has anticipated such obstacles and provided solutions. Examples are the phenomena of reinvasion and resistance to organophosphorus larvicides. In the first case, the Programme expanded its operations to cover the sources of reinvasion while in the second, the successful search for new insecticides allowed for the rotational use of several environmentally acceptable larvicides to overcome resistance.

d. Also, as a result of research the increased knowledge of the vectors and improved understanding of their behaviour and importance for transmission have contributed largely to steadily improving vector control operations and their efficiency. Another important development has been the advent of ivermectin as a means of onchocercal morbidity control in humans, to a large extent due to field studies carried out by the Programme. It should be stressed in this connection that OCP collaborates closely with other research entities within and outside WHO, so as to achieve the best possible cost/effectiveness also in this field.

e. Although the Programme adheres to the overall strategy laid down in the Long-Term Strategy there has always been ample room for adaptation and flexibility in its application. This is demonstrated by the occasional modification of the boundaries of OCP operations originally determined on entomological grounds, but more recently modified so as to conform with epidemiological criteria (see paragraph 10.28 below).

f. Cost/effectiveness and optimization of the use of resources are of major concern in the management of the Programme. Determined and continued search for improvement in control operations at a lower cost has thus resulted in the application of continuous satellite transmission of hydrological data allowing for larvicides to be sprayed in the right quantity according to precise readings of the water flow, thereby economizing on insecticides. Also, the computerization of helicopter circuits has gone a long way towards optimization of flying hours.
g. The Programme management is constantly on the outlook for savings and has on several occasions succeeded in lowering the cost of commodities through negotiations with industry. OCP has thus benefited from substantial reductions in the price of larvicides, in one case up to 50%. As regards ivermectin, it was after extensive discussions with the Programme Director that the manufacturer decided to make the drug available free of cost.

h. Whenever activities are better and more cost/effectively performed by other entities than OCP itself such services are contracted out. This goes for aerial operations where the Programme enters into contract with the company making the most advantageous bid, a procedure repeated every three years. Furthermore, trucking of insecticides and other commodities, previously done by Programme vehicles, is now in the hands of private firms on a contractual basis as are security arrangements at OCP headquarters and operational centres.

i. The Programme has been fortunate in attracting highly qualified and devoted staff. The overriding consideration in selection has always been high technical and managerial skills and OCP's record of staff retention is indeed impressive considering also that conditions in the field are often very taxing.

j. An important, fairly recent development has been the construction of an epidemiological model which is now an instrument of significance in the development and continuing adaptation of operational plans.

k. It is by the application of the operational policies and managerial principles exemplified above, that the Programme has succeeded in following its chartered course and thereby gone a long way towards the attainment of its objective. The operational approach of OCP has stood the test of time and it is confidently predicted that the continued adherence to this approach during the fourth Financial Phase will produce the expected results so that operations will come to an end within the time frame predicted on currently available technical information.

l. It is appreciated that the development of a macrofilaricidal drug could radically alter the approach to control and prove an invaluable tool in instances of recrudescence during and after devolution.

m. Progress will be constantly monitored by the Committee of Sponsoring Agencies, the Expert Advisory Committee and the Joint Programme Committee, and the course of action will be adjusted according to the guidance and recommendations received from these bodies. Furthermore, it is suggested that an external review be carried out at mid-term during the fourth Financial Phase. The findings and recommendations of the review mission would assist the OCP management in maintaining its effective adaptation to the most recent knowledge of relevance to Programme operations and this in particular in respect to the impact and future role of ivermectin.

8. Objective and targets for operations during the 1992-1997 period

8.1 The objective of the Programme as defined in 1983 by the Expert Advisory Committee reads as follows: "to eliminate onchocerciasis as a disease of public health and socioeconomic importance throughout the OCP area and to ensure that there is no recrudescence of the disease thereafter".

8.2 Since then, epidemiological model predictions indicate that recrudescence, should it occur, could be effectively dealt with through application of ivermectin, a drug that was not available for human consumption at the time of definition of the objective. Consequently, EAC at its 1990 session recommended the following modification to the objective slightly adjusted by CSA: "to eliminate onchocerciasis as a disease of public health
importance and as an obstacle to socioeconomic development throughout the Programme area and for the Participating Countries to maintain this achievement."

8.3 Programme operations during the 1992-1997 period will aim at attaining the following targets:

<table>
<thead>
<tr>
<th>Target</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1992</td>
<td>plans for devolution prepared and its implementation underway in the major part of the Original OCP area excepting the reinvaded zones (para. 18.19)</td>
</tr>
<tr>
<td>1992/93</td>
<td>preparation for devolution completed in the Extension areas (para. 18.19)</td>
</tr>
<tr>
<td>1992/94</td>
<td>discontinuation of entomological surveillance and reduction of the network in the major part of the Original Programme area (para. 10.18)</td>
</tr>
<tr>
<td>1994/95</td>
<td>cessation of what little is left of larviciding in the non-reinvaded Original OCP area (paras 10.14 and 10.16)</td>
</tr>
<tr>
<td>1996</td>
<td>withdrawal of the remaining entomological surveillance network from the non-reinvaded Original OCP area (para. 10.18)</td>
</tr>
</tbody>
</table>

9. General considerations

9.1 The present Plan of Operations falls within the framework of the Long-Term Strategy (LTS) and the activities enumerated are a continuation of those described in the LTS as appropriate for reaching the Programme objective. During the 1992-1997 period the emphasis of control operations will shift from the Original OCP area (where the objective will have been fully met before the end of that period) to the Extension areas where vector control will safeguard the achievements in the Original Programme area, protect the populations in the Extension areas, and move OCP towards attaining its objective throughout the eleven-country area (see also paragraph 9.8 below).

9.2 With vector control practically completed in the Original Programme area and well underway in the Extension areas, a dominant feature of the fourth Financial Phase will be the consolidation of devolution in the former area and its preparation and gradual implementation in the latter areas. The ultimate success of the Programme will depend on the extent to which the Participating Countries will arrive at early detection of recrudescence and at its effective control by means of ivermectin distribution.

9.3 The strengthening of the national epidemiological surveillance and control capability will therefore remain a major concern of OCP throughout the period with particular emphasis on the sustainability of this capacity in the Participating Countries and on its manifestations in operational terms. Given the overriding importance of the Programme's support to the national efforts in this respect, an OCP Devolution Unit was established in Ouagadougou by the end of the third Financial Phase. The activities of this unit will be further strengthened during the Fourth Phase.
9.4 It is planned that General Service staff in the Original and Southern Extension areas will become nationally employed under similar conditions as those already prevailing in the Western Extension area, this harmonization being in line with the Programme's move towards a steady increase in national involvement within the context of devolution. Negotiations will be undertaken with the Participating Countries in this respect and the agreements reflected in the country protocols (see paragraph 4.6 above).

9.5 More than 15 years of OCP-conducted vector control, supported by model predictions, has demonstrated that successful larviciding can achieve interruption of transmission and, if continued uninterruptedly during 14 years, result in virtual elimination of the human reservoir of the parasite in the absence of renewed infection, within the area under control. Although, initially, large-scale field trials seemed to indicate that ivermectin might have a similar effect if applied for a sufficiently long period, such expectations were soon discouraged by subsequent field investigations and epidemiological model simulations.

9.6 The Expert Advisory Committee therefore recommended, at its June 1989 session; that OCP should continue to rely on larviciding for the control of transmission and that ivermectin should be used widely for the treatment of infected cases with a view to controlling morbidity and preventing ocular manifestations leading to blindness. Vector control brings the Programme to its objective within a finite period while ivermectin control of onchocercal manifestations will need to be continued indefinitely as without vector control, transmission will continue in areas where ivermectin is given alone.

9.7 EAC further recommended that whenever ivermectin was applied on a community-wide basis together with larviciding, the drug could be given during five to seven years to ensure rapid maximum clinical effect after which vector control alone would bring about virtual elimination of the human parasite reservoir.

9.8 The findings and recommendations of the Expert Advisory Committee were incorporated in a strategy document (JPC10.8) which was considered, and endorsed, by the Joint Programme Committee in December 1989. It was underlined that OCP would fully attain its objective in the original seven-country area, and this within the twenty year period assigned to it. Operations in the Extension areas should therefore be seen as a successor control programme, independent in activities and timeframe and intended to protect the populations in these areas and to safeguard the achievements in the Original area.

9.9 At the same time it was stressed that OCP, as a result of an underestimate of the duration of infectivity of the parasite in man (14 years instead of 11) and a delay of up to 3 years in the start of larviciding in the Extension areas due to resistance problems, would need to continue vector control beyond 1997 when the Programme was initially predicted to come to an end. Operations during the remaining years would, however, be conducted on a gradually reducing scale.

9.10 The overall strategy for the fourth Financial Phase will thus continue to be based on larviciding as the means of transmission control. Chemotherapy by ivermectin will constitute an important complement aiming at preventing severe ocular manifestations of the disease as was already the case during the third Financial Phase (1986-1991).
9.11 In determining the target areas for, and the extent of, larviciding, the overarching consideration will remain the need for interruption of transmission whenever considered indispensable for attaining the Programme objective. Originally the overall strategy aimed at, and succeeded in, vector control throughout the Original OCP area. Since then, clarification of the dynamics of the onchocercal epidemiology and the advent of ivermectin have allowed the Programme to institute larviciding in the Extension areas on a more selective and seasonal basis or leave out vector control from certain areas where epidemiological investigations and other considerations have established that ivermectin distribution alone will allow the Programme to meet its objective (see for example paragraph 10.28 below).

9.12 More specifically, areas designated for ivermectin distribution alone are those where:

- the serious hyperendemic foci are limited to a few circumscribed zones;
- population is sparse;
- a substantial proportion of onchocercal larvae in blackflies are animal filariae;
- the endemic foci do not constitute sources of reinvasion; and
- the cost of aerial operations would constitute an inordinate drain on limited resources.

9.13 In preparing the Long-Term Strategy (LTS) and the Plan of Operations for the 1986-1991 period, the notion of graduation of vector control according to intensity of operations (attack, consolidation, maintenance) was introduced. This concept has not been applied in the planning for the fourth Financial Phase, insofar as larviciding in the Extension areas developed naturally into selective and seasonal operations which can no longer be graded according to the LTS system.

9.14 The operational plans and budgetary forecasts contained in the remainder of the present document have been worked out on the basis of more than 15 years of field experience. The likelihood is therefore that implementation will match predictions. However, given the dependence of OCP operations on a series of unpredictable biological and climatic variables, it is important that the Programme management continue to be granted the flexibility necessary to meet unforeseeable circumstances and events and to adjust the use of resources accordingly. OCP will thus enhance its proven capability to respond and adapt to changes in the operational environment.

9.15 High priority will continue to be given to the development of a field-applicable macrofilaricidal drug, the introduction of which could radically alter the control strategy.

9.16 OCP has over the years developed and refined a unique regional infrastructure, both as regards communications and availability of interconnected operational centres where Programme staff have accumulated an intimate knowledge and understanding not only in the field of onchocerciasis control but also in respect to local, social and economic conditions. It would therefore seem legitimate to explore ways to put OCP-related personnel and structures to the use of further development of health care systems, coordinated care of natural resources and the strengthening of research capabilities within the West African region.
9.17 The Programme will operate over an area of 1 235 000 km² (including the Original area), and close to 50 000 km of river will be under control: surveillance and larviciding or surveillance alone (Original area: more than 18 000 km). In all, 30 million people will be protected from onchocercal infection.

10. Vector control

Vector control: general

10.1 The operational aim will remain virtual interruption of transmission wherever there exist significant human reservoirs of onchocercal parasites with a potential for causing the blinding form of the disease. The approach to attaining this aim will continue to be seasonal and selective larviciding which is finetuned to prevent transmission of the blindin strain of *O. volvulus* by efficient, usually migratory, savanna cytoforms, rather than blanket treatment throughout the year.

10.2 The Programme has over the years acquired a unique knowledge and understanding of the bionomics, vector efficiency and migratory practices of the various cytoforms of the blackfly throughout the OCP area. Also, the seasonal changes in the dynamics of vector populations are becoming increasingly known.

10.3 By reacting to the results of applied research when drawing up medium-term and short-term programmes, OCP has brought about a considerable improvement in the cost/effectiveness of vector control operations and will continue its efforts in that direction.

10.4 Also, the now generalized use of satellite-transmitted data concerning river discharge, captured from beacons positioned at key points, allows for a precise insecticide treatment as regards determination of application points, aircraft circuit, choice of larvicides and dosage. The computer storage and analysis of hydrological and larvicide application data will continue to be of essence in this respect.

10.5 The use of different larvicides in rotation will remain the strategy for coping with resistance to temephos which will continue to be used in any given area until larval susceptibility reaches a point at which the five replacement larvicides: *Bacillus thuringiensis* (B.t. H-14), permethrin, phoxas, carbosulfan and pyraclofos come into play.

10.6 The Vector Control Unit will rely on the results of epidemiological surveys when deciding finally on the cessation of larviciding within the Original OCP area. Larviciding will be discontinued after 14 years if the decline in CMFL and prevalence of skin microfilariae in indicator villages have been in accordance with model predictions. Furthermore, there should have been no significant incidence of infection (including no incidence in children born since the start of vector control) during the control period and the results of cross-sectional surveys in surrounding villages should be consistent with those for the indicator villages. In case these criteria are not met, detailed investigations will be undertaken to determine the risk of recrudescence of infection and to estimate the required additional period of larviciding.

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1 Community Microfilarial Load: the geometric mean of microfilariae per skin snip among persons aged 20 years and more, including those with a zero count.
10.7 At the time of cessation of larviciding in a circumscribed area, the national health authorities concerned will be notified accordingly with a view inter alia to make the final arrangements for the devolution activities required in that area.

10.8 As a general principle, the entomological surveillance network will be kept in place for two years of significant blackfly presence after larviciding has been discontinued in a given area in order to produce tangible evidence that transmission has reached an insignificant level (post control evaluation).

10.9 Similarly, the Expert Advisory Committee recommended at its June 1989 session that monitoring of fish and invertebrates be continued for at least one year in some river basins in the Original OCP area where larviciding ceased in 1990.

10.10 Surveillance of the aquatic environment is expected to focus increasingly on the effect, or lack of effect, of vector control in the Extension areas as and when larviciding ceases in the Original OCP area. The monitoring of invertebrates will remain the responsibility of OCP and the surveillance of fish that of national hydrobiologists.

10.11 During the fourth Financial Phase, the Programme will continue investigations of the impact of larviciding on the riverine milieu and encourage national authorities to monitor the broader environmental effects that human resettlement and socioeconomic development may bring to onchocerciasis controlled areas. OCP will also monitor eco-environmental changes in the oncho-controlled zones in respect of any potential impact which may exacerbate the potential for recrudescence.

10.12 As vector control comes to an end, the blackfly will return. This could, apart from the nuisance of bites, give rise to fear of blindness, a fear to be alleviated by raised community awareness of the mode of transmission and the manifestations of onchocerciasis. Reassurance that the return of the blackfly carries no risk of reappearance of the disease must therefore be given to the populations concerned.

**Vector control: operations**

10.13 **Original Programme area:**† larviciding which ceased during 1990 in the major part of the original seven-country area, will during the first two years of the fourth Financial Phase remain confined to a few zones, where the reduction in the microfilarial load was delayed due to temporary vector control problems.

10.14 These zones will be kept under intensive epidemiological evaluation in order to determine when larviciding can be discontinued without risk of resumption of transmission. It is expected that vector control will no longer be needed there as from 1994, except that entomological surveillance may continue for two years more (see paragraph 10.8 above).

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† For the purpose of the following, the Original Programme area excludes the 1978/79 extension into the south of Côte d'Ivoire (see para. 3.5 above) where larviciding started with a 4 to 5 years' delay and where particular operational conditions were encountered. Plans for vector control in that extension are included under those for the Western Extension area (paragraphs 10.26 to 10.32 below).
10.15 Vector control will also continue in the south-eastern and western periphery of the Original area where the reduction in the CMFL lagged behind as a result of persistent transmission maintained by reinvasion until the end of the eighties when the sources in the Extension areas were brought under control (see map in Annex 5).

10.16 By 1994 larviciding will come to an end throughout the Original Programme area, with the exception of the previously reinvaded peripheral zones where vector control will be continued as an integral part of OCP operations in the Extension areas.

10.17 The number of flying hours required annually for larviciding in the Original OCP area will remain at an average level of 1 400 hours until 1994. The consumption of insecticides will come to 65 000 litres per year through 1994.

10.18 The strength of the entomological surveillance network in the Original Programme area will be reduced in 1992/1994 from 4 to 3 sectors and from 12 to 8 subsectors, all to be disestablished by 1996.

10.19 The estimated requirements for larviciding and entomological surveillance in the reinvaded zones of the Original area beyond 1994 are included in the estimates for the Extension areas as given below.

10.20 Aquatic monitoring will continue at least one year after cessation of larviciding in a few representative observation posts.

10.21 Southern Extension area: as from 1988 larviciding attained full coverage of the area after a geographically limited start in Ghana during 1986 followed by an expansion through southern Benin and Togo in 1987.

10.22 Selective and seasonal larviciding will remain the guiding principle for vector control in the Southern Extension area and certain regions will continue to be left out entirely as, for instance, the Sota Basin in the North of Benin where larviciding was discontinued during the third Financial Phase as its cost was prohibitive, due to excessive distance from airbase coupled with perennial breeding. Furthermore the basin does not constitute a source of onward transmission. For these reasons, vector control has been replaced by large-scale ivermectin treatment which will be continued through the fourth Financial Phase.

10.23 Similarly, larviciding will be limited in the south-western region of the Southern Extension area, in the upland rainforest zone on the border between Togo and Ghana, where the rough mountainous terrain, dense vegetation and frequent adverse conditions hamper aerial operations. This is further warranted by the confirmation that the original vector, the "Djodji" form of Simulium sanctipauli seems to have been replaced in that zone by S. squamosum and S. yahense vectors of non-blinding onchocerciasis.

10.24 It is estimated that annual larviciding in the Southern Extension area will require 1 000 flying hour per year until 1994 after which the annual requirement will increase to 1 500 hours as a result of larviciding in the reinvaded zones of the Original OCP area becoming part of operations in the Extension areas. Around 90 000 litres of larvicides will be required each year during the 1992-1997 period.

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1 For ease of presentation larvicide requirements are given in global litre figures rather than specified by individual products.
10.25 The entomological surveillance network in the Southern Extension area will remain at the 1991 level (1 sector and 5 subsectors) until 1994 when it will increase to 2 sectors and 6 subsectors following the "absorption" of the network in the south-eastern reinvaded zones in the Original Programme area.

10.26 Western Extension area: as in the Southern Extension area, larviciding will continue to be selective and seasonal in nature. The extent of larviciding will be determined on the basis of up-to-date ento-epidemiological and hydrological data.

10.27 In Guinea, larviciding aiming at the control of the "savanna" vector *S. sirbanum*, whether or not associated with forms of *S. soubrense*, will continue throughout the year. In Sierra Leone, larviciding in the North, focusing on *S. sirbanum* capable of transmitting into the savanna belt, will be conducted regularly while the control of *S. soubrense* B (relatively non-migratory) in the South will be conducted on a largely selective and seasonal basis.

10.28 The exclusion from larviciding of the northern part of the Western Extension area (see Annex 9) is in accordance with the overall control strategy and in conformity with the criteria listed in paragraph 9.12 above.

10.29 Control in that area will continue to be based on large-scale ivermectin distribution and the Programme will spare no efforts to ensure the highest possible coverage of the target populations. Full use will be made for this purpose of the existing ento-epidemiological network established by OCP. The population groups concerned will thus see onchocerciasis removed as a disease of public health and socioeconomic importance.

10.30 Concurrently with, and in support of, the intensive ivermectin treatment programme, opportunity will be taken of field operations to investigate such questions as the possible additional benefits of increasing the frequency of treatment and the cost/effectiveness of different strategies for community-wide and centre-based ivermectin distribution.

10.31 It is expected that aerial operations in the Western Extension area will be conducted at the 1990 level through 1994, i.e. at the rate of 5 400 flying hours annually. During the remainder of the fourth Financial Phase, the number of hours per year will increase to 5 800 as a result of the inclusion in 1994/1995 of vector control in the westerly reinvaded zones of the Original area within the Extension operations. The consumption of larvicides is estimated to oscillate around 370 000 litres annually.

10.32 The entomological surveillance network will remain at its 1991 level (3 sectors and 12 operational bases) until 1994 when 2 subsectors from the previously reinvaded zones of the Original OCP area will be operationally incorporated in the Western Extension area. No further changes are expected before the end of the fourth Financial Phase.
10.33 **Total VCU resource requirements:** The anticipated maximum extent of larviciding throughout the Programme area in (1990), 1992, 1994 and 1997 is depicted in maps shown in Annex 9.

10.34 The trend in resource requirements can be summarized as follows: in 1990 the total number of flying hours and litres of larvicides for the entire Programme area came to 8 300 and 625 000 respectively; these requirements will decrease until 1994 and further reduce to 7 300 and 460 000 thereafter; likewise, there will be a reduction in the number of sectors and subsectors/operational bases from 8 and 29 respectively (planned for 1991) to 5 and 20 by 1997.

10.35 Monitoring of the aquatic environment in the two Extension areas will continue as an integral part of vector control operations. As mentioned above, (paragraph 10.9) ecological surveillance will extend one year beyond the cessation of larviciding in any given zone. The national teams will continue to monitor the effects of larviciding on fish and the OCP team will remain responsible for surveying invertebrates.

10.36 VCU staff requirements at OCP HQs and in the headquarters of the Eastern and Western Operational Areas will remain stable throughout the 1992-1997 period with little variation from the 1991 situation. The total VCU staff complement on OCP/WHO contract will, during the fourth Financial Phase, diminish from 18 to 15 Professionals and from 361 to 68 General Service posts in offices with intercountry responsibilities, the remaining General Service staff being nationally employed.

10.37 Operational and other expenses for VCU are estimated to decrease from US $4.3 million in 1992 to US $3.8 million in 1997, i.e. US $100 000 per year.

11. **Epidemiological evaluation and surveillance**

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11.1 **Epidemiological evaluation**

The epidemiological Evaluation Unit (EPI) will continue its traditional role as the focal point for assessing the impact of vector control, essentially in the Extension areas where the epidemiological maps prepared in 1989/90 will serve as benchmark. The search for microfilariae in skinsnips, whenever carried out, will continue to adhere to WHO instructions designed to prevent transmission of such viral diseases as hepatitis and AIDS.

11.2 However, given that community-wide ivermectin distribution, undertaken on a large scale throughout the Programme area, leads to a rapid and steep reduction in the microfilarial load, the CMFL ceases to be a valid index for the epidemiological trend analysis in villages previously selected for skin-snip examination.

11.3 Insofar as ivermectin treatment will continue for an average of six years (see para. 9.7 above), evaluation of the effect of vector control on transmission will be limited to entomological surveillance during that period as the temporary disappearance of microfilariae makes examination of skin-snips worthless. After a further three years without ivermectin treatment, skin-snip examination will again become a valid means of evaluating the impact of transmission control. In the meantime efforts will be made to develop other diagnostic procedures allowing for rapid community assessment, independent of ivermectin application and devoid of risk of disease transmission.
11.4 Also, impact analysis in terms of measuring incidence will to some extent rely on skin-snip examination of non-treated, previously skin-snip negative persons and of children excluded from ivermectin treatment, although such tests are of limited sensitivity initially. Obviously, the eventual availability of an immunodiagnostic test would drastically alter the situation and the Programme will continue and reinforce its support to the development of a field-applicable test (see also paragraph 17.8 below).

11.5 Apart from monitoring the impact of vector control in the Extension areas, epidemiological evaluation will provide the data necessary for OCP/VCU to decide on cessation of larviciding (see para. 10.6 above).

11.6 OCP/EPI will therefore direct a good deal of the evaluation efforts to indicator villages situated in the circumscribed zones within the Original Programme area where larviciding had previously met with operational difficulties and therefore had to be continued beyond 1990 (see paragraph 10.13 above) when it ceased in all other parts of the non-reinvaded zones of that area.

11.7 Epidemiological evaluation will also pay particular attention to the reinvaded zones in the peripheral regions of the Original area with the expectation that the results will allow for cessation of larviciding in parts of these zones before the end of the fourth Financial Phase (see maps in Annex 9).

11.8 The major part of the fieldwork will continue to be carried out by national epidemiological teams now operating, with OCP financial and logistics support, in all the Participating Countries. OCP/EPI will remain responsible for programming, coordination, supervision and for ensuring comparability of findings as well as for analysis of data and training.

11.9 In all, eleven national teams are employed for periods ranging from 3 to 7 months a year in epidemiological evaluation and ivermectin distribution (see paragraph 12.6 below). Each team is composed of a minimum of 6 technicians and one driver.

Epidemiological surveillance

11.10 With larviciding coming to an end in most of the Original Programme area, vigilance is called for to ensure that any recrudescence of onchocerciasis, that may occur, is detected sufficiently early to ensure its control by focal treatment.

11.11 Although such maintenance activities fall under the operational responsibility of the Participating Countries, OCP/EPI will continue to provide technical and logistic support to national teams, including training, ensuring uniformity in surveillance techniques and ivermectin distribution methodology, identification of high-risk foci, reporting, and inter-country communication. In addition, the Programme will act as a coordinating body and a "clearing house" for information regarding national devolution activities and participate in investigations and control of recrudescence (see also "Devolution", section 18 below).

OCP involvement in ivermectin distribution

11.12 OCP/EPI will pursue its programme of community-wide ivermectin application in areas where populations are at risk of onchocercal blindness, as initiated during the third Financial Phase (for details: see following section and the map in Annex 10).
11.13 The medium-term and long-term impact of large-scale ivermectin distribution will be assessed by longitudinal ophthalmological surveys carried out in a network of communities in the Extension areas where ocular examinations have established the pre-treatment base-line situation. Such surveys will use objective measurements, including eye photography, in order to ensure comparability between the findings of different investigators.

11.14 The staffing of the OCP/EPI unit is expected to remain stable at the level of two Professionals throughout the 1992-1997 period with 23 General Service posts, reducing to 20 by 1997.

11.15 Operational and other expenditures are expected to be around US$ 825 000 per year.

12. **Ivermectin distribution**

12.1 OCP has, since ivermectin became available for large-scale application in human populations, taken the lead in carrying out field studies and in organizing and conducting community-wide distribution of the drug to alleviate the often debilitating symptoms of the disease and prevent its serious ocular manifestations, including blindness.

12.2 Ivermectin will continue to be supplied free of charge by the manufacturer to all health administrations and organizations upon the submission of distribution programmes, endorsed by the independent "Mectizan Expert Committee". The Programme acts on behalf of the eleven OCP countries as the procurement agency for the entire area.

12.3 Insofar as ivermectin has proved itself to be devoid of serious side-effects, it is now dispensed on a community-wide basis with monitoring of adverse reactions.

12.4 In communities at risk of onchocercal blindness, which were brought under ivermectin treatment by OCP/EPI during the latter half of the third Financial Phase, OCP will continue annual, large-scale distribution to all persons infected with the onchocercal parasite, suspected of being infected, or merely living in the villages concerned. This will be done with increasing national participation.

12.5 The treatment will last for an average of six years (to achieve maximum benefits of ivermectin in the control and arrest of ocular manifestations) after which vector control will ensure virtual elimination of the human reservoir of the parasite (see paragraph 9.7 above). Insofar as OCP-directed ivermectin treatment has been applied to these communities since 1987, starting with a limited number in the Original Programme area and rapidly increasing to communities throughout the OCP area, distribution will gradually cease between 1992 and the end of the fourth Financial Phase.

12.6 Most of the actual field work will be carried out by national epidemiological evaluation teams supplemented by the staff of local health centres, while OCP/EPI will be primarily concerned with drawing up the distribution schedules, supervising the treatment, evaluating the results and providing technical and logistics support.
12.7 Full use will be made of such "outreach" activities as immunization campaigns to enhance large-scale distribution of ivermectin, a field in which TDR-supported operational research, designed to improve the coverage and efficacy of community-wide drug application, would be welcomed.

12.8 Estimates of OCP/EPI-conducted treatment during the 1992-1997 period are given below:

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<td><strong>Estimated number of OCP/EPI ivermectin treatments</strong></td>
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<td>during the 1992-1997 period, by calendar year (000)</td>
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<td>400</td>
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The gradual decrease in the annual totals is explained by the fact that an increasing number of persons will have received five to seven years of treatment after which they are no longer included in the distribution programme.

In addition, an estimated population of 45 000 will be included in the ivermectin distribution programme in the northern part of the Western Extension area (see paragraph 10.29 above). This figure will remain unaltered from 1992 to 1997.

12.9 In areas with low endemicity only persons diagnosed as harbouring the parasite will be treated. Ivermectin will be dispensed in fixed health centres to which patients suffering from symptoms of onchocercal infection present themselves.

12.10 The staff of health centres will undertake this "passive" case-finding by means of presumptive or laboratory diagnosis in persons showing symptoms of onchocerciasis, and institute treatment of the disease. OCP will make field manuals available to the national authorities. Special emphasis will be given to record keeping and to the monitoring of side-effects.

12.11 In all programmes of ivermectin treatment, be they community-wide or centre-based, the exclusion criteria existing at any given time will be adhered to.

12.12 The Programme will continue, and strengthen, its collaboration with Non-governmental Organizations (NGOs) and Private Voluntary Organizations (PVOs) in the distribution of ivermectin. Interested NGOs and PVOs operating in the OCP area do so under agreement with the Participating Countries and in the framework of national programme activities. Therefore, OCP-NGO/PVO collaboration falls naturally within the Programme's collaborative agreement with the national health authorities concerned.
12.13 In supporting the ivermectin distribution programme, NGOs and PVOs will continue to follow the guidelines prepared by the Programme, adhere to the OCP record system and monitor adverse reactions in line with the current directions.

12.14 Although the probability that microfilariae become resistant to ivermectin is remote, a process of monitoring of susceptibility to the drug will be instituted in order for the Programme to be assured of the continuing efficacy of ivermectin.

13. Biostatistics and information systems

13.1 The unit responsible for biostatistical analysis and support to information systems development, OCP/BIS, will continue to work closely with the Vector Control Unit (VCU) and the Epidemiological Evaluation Unit (EPI) in the planning and collection of the data necessary to determine cessation of larviciding in a given area, in the interpretation of such data, and in arriving at the final decision.

13.2 OCP/BIS will, in this connection, assist VCU in developing programmes for the two years' entomological surveillance to be continued after the discontinuation of larviciding (cf. paragraph 10.8 above) and help in the ensuing data analysis.

13.3 The unit will continue to be concerned with the interpretation of the findings of epidemiological evaluation in indicator villages as well as with the analysis of entomological surveillance data. However, a great deal of the routine analysis, for which computer programmes have been developed, will become the responsibility of the units concerned, and the role of OCP/BIS will be limited to integrated analysis and technical backstopping.

13.4 Continuing model simulations, based on constantly updated operational and applied research data, will remain an essential element in the adaptation of the overall control strategy to variations in the entomo-epidemiological situation within the Programme area.

13.5 A particularly important use of the epidemiological model will be its contribution to the final decision regarding cessation of larviciding in areas where vector control has been underway for a period which in principle should suffice to eliminate the human reservoir of the parasite (see also paragraph 10.6 above).

13.6 Also, the model will continue to be utilized for trend analysis resulting in epidemiological forecasts of direct relevance to planning and operational decision-making. It is thus estimated that, with the exception of a few foci, the CMFL and overall onchocercal prevalence will be virtually zero by 1994 throughout the non-reinvaded zones of the Original OCP area. In the initially "hyperendemic" villages in the Extension areas under vector control since the end of the eighties it is expected that the CMFL and the prevalence will have fallen to 40% and 80% of their respective pre-control values by 1994, and to 10% and 60% in 1997 (see graph in Annex 11).

13.7 Furthermore, special attention will be paid to the use of model predictions of onchocercal manifestations in the eye in order, inter alia, to anticipate the long-term effect of ivermectin treatment. Also, the model will be used to look into the worm-age dependent effectiveness of ivermectin, and to investigate the potential operational value of a macrofilaricide. In addition, emphasis will be given to model-supported decision-making to enhance cost-effectiveness in control operations.
13.8 In connection with preparations for devolution, the epidemiological model will help to clarify such issues as the maximum admissible time between the return of infection and its control, the epidemiological interpretation of surveillance data based on skin snips or immunodiagnosis (when available), and the operational aspects of recrudescence control by ivermectin (threshold values, population coverage, frequency and duration of treatment, etc.). The use of the model will facilitate technical discussions between epidemiologists and aid the decision-making process on recrudescence control under devolution.

13.9 The Programme-wide computer network will continue to be utilized extensively for operational, management and administrative purposes (aerial operations, budget and finance, personnel, supplies and equipment, transport, etc.). OCP/BIS will ensure the best possible use of the network by training the Professional and General Service staff involved, and by helping in making available the most suitable hardware and software to the staff concerned.

13.10 The OCP/BIS staff requirement for the fourth Financial Phase is estimated at 1 Professional and 2 General Service posts throughout the period.

13.11 Annual operational and other expenditures are expected to remain stable at the level of US$ 120 000.

14. Support to socioeconomic development

14.1 Assistance to socioeconomic development in the onchocerciasis controlled zones falls outside the Programme's terms of reference which are limited to the control of the disease. Support to the Participating Countries in this field was therefore entrusted to the Committee of the Sponsoring Agencies (CSA) acting as a collegiate body or individually through its member organizations within their fields of competence.

14.2 Since then CSA has completed a series of regional and country development studies in the Participating Countries to identify oncho liberated zones the most promising geographic areas for agro-pastoral production and to bring attention to the land settlement issues and policy options which are most favourable to cost-effective, environmentally sustainable production systems. CSA is in a favourable position to facilitate bringing together the Participating Countries and the Donor community, collectively and individually to build on these studies in efforts to define and promote action to address development opportunities, requirements and constraints.

14.3 More specifically, the Committee will be instrumental, to the extent required by the Participating Countries and in concert with potential donors, in initiating on a country and intercountry basis, the preparation of strategy documents and plan of actions for such regional programmes as river system management taking account of enhanced productivity in relation to the protection of the environment.

14.4 The contribution of OCP per se will essentially be one of providing liaison services with the Participating Countries and the CSA in its support to socioeconomic development. The Programme will also assist, whenever required, in any studies that may be called for to assess the progress made in this field based on the pre-control data collected by the Programme in the Extension areas as well as on the recommendations emanating from the above regional studies. The OCP responsible officer for socioeconomic development will work closely with the Devolution Unit to which he will be administratively attached.
14.5 The OCP socioeconomic support staff will remain at its 1991 staffing level, namely 1 Professional post.

14.6 Operational and other expenditures are expected to be in the order of US$ 50 000 per year until 1995.

15. Training

15.1 The OCP-funded training programme will center on the preparation for, and reinforcement of, the devolution process. Fellowships will be awarded to nationals of the Participating Countries to study management of health services, epidemiology, epidemiological surveillance, health statistics, organization and implementation of large-scale public health activities, health education and impact assessment.

15.2 As a general principle, OCP fellows will be trained in institutions located in Africa. Given the importance of a strong epidemiological surveillance in the context of devolution (see paragraph 18.4 below), special efforts are underway to strengthen institutions in Bamako (francophone) and Accra (anglophone) in order that they may provide courses in epidemiology at the level of masters degree. The modalities determined by the needs and requirements, will be worked out at an early date and considered by EAC at its 1992 session.

15.3 It is expected that OCP-funded training for devolution will be coordinated with, and supported by, the award of fellowships by WHO/AFRO. The Regional Office has recommended to its West African Member States that they reserve a fixed percentage of the WHO regular budget allocations to onchocerciasis control. Part of these amounts could usefully be spent on training for devolution.

15.4 The Programme will continue its in-service training programme for its own staff, both on the technical and administrative side. Given that more than 95 per cent of the total number of staff positions - in all 550 (1990) - are filled by nationals from the Participating Countries, OCP can be said to make a significant contribution to manpower development within the region it serves.

15.5 During the fourth Financial Phase, particular attention will be paid to the evaluation of the employment of former OCP fellows, and the national administrations concerned will be encouraged to direct the expertise of these fellows to devolution-connected activities.

15.6 It is expected that the cost of OCP fellowships will be in the order of US$ 260 000 annually throughout the 1992-1997 period included in the budget estimates for devolution.

16. Development of a macrofilaricidal

16.1 In the field of chemotherapy, the search for a macrofilaricidal will remain the objective of the OCP-funded Onchocerciasis Chemotherapy Project (OCT). The emergence of an effective, field applicable drug without serious side-effects would ease the control of the disease and radically alter the strategy of the Programme. A macrofilaricidal would also greatly simplify the control of recrudescence.
16.2 As regards the institutional arrangements for OCT, a joint OCP/TDR project has been established for the development of a macrofiliaricidal drug and to bring such a drug(s) to the point of registration. The project ("MACROFIL") is funded jointly by OCP and TDR, each contribution managed separately by the Project Manager who remains an OCP staff member. This streamlines macrofiliaricidal activities for both onchocerciasis and lymphatic filariasis in one group to the benefit of both Programmes.

16.3 The number of posts will remain at the 1991 level, i.e. one Professional and one General Service staff through the fourth Financial Phase. The total budgetary requirements for the 1992-1997 period are estimated at US $14 million, it being understood that, given the nature of research and development, a certain flexibility will be permitted in determining annual expenditures within the overall ceiling.

17. Research

17.1 The OCP-sponsored research activities will continue to be planned and implemented to meet the priorities set by the Expert Advisory Committee (EAC). They have over the last few years fallen into the following main groups with variations as to the importance attached to each group: vector control, bionomics, *O. volvulus* characteristics, immunodiagnostic testing, modelling and operational research. The Programme will maintain its support to the search for a macrofiliaricidal as a priority concern through the funding of the Onchocerciasis Chemotherapy Project (OCT), referred to in the preceding section.

17.2 It is expected that the priority groups will remain without major changes during the fourth Financial Phase, although the relative importance given to individual research subjects within each group may alter as new knowledge is acquired or other operational questions come to the fore. EAC guidance will continue to be of crucial importance in this regard.

17.3 Most of the Programme's research activities will, as hitherto, be conducted in connection with OCP field operations and will, as such, contain a strong element of operational research oriented towards a steady improvement of the Programme's day-to-day performance in terms of cost/effectiveness of operations.

17.4 An indication is given in the following of what is expected to be the main emphasis of research activities within each of the aforementioned groups during the 1992-1997 period.

17.5 As regards vector-control, OCP will, routinely, ascertain the geographical and seasonal distribution as well as the vectorial role of the various forms and species of the blackfly in the Extension areas and correlate the findings with the epidemiology of onchocerciasis. Cytotaxonomic studies will be maintained as will susceptibility tests on non-target organisms wherever larviciding takes place. Also, fly-feeding and transmission experiments will continue until the relationship between different levels of the microfilarial load in infected persons and the risk of transmission has been clarified, using both savanna and forest vectors. Further studies will be undertaken on the organization of an entomological surveillance network to be kept in place two years after cessation of larviciding in any given area, and on the interpretation of the data thus provided.
17.6 Screening and evaluation of new larvicides and of potentially improved formulations of existing ones will remain a major preoccupation of the Vector Control Unit.

17.7 Studies will continue to ascertain the blinding potential of *O. volvulus* transmitted under varying ecological conditions and by different vectors, and to improve the identification of the characteristics of the parasite at the infective larvae (L3) stage; the latter in particular in respect to the separation of different human strains of the parasite and the distinction between human and animal strains transmitted by the blackfly. Recent testing of DNA probes carried out on nodules collected from persons belonging to communities with onchocerciasis in its blinding and in its less severe form, as ascertained by ophthalmological surveys, have shown this methodology to be capable of a high degree of differentiation. This line of investigation will be pursued to eventually extend its use to the identification of L3 larvae. Collaboration with TDR will be maintained in these respects.

17.8 The availability of an immunodiagnostic test of high specificity and sensitivity and easily applied under field conditions would allow for early diagnosis and, in particular, facilitate the detection of recrudescence of the disease in the context of the devolution process. OCP will therefore continue its collaboration, in particular with TDR, in the search for a biogenetic test that meets the above criteria and undertake its epidemiological testing.

17.9 The Programme will continue its studies on the long-term effect of ivermectin on the clinical, in particular ocular, manifestations of the disease and on transmission when given alone, at increased frequency or in combination with other drugs. The optimal frequency of application will be another subject for continuing operational research as will the organization of delivery of ivermectin, community-wide or through fixed centres, and the contribution of NGOs and PVOs.

17.10 The need for an in vitro test for determining the level of microfilarial susceptibility to ivermectin has already been referred to in paragraph 12.14 above.

17.11 The epidemiological model will be further developed with a view to enhancing its predictive value and contribution to the Programme's planning process. Particular emphasis will be given to the risks and dynamics of recrudescence and its detection and control under devolution, including the determination of the incidence level above which control by ivermectin must be instituted. The model will also be strengthened with a view to enhancing its contribution to operational decision-making.

17.12 In connection with the increasing involvement of the Participating Countries in epidemiological surveillance of onchocerciasis and control of recrudescence, OCP will increase its involvement in operational research to identify the requirements for devolution to succeed on a sustainable basis, to investigate operational aspects of devolution activities, to assess the extent to which the necessary infrastructure and resources exist in the countries concerned, and to help in closing the gap between what is required and what is available.

17.13 Other subjects to be investigated through operational research are the effect of migration on recrudescence during devolution and the promotion of community awareness regarding the problem and dynamics of onchocerciasis.
Finally, the OCP units directly concerned will follow closely the progress made in Participating Countries and promote national operational research in aid of the devolution process.

18. Devolution

18.1 In general terms, devolution is seen as the maintenance by the Participating Countries of OCP's achievements after the cessation of Programme operations. Devolution-connected activities will be integrated into the national health systems in order that recrudescence of onchocerciasis may be detected and managed at an early stage.

18.2 OCP has amply demonstrated its ability to eliminate onchocerciasis as a problem of public health and socioeconomic importance. However, the ultimate test of the success of the Programme will be the extent to which the Participating Countries will detect and control recrudescence of the disease after OCP operations have come to an end. Strengthening of the devolution process will therefore continue to be of crucial importance.

18.3 Although the risk of reappearance of the disease in "oncho-freed" areas has been reduced to a minimum, the Participating Countries will need to maintain a state of vigilance to ensure early detection of renewed transmission, should it nevertheless occur, and to deal with it rapidly and effectively.

18.4 Operationally, the two tools of devolution will remain epidemiological surveillance to detect recrudescent cases and the control of such cases. It is of the utmost importance that the Participating Countries will have strong central epidemiological services capable of planning and directing field surveillance and of analyzing competently the data collected so as to institute prompt control whenever and where required.

18.5 Onchocercal surveillance will continue to be part of mobile polyvalent epidemiological investigations conducted regularly in selected indicator villages in high-risk areas with the examination being limited to first-line communities. Only if new cases are detected will the investigation be extended throughout the area concerned.

18.6 The control of recrudescence will (in the absence of a macrofilaricide) consist of community-wide application of ivermectin organized by the mobile epidemiological surveillance teams, or by the health centre staff.

18.7 As already mentioned, the capability to detect and control recrudescence must be firmly implanted in the public health systems of the Participating Countries as a continuing and sustainable activity.

18.8 In addition to active surveillance, static health centres in oncho-endemic areas will be equipped to carry out passive surveillance and thus cater for patients who report on their own with symptoms that should alert the staff to the possibility of onchocercal infection.

18.9 Entomological surveillance will not play a role in recrudescence detection, but limited vector control on the ground may in geographically circumscribed zones, under particular circumstances, help to alleviate nuisance during the periods of the year when biting rates are excessive.
18.10 The availability of an immunodiagnostic test would greatly facilitate surveillance and this, in particular, in regions where skin-snip examination is of little use because of large-scale distribution of ivermectin. Likewise, the emergence of a field-applicable macrofilaricid would largely contribute to the success of devolution.

18.11 Although the principles of devolution have now been firmly established, there remains a need for research designed to facilitate decision-making, including the search for an immunodiagnostic test and the determination of the incidence level which signals recrudescence as well as further clarification of operational and managerial aspects of surveillance and the control by ivermectin.

18.12 Insofar as devolution, once fully operational, is by its very nature a national undertaking, the role of the Programme will be one of surveillance (initially), support and coordination. For that purpose, OCP has established a Devolution Unit by re-assignment of existing staff and will seek expertise in such fields as epidemiology, management, social sciences and training on an "as and when required" basis. The unit includes the officer responsible for support to socioeconomic development, transferred from the Director's Office, as well as staff dealing with information. Budgetary allowance will be made for the employment of consultants whenever necessary. The unit has a complement of four professional posts, one secretary and an annual budget in the order of US $1 100 000.

18.13 The Programme will thus continue to assist national health authorities in drawing up their devolution plans, to provide technical guidance (including manuals) as regards epidemiological surveillance and control of recrudescence, and to train national staff in disciplines related to devolution, including multi-disease surveillance, drug distribution and management. Assistance will be given to the preparation of human resource development plans, to the sensitization of governments and communities in respect to the importance of onchocerciasis control maintenance and to operational research connected with drug delivery systems, the epidemiological impact of ivermectin in different regimes, its long-term safety and community participation.

18.14 The Participating Countries will be encouraged to enhance the role of their National Onchocerciasis Committees; and to make them "focal points" for devolution with which OCP could establish direct and close working relations.

18.15 With the steadily increasing involvement of nationals in Programme operations, the Participating Countries will have at their disposal a core of experienced staff ready to be employed in the devolution process. Also, OCP will continue to put its experience, infrastructure and services at the disposal of the Participating Countries in joint efforts to make their health services capable of dealing effectively with devolution (see paragraph 19.4 below).

18.16 As already mentioned, the success of devolution will depend on the capability of the national health systems to cope effectively with onchocercal case-detections and with the control of renewed transmissions. Hence the need for strengthening the public health systems in the Participating Countries of which devolution activities form an integral part, and for instituting or enhancing continuing training of health workers to enable them to participate effectively in the devolution process. It is in this connection that the provision of direct technical and material support by OCP and the WHO Regional Office for Africa becomes of crucial importance.
18.17 By continuously pursuing its constitutional role to help Member States improve their health delivery systems, WHO/AFRO contributes to laying the foundation for a successful devolution process within, and among, the Participating Countries. More specifically, an intercountry coordinator for devolution, stationed in the office of the WHO Representative in Ouagadougou, has been appointed by the Regional Director. Also, WHO representatives in the Participating Countries are encouraged to give priority attention to devolution activities and regular meetings are held between WHO/AFRO and OCP staff. It is expected that the direct involvement of the Regional Office and its field staff in the devolution process will be further strengthened during the fourth Financial Phase.

18.18 In addition to support from WHO/AFRO at the country level, OCP and the World Bank will, in consultation with the Participating Countries, seek the support of devolution from other multilateral organizations as well as from bilateral agencies, NGOs and PVOs. Likewise, the Programme will continue its endeavour to enhance the collaboration with the OCP Donor Community in this important field.

18.19 It is expected that the last of the Participating Countries to complete preparations for devolution will have done so early in the fourth Financial Phase, while plans for devolution will have been prepared and its implementation begun in the original seven-country area already by 1992.

18.20 Given that vector control has already stopped in parts of the Original OCP area and will cease throughout that area during the fourth Financial Phase, the years 1992 to 1997 will be a period for field-testing of devolution activities by the Participating Countries with OCP helping to ensure that operational experience is properly analyzed and effectively communicated among them.

18.21 Solidarity among the Participating Countries has been the leitmotiv enabling OCP to reach its targets and objective. Without mutual understanding and the will to collaborate in the common interest, vector control could not have interrupted transmission over such a vast area and over such a long time.

18.22 But if solidarity has been a conditio sine qua non for the success of Programme operations per se it becomes even more essential in the post-OCP devolution era, when an undetected or ignored resurgence of new infections could result in an unmanageable situation not only within the afflicted area but also, via trans-border transmission, in neighbouring countries.

18.23 Inter-country communication and collaboration, which have been spearheaded and supported by OCP, must therefore continue unabated after the end of the Programme. More specifically, OCP will during the fourth Financial Phase, in close collaboration with the Participating Countries, institute a system of exchange of information regarding epidemiological surveillance in individual countries and its findings, as well as possible instances of recrudescence and its control. Such exchange should be instituted at an early date and extended gradually to become fully operational before the cessation of Programme operations.
18.24 During the fourth Financial Phase, discussion will be held among all interested parties on the arrangements to be made at the end of OCP operations for maintaining coordination between the Participating Countries in devolution-centered fields and for ensuring the information flow necessary for an effective surveillance and control on a regional basis, so as to safeguard the achievements of the Programme and avoid the occurrence of unmanageable instances of recrudescence of the disease. This would include monitoring epidemiological trends throughout the Programme area, coordinating onchocerciasis research carried out in the Participating Countries, assisting in data processing and storage, helping countries to determine their needs and priorities, making arrangements for training and reviewing research. By the end of the Phase, a blueprint of a suitable arrangement should be available.

19. Management, administration and support services

19.1 As in the past, the central management of OCP, supported at the operational level, will aim at the best possible cost/effectiveness ratio in implementing the annual Plans of Action. Senior Staff Seminars will continue to provide an opportunity for ensuring that cost-consciousness remains a preoccupation throughout the Programme and for soliciting ideas and suggestions for improvement.

19.2 Although there will be a gradual decrease in vector control operations during the fourth Financial Phase, no substantial reduction is anticipated in the core establishment at OCP HQs in Ouagadougou and at the Operational Area Headquarters in Kara and Bamako, in Bouaké (IRU) and in the VCU research and hydrobiological establishments. These central activities and services are required at a level and in quantities which cannot be reduced further if the Programme's smooth management process is to be maintained.

19.3 Even if immense progress has been made in recruiting nationals from the OCP region for posts at all Programme levels, efforts will continue to fill future vacancies with staff originating from the eleven Participating Countries. This should be seen as a major contribution of OCP to the strengthening of national administrations and, ultimately, to ensuring the success of devolution.

19.4 Also, the Programme-wide operations and communication network (sectors, subsectors, radio, computers, vehicles, etc.) could eventually help to buttress health services in the Participating Countries, once OCP activities in a given area come to an end. This could even be the case in most of the Original Programme area before the end of the fourth Financial Phase.

19.5 A particular problem connected with devolution could be the reintegration of OCP staff seconded by the national administrations concerned. At the same time it would seem essential to retain such staff capable (after a period of reorientation) of making a substantial contribution to the strengthening of the national health services which is an issue of major concern to the Participating Countries and the Donor Community.

19.6 The number of posts (including the Director's Office) will reduce during the 1992-1997 period from 9 to 8 Professionals and from 91 to 40 General Service staff.

19.7 Operating costs and capital expenditure (vehicles, equipment, etc.) are estimated to reduce from US $1 000 000 in 1992 to US $610 000 in 1997.
The following table summarizes the planned reduction in OCP/WHO posts between 1992 and 1997:

<table>
<thead>
<tr>
<th>Unit</th>
<th>Prof. Category</th>
<th>Gen.Serv. Category</th>
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<tbody>
<tr>
<td>Vector control</td>
<td>18</td>
<td>15</td>
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<tr>
<td>Epidemiological evaluation</td>
<td>2</td>
<td>2</td>
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<tr>
<td>Biostatistics and information systems</td>
<td>1</td>
<td>2</td>
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<tr>
<td>Devolution</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Onchocerciasis Chemotherapy Project (OCT)</td>
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<td>1</td>
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<tr>
<td>Management and administration</td>
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<td>8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>35</strong></td>
<td><strong>31</strong></td>
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</table>

Summary of total estimated costs for the fourth Financial Phase

The budgetary forecasts for the 1992-1997 period are summarized in Table 3 below. These estimates are based: (a) on costs used for the 1991 Plan of Action and Budget, applying a US dollar/CFA exchange rate of 285 and (b) on assumptions made for price contingencies for annual cost increases in the various categories of expenditures as follows:

- an annual cost increase of 7.5% for Professionals and 7% for General Service staff
- increase of 21% in aerial contract over the period 1993 to 1997;
- annual increase of 5% in cost of fuel (including Jet A1) (takes account of cost increase as well as of overall consumption);
- air fares increase of 10% annually in 1992 and 1993, 5% each year during remainder of the Financial Phase; annual per diem increase of 5%;
- annual increase of 3.5% in cost of vehicles from 1992 to 1994 (thereafter few, if any, purchases).
- 5% increase in cost of equipment from 1992 to 1994 (thereafter cost increase to be set off by decrease in quantities purchased);
- 8% annual increase in services throughout the Financial Phase;
- no increase for larvicides.
### Table 3

**Estimated costs of operations by Programme activity and by calendar year (US$ 000)**

<table>
<thead>
<tr>
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<tr>
<td>Vector control</td>
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<td>18 690</td>
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<td>1 222</td>
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<td>Chemotherapy Project (OCT) 1</td>
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<td>2 386</td>
<td>2 771</td>
<td>2 510</td>
<td>2 295</td>
<td>1 785</td>
<td>13 943</td>
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<td>Management and administration 2</td>
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<td>3 107</td>
<td>2 899</td>
<td>2 872</td>
<td>2 836</td>
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<td>Capital costs</td>
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<td>907</td>
<td>610</td>
<td>313</td>
<td>-</td>
<td>3 644</td>
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<td>Administrative support costs</td>
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<td>360</td>
<td>360</td>
<td>360</td>
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<td>Statutory meetings</td>
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<td>323</td>
<td>323</td>
<td>323</td>
<td>323</td>
<td>1 920</td>
</tr>
<tr>
<td><strong>Total, of which</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- budgeted for the Original OCP areas:</td>
<td>32 453</td>
<td>30 085</td>
<td>30 029</td>
<td>28 304</td>
<td>27 732</td>
<td>26 862</td>
<td>175 465</td>
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<tr>
<td>- budgeted for Extension areas:</td>
<td>11 400</td>
<td>8 700</td>
<td>6 600</td>
<td>2 200</td>
<td>1 900</td>
<td>1 400</td>
<td>32 200</td>
</tr>
<tr>
<td></td>
<td>21 100</td>
<td>21 400</td>
<td>23 400</td>
<td>26 100</td>
<td>25 800</td>
<td>25 400</td>
<td>143 200</td>
</tr>
</tbody>
</table>

Note: Annex 12 provides a graphic presentation of trends in the proportional distribution of expenditures/budgetary forecasts during the third and fourth Financial Phases, by the Original Programme area and the Extension areas as well as by calendar year.

1 Cost-estimates for other research included within budgetary forecasts for individual activities.

2 This budget line includes provision for expenditures in respect to the Director's Office, Administration & Support Services comprising Personnel, Budget and Finance, Supplies & Services, and Transportation amounting to around 10% of the total expenditures.
20.2 The planned 1992-1997 level of budget estimates reflects a situation where operations in the Original Programme area have ceased and been transferred to the equally important Extension areas as a successor programme designed to safeguard the achievements in the former area and to protect the populations in the latter. This move of centres of gravity was initiated already during the third Phase and will allow for a gradual decrease in control activities throughout the fourth Phase resulting in a 17% reduction in the budget from 1992 to 1997.

20.3 The total cost of operations during the third Financial Phase (1986-1991) will come to US $180 million and that of implementing the Plan of Operations for the fourth Financial Phase (1992-1997), expressed in 1991 prices including contingency allowance will be in the order of US $175 million. In real terms, that is in constant 1991 US dollars, the cost of the fourth Phase will be appreciably lower - 26% less - than the cost of the third Phase.

20.4 The main concern in drawing up the present Plan of Operations has been to present the minimum of control operations, and the corresponding resource requirements, which will allow the Programme to eventually reach its objective and this at the least cost. It is therefore obvious that any reduction in the planned operations, any substantial modification to the control strategy or any further cuts in the OCP establishment would seriously jeopardize the eventual attainment of the Programme objective.

20.5 On the other hand, thought could be given to the substitution of cheaper for more expensive larvicides, e.g. use permethrin more extensively than foreseen in the Plan of Operations. It should be stressed, however, that the rotation scheme of the various larvicides takes account of, and adheres strictly to, the recommendations of the Ecological Group so as to ensure that there be no, or minimal, damage to the non-target fauna specifically and to the environment in general. Any excessive use for reasons of economy of, for instance, permethrin causing damage to the environment would not only run counter to the recommendations of the Ecological Group but seriously taint the image of the Programme among the Participating Countries and within the Donor community.

D. BENEFITS, RISKS AND SAFEGUARDS

21. Benefits

21.1 The implementation of the above Plan of Operations will take the Programme a long way towards meeting its objective. By 1997, and even before, onchocerciasis will no longer be a problem of public health importance or an impediment to socioeconomic development within the Original OCP area, nor will there be any risk of uncontrolled recrudescence insofar as devolution will have been firmly anchored in the national health services of that area.

21.2 What will be left for the Programme to carry out beyond 1997, will be limited to vector control and epidemiological evaluation and surveillance in the Extension areas, activities which will gradually decrease in importance before coming to an end a few years later. The support services, such as computer support, training and research, will equally diminish as control operations cease.
21.3 In more specific terms, the benefits will be: the human reservoir of the onchocercal worm will be virtually eliminated throughout the Original Programme area from where OCP will have withdrawn; people living in endemic regions within the Extension area will no longer be exposed to infection; the Original area will be protected from reinvasion; the human reservoir of *O. volvulus* in the Extension area will be well on its way to virtual elimination; all persons originally suffering from onchocercal infection will be treated by ivermectin for at least six years with a considerable reduction of morbidity and risk of blindness; riverain land will be made available for resettlement; and devolution will be fully operational in the Original OCP area with preparations completed in the Extension areas.

21.4 Expressed in figures, the estimates are that as a result of OCP operations from 1974 up to the end of the fourth Financial Phase, 30 million people will continue to be protected from onchocercal infection, 2 million persons will have lost their infection and 150 000 cases of onchocercal blindness will have been averted; 6 million children born during the 1992-1997 period will grow up without risk of blindness due to onchocerciasis (up to 15 million since the beginning of OCP); and around 10 million hectares of fertile, riverain land in the Extension areas will become available for cultivation during the fourth Financial Phase (a total of 25 million since 1974), potentially sufficient to feed more than 17 million people if free from other major constraints to agricultural development and if cultivated using traditional technologies and agricultural practices.  

21.5 A number of equally important, but less tangible, achievements will continue to accrue as a result of the various activities of the Programme. Although direct national participation in OCP operations was limited in scope until the beginning of the eighties, Participating Countries have since then become increasingly involved in OCP activities. This trend will be intensified during the 1992-1997 period to the benefit of the health services of the countries concerned.

21.6 Also, the direct involvement of African staff in Programme operations (97% of all posts in 1992) will provide the Participating Countries with a body of health workers who have had a solid experience in management, once OCP comes to an end in any given area.

21.7 In this connection, devolution should be seen as a means to promote health delivery systems in the Participating Countries. Developments during the fourth Financial Phase could very well offer a unique demonstration of how a "vertical", mono-disease control programme like OCP can move towards a "horizontal", integrated public health activity and provide the know-how and operational experience necessary for overall health systems development.

21.8 Of particular importance will be the direct and indirect contribution of the Programme to the strengthening of the epidemiological surveillance systems in the Participating Countries as an essential component of devolution.

21.9 The all important collaboration among the Participating Countries as well as between them and the Donor Community - a perfect example of a successful North-South dialogue - constitutes the basis on which the success of the Programme has been built and on which its future will depend. Although this collaboration has so far been essentially limited to OCP operations as such, no doubt, the implementation of devolution will give rise to a widening of Donor support to the benefit of health care in the Participating Countries.

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2. Risks and safeguards

22.1 Since 1985, OCP has learned to live with resistance to larvicides as a problem for which operational solutions have been refined. Given the extensive experience in rotation of the available compounds and the likelihood that additional larvicides become available, there is little risk that an unmanageable situation could arise in the future. However, the search for new larvicides and improved formulations of existing ones will continue not only for the purpose of providing additional safeguards but also with a view to improving the cost-effectiveness of environmentally acceptable vector control.

22.2 Although the probability of *O. volvulus* developing lowered susceptibility to ivermectin is remote, the Programme is supporting research in order to eventually institute testing for monitoring resistance in large-scale treatment programmes.

22.3 Following the experience of vector control in the Western Extension area where larviciding had to be extended west and south-ward due to a change in ecology resulting in vectors of the blinding form of *O. volvulus* moving beyond the originally determined Programme boundaries, entomological surveillance will remain alert to the possibility of similar situations arising in other parts of the Programme area.

22.4 The risk of epidemiologically significant, massive invasion of blackflies from countries outside the OCP area is minimal. In Liberia the main vector, *S. yahense*, is non-migratory and probably refractory to the savanna strain of the parasite. To the east of the Programme lies the savanna country of Nigeria from where large-scale, long-distance movements of *S. damnosum* s.l. do not occur in a westward direction. There is, however, significant short-range infiltration of the border rivers (Sota and Oueme) of the Republic of Benin. In the North, the Sota Valley, which has been controlled since 1978, now presents a situation where the disease has disappeared and infection levels are very low. Further south the Oueme basin, part of the Southern Extension area, is subject to unsatisfactory transmission levels at present, but epidemiological surveys suggest there is little blindness owing to onchocerciasis. The potentially exposed zones will continue to be kept under surveillance and appropriate control measures instituted should "danger situations" unexpectedly arise.

22.5 Delayed detection of recrudescence could result in difficulties in achieving its effective control. OCP will therefore spare no efforts in bringing the devolution process in the Participating Countries concerned to a fully operational level, and in pursuing the search for a field-applicable immunodiagnostic test, and for a field-applicable macrofilaricide.

22.6 Previous OCP epidemiological studies have indicated that human migration does not pose a threat to the onchocerciasis controlled zones of the Original Programme. However, the risk of infected migrants giving rise to recrudescence cannot be entirely discarded, in particular in view of an increasing South-North population movement resulting from socioeconomic developments in the region. Again, the importance of national vigilance and epidemiological control must be emphasized.
22.7 A series of unforeseeable biological, climatic and human developments could influence OCP operations, including deforestation, water management and modifications in rainfall patterns. The Programme will continue to keep alert to such developments and whenever needed, adjust its strategy and tactics accordingly, so as to ensure that it reaches its objective as planned.

22.8 In undertakings which have been going on reasonably successfully for a good number of years, there is always a certain risk of complacency setting in, i.e., the contracting parties become accustomed to a smooth-running operation to the extent that their interest and support start waning. This has never been the case as far as OCP is concerned and it is important that the Programme can continue to count on the full support, involvement and vigilance of the Participating Countries as well as of the Donor Community until the end of OCP operations.
LIFE CYCLE OF ONCHOCERCA VOLVULUS

Onchocerca volvulus

Adults in subcutaneous tissue
Subcutaneous tissue
Enters skin through fly bite wound
HOMO SAPIENS

Infective stage
Migrates to head and proboscis
3rd stage larva
Larva (sausage form)

Microfilariae
Skin

Ingested
Thoracic muscles
Penetrates stomach wall
SIMULIUM

Microfilariae in skin
Annex/annexe 3

List of Donors to the Onchocerciasis Control Programme
Liste des Donateurs au Programme de Lutte contre l'Onchocercose

Belgium/Belgique
Canada
Finland/Finlande
France
Germany/Allemagne
Grand Duchy of Luxembourg/Le grand-Duché de Luxembourg
Italy/Italie
Japan/Japon
Kuwait/Koweit
Netherlands/Pays-Bas
Norway/Norvège
Portugal
Republic of Korea/République de Corée
Saudi Arabia/Arabie saoudite
Switzerland/Suisse
United Kingdom of Great Britain and Northern Ireland/Royaume-Uni
Grande-Bretagne et d'Irlande du Nord
United States of America/États-Unis d'Amérique

* * *

African Development Bank/Banque africaine de Développement
Commission of European Communities/Commission des Communautés européennes
Calouste Gulbenkian Foundation/La Fondation Calouste Gulbenkian
OPEC Fund for International Development/Fonds OPEP pour le Développement international
United Nations Development Programme/Programme des Nations Unies pour le Développement
The World Bank/La Banque mondiale
World Health Organization/Organisation mondiale de la Santé

January/janvier 1991
# The Structure of OCP

<table>
<thead>
<tr>
<th>Structure</th>
<th>Composition/support</th>
<th>Role/Responsibility</th>
</tr>
</thead>
</table>
| Joint Programme Committee (JPC) | Representatives of:  
- The Participating Countries  
- The Donors  
- The Sponsoring Agencies | - Overall policy, operational and budgetary authority  
- Approves Plan of Action and Budget (meets once a year) |
| World Bank: Fund mobilization and Trust Fund administration | Committee of Sponsoring Agencies (CSA) | Representatives of UNDP, FAO, World Bank and WHO (meets several times a year) | Review of management/budget matters and of JPC docs: can provisionally authorize supplementary budgets; supports socio-economic development |
| Programme Director HQ in Ouagadougou | Supported by Units of:  
- Vector Control  
- Epidemiological Evaluation  
- Biostatistics and Information Systems  
- Devolution  
- Administration & Management | Responsible to JPC for all OCP activities | Planning and programming  
Operations  
Budget and Finance  
Reporting |
| Expert Advisory Committee (EAC) | 12 members: Ecological Group (5 members) is a subgroup of EAC | Technical audit of CCP | Advise to Director and JPC through CSA (meets once a year) |
| Ecological Group | National Onchocerciasis Committees (NOC) | One in each of the Participating Countries. High-level representatives meet once a year | Facilitate liaison between OCP and national authorities  
- Promote OCP activities |
ONCHOCERCIASIS CONTROL PROGRAMME ORGANIZATIONAL CHART

PROGRAMME DIRECTOR OUAGADougOU

LIAISON OFFICE GENEVA

ONCHO. CHEMOTHERAPY PROJECT

DOCUMENTATION

MEETINGS

VECTOR CONTROL

EPIDEMIOLOGICAL EVALUATION

BIOSTATISTICS AND INFORMATION SYSTEMS

DEVOLUTION

ADMINISTRATION AND SUPPORT SERVICES

ADMINISTRATION

PERSONNEL

BUDGET AND FINANCE

SUPPLIES AND SERVICES

TRANSPORTATION

CHIEF AVIATION OFFICER

OUAGADougOU

BAMAKO

MALI WEST

SENEGAL

GUINEA BISSAU

HYDROLOGY

ENTOMOLOGICAL EVALUATION

WESTERN AREA

RESEARCH 
OUAGADougOU

BouAKE-BAMAKO-KARA

AERIAL OPERATIONS

ODIENNE

ORIGINAL AREA

COTE

DIVOIRE-WEST

BURKINA FASO-WEST

MALI EAST

WESTERN EXTENSION

GUINEA

SIERRA LEONE

EASTERN AREA

AERIAL OPERATIONS

KARA

ORIGINAL AREA AND SOUTHERN EXTENSION

BENIN

BURKINA FASO-EAST

GHANA

TOGO

NIGER

COTE DIVOIRE-EAST
REINVADED ZONES IN THE ORIGINAL PROGRAMME AREA (1983)
ZONE REVENUES DANS L'ARÈNE INITIALE DU PROGRAMME (1983)
Trend in prevalence of infection in holo-endemic villages
in the central OCP area

Prevalence of mf in cohort of adults
(as percentage)

Years of vector control

- - - - observed
predicted for villages
- - - - with CMFL=90
- - - - with CMFL=30
PREDICTED IMPACT OF CONTROL

and examples of premature cessation of vector control

(a). Impact of 14 years of vector control

(b). Recrudescence after premature cessation of vector control

(c). Recrudescence control with ivermectin
### OCP fellowships, by country and by field of study (arrêté au 31 décembre 1990)

<table>
<thead>
<tr>
<th>Disciplines</th>
<th>Countries</th>
<th>Entomologie</th>
<th>Hydrobiologie</th>
<th>Épidémiologie</th>
<th>Santé publique</th>
<th>Parasitologie</th>
<th>Ophtalmologie</th>
<th>Économie de la Santé</th>
<th>Administration et technique</th>
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1 Other countries
MAXIMUM RIVER STRETCHES WHICH COULD COME UNDER LARVICIDING IN 1994

MAXIMUM DE RIVIERES POUVANT ETRE INCLUSES DANS LES TRAITEMENTS LARVICIDES EN 1994

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1 See reverse
Voir verso

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1 Voir paragraphe 10.13 - See paragraph 10.13
Note: the indication of river stretches which could be treated is provisional, intended only to denote orders of magnitude for the treatment at its maximum; the actual programmes of larviciding will be continuously refined in the light of the most up-to-date ento-epidemiological, meteorological and hydrological data.

les indications des rivières pouvant être incluses dans les traitements larvicides sont provisoires et ne tendent qu'à démontrer un ordre de grandeur des traitements menés à leur maximum; le programme de travail des traitements larvicides sera élaboré en détail selon les données les plus récentes concernant les conditions ento-épidemiologiques, météorologiques et hydrologiques.
MAXIMUM RIVER STRETCHES WHICH COULD COME UNDER LARVICIDING IN 1992

MAXIMUM DE RIVIERES POUVANT ETRE INCLUSES DANS LES TRAITEMENTS LARVICIDES EN 1992

Limite actuelle du programme - OCP boundaries
Aire initiale du programme - Original Programme area
Rivière susceptible d'être traitée - River stretches which could be treated
Rivière ou les éponges larvicides sont terminés - Rivers where larviciding has ceased

1 See reverse
Voir verso

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MAXIMUM RIVER STRETCHES WHICH COULD COME UNDER LARVICIDING IN 1997

MAXIMUM DE RIVIERES POUVANT ETRE INCLUSES DANS LES TRAITEMENTS LARVICIDES EN 1997

- Limite actuelle du programme - OCP boundaries
- Aire initiale du programme - Original Programme area
- Rivière susceptible d'être traitée - River stretches which could be treated
- Rivière où les épongages larvicides sont terminés - Rivers where larviciding has ceased

1 Voir paragraphe 10.13 - See paragraph 10.13
Note: the indication of river stretches which could be treated is provisional, intended only to denote orders of magnitude for the treatment at its maximum; the actual programmes of larviciding will be continuously refined in the light of the most up-to-date ento-epidemiological, meteorological and hydrological data.

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Predicted impact of vector control in the extension areas
(start of control in 1989)

Calendar Year

1989 1991 1993 1995 1997 1999 2001 2003

Percentage of pre-control value

CMFL
CMFC

Prevalence of skin microfilariae
Prévalence de microfilaries cutanées

Phase quatre
Fourth Phase

Pourcentage basé sur les valeurs de prétraitement
REPARTITION DES COUTS ENTRE L'AILRE INITIALE ET LES ZONES D'EXTENSION

BREAKDOWN OF COSTS BETWEEN ORIGINAL AND EXTENSION AREAS
(1986 - 1997) *

* From 1986 to 1990 figures show expenditures actually incurred
From 1991 to 1997 figures show budgetary forecasts

* De 1986 jusqu'à 1990: les dépenses encourues
De 1991 jusqu'à 1997: les budgets prévus