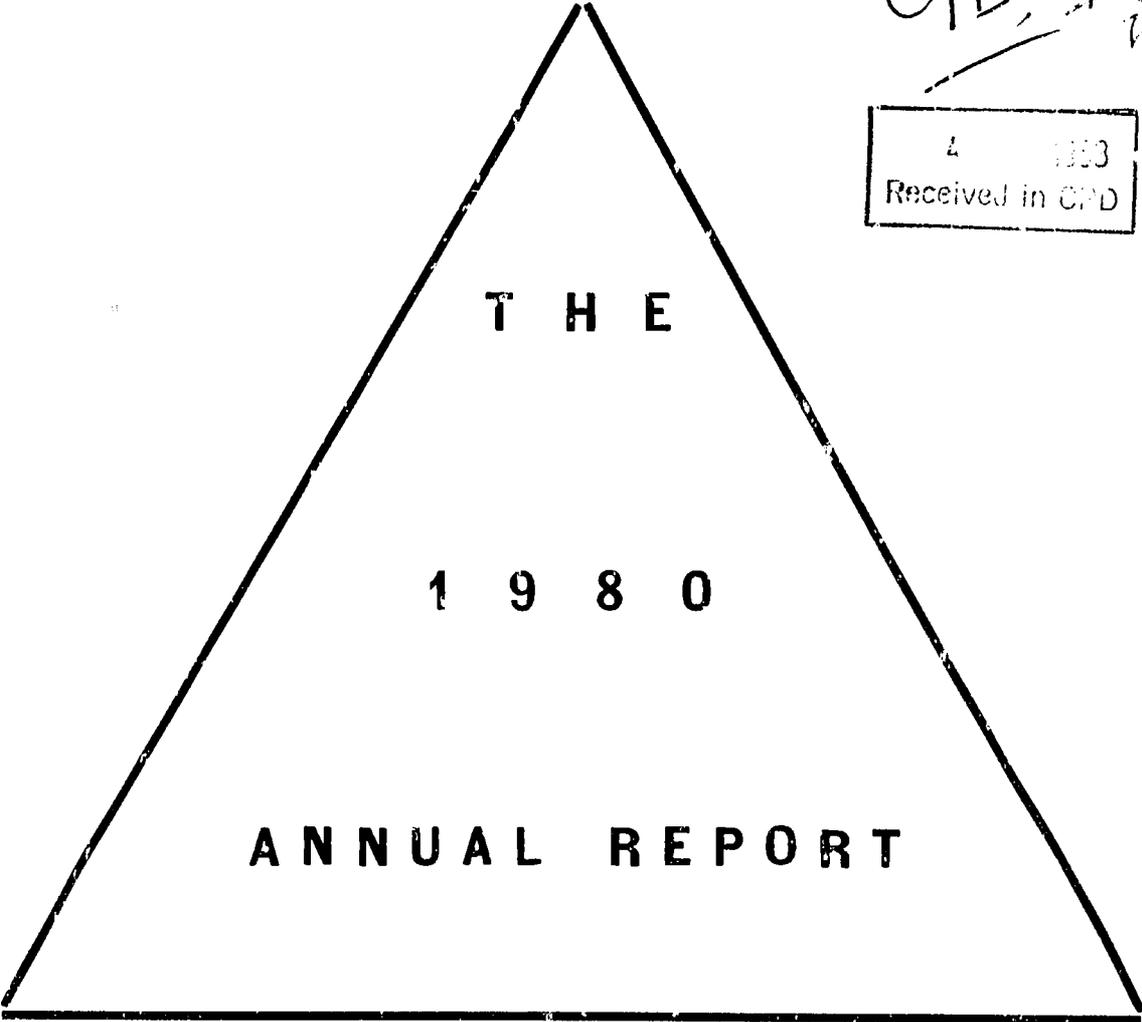


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BLUE NILE HEALTH PROJECT

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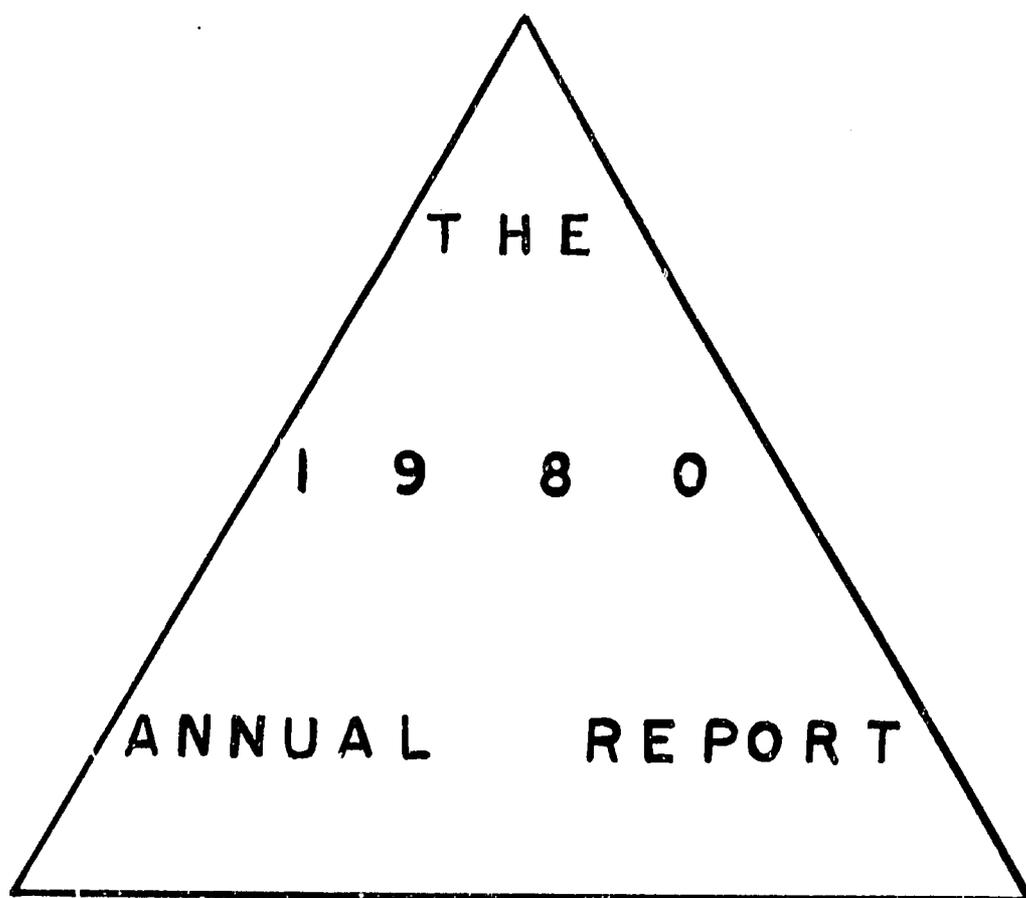


WAD MEDANI

MINISTRY OF HEALTH

DEMOCRATIC REPUBLIC OF THE SUDAN

BLUE NILE HEALTH PROJECT



WAD MEDANI

MINISTRY OF HEALTH

DEMOCRATIC REPUBLIC OF THE SUDAN

IN MEMORIAM

To the memory of Dr OSMAN AHMED ZUBEIR
who died on duty and played an important
part in establishing the project. His
dedication to his work will serve as an
inspiration to all of us.

THE BLUE NILE HEALTH PROJECT
THE 1980 ANNUAL REPORT

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PREAMBLE

The specific objectives of the project are:

- a) To prevent schistosomiasis transmission from developing in the Rahad irrigation system, emphasizing permanent and long-term vector control measures.
- b) To assess and reorganize immediately the on-going water-associated disease control programme in the Gezira/Managil scheme and develop and implement an interim comprehensive strategy based on improving currently used methods and materials and strengthening the existing infrastructures.
- c) To develop and assess a long-term comprehensive strategy in a study zone, (see map on page 4 (figure 1)), which will reduce considerably water-associated disease transmission and which will maintain the results achieved at low cost, and with minimal environmental hazards, and to apply this strategy in the project area.
- d) To seek innovative control measures which are considerably more cost-effective than present techniques, emphasizing environmental management, biological control, community participation and health education and reducing foreign exchange requirements.
- e) To maximize the socio-economic benefit of disease control by improving basic health services, water supply and sanitation and integration of project activities into local basic health services.
- f) To establish the costs and benefits of water-associated disease control in tropical agricultural systems, including measurement of community productivity, for planning of new water resource developments.
- g) To train decision-makers, planners, designers and operators of the water resources projects and health staff in the Sudan and elsewhere on the approaches and methods for the prevention and control of water-associated diseases in water resources projects.
- h) To promote and establish close coordination amongst the different national departments and institutions involved and with the international agencies concerned.

In 1980, despite initial shortages of funding, expectations were exceeded in many areas. The most important accomplishment was the prevention of schistosomiasis transmission in the Rahad scheme. This was accomplished with intensive chemotherapy and snail control efforts.

CHAPTER I

GENERAL INTRODUCTION

The Blue Nile Health Project began in 1979 when the agreement was signed by the Government of Sudan and the World Health Organization. The project is aimed at the prevention and control of the major water-associated diseases among the agricultural communities receiving irrigation waters from the Blue Nile in Sudan, (Figure 1).

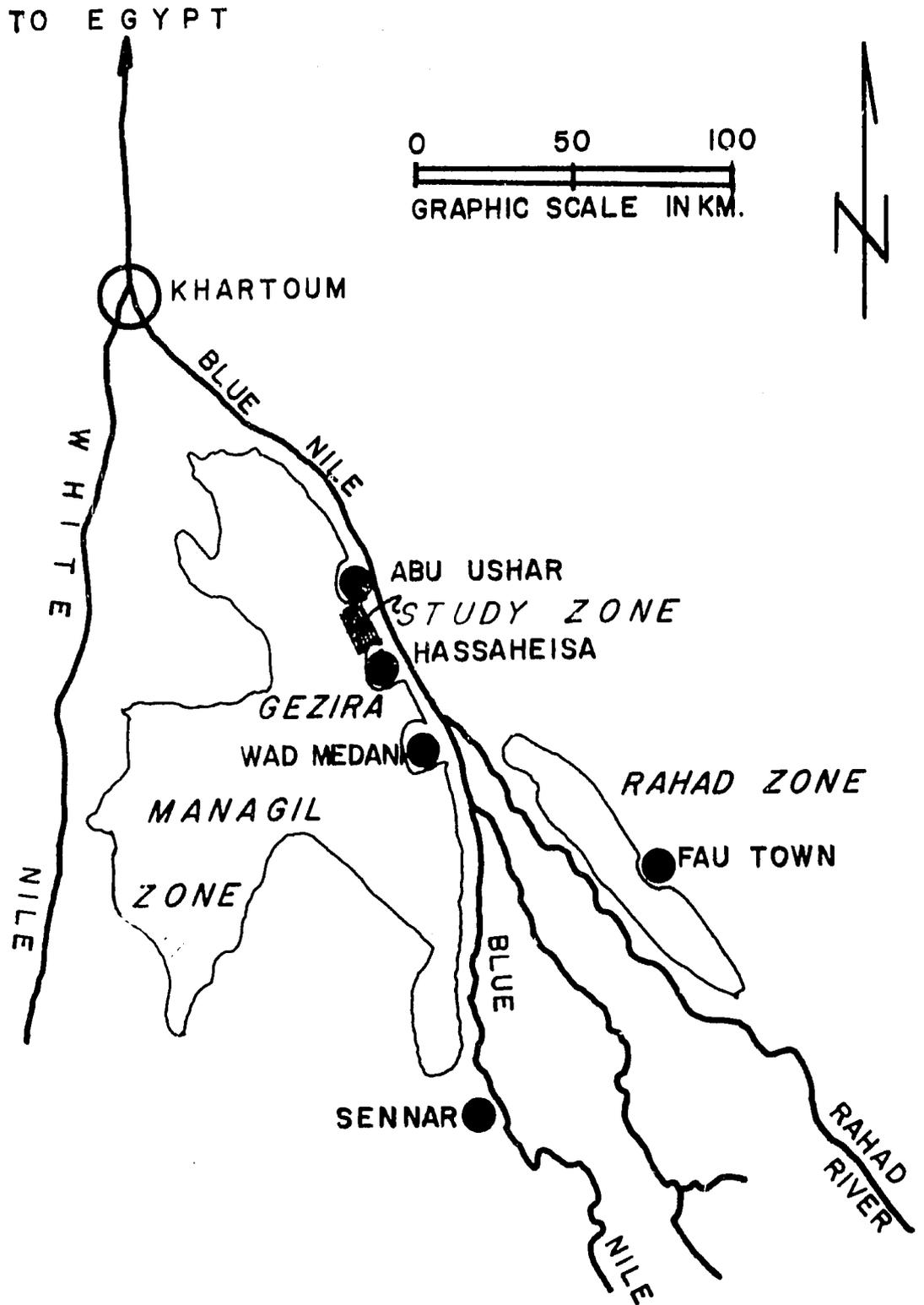
It is expected to take ten years to achieve a stable, economical level of control over diarrhoea, schistosomiasis and malaria in the population of over two million people. Prior to 1980 the project activities were devoted to the search for senior staff, planning and some training. Thus 1980 was the first year of operations.

Following the initial organizational chart (figure 1A) specified in the Project Agreement, many senior staff members were active during 1980, (Table 1). In addition to their project activities, these senior staff attended several international meetings and study tours in their professional fields of activity (Table 2).

Highlights of 1980

The following major activities were completed in 1980:

1. Seven of the senior staff began working in the top management positions, and about twenty technical and support personnel were recruited.
2. Following the guidelines of the First Scientific Advisory Group, which met in October 1979, the Interim Strategy was initiated in the Rahad Zone, as follows:
 - a. examining 20 000 people for schistosomiasis and treating 2 400 with the latest drugs.
 - b. controlling schistosomiasis snails with chemicals during the cotton-picking season
 - c. continuing the annual anti-malaria programme
 - d. conducting the First Annual Epidemiological Survey to monitor transmission of the three diseases (schistosomiasis, malaria, diarrhoea)
3. The Interim Strategy was apparently successful in preventing schistosomiasis transmission in the new Rahad Irrigation Scheme during 1980, one of the major goals of the Blue Nile Health Project.
4. In the Gezira-Managil Zone the normal malaria and schistosomiasis control operations were successfully carried out, including the annual spray round for malaria control and the January survey for malaria prevalence. Mosquito larviciding operations continued as before.



BLUE NILE HEALTH PROJECT IN SUDAN

FIGURE 1

BLUE NILE HEALTH PROJECT ORGANIZATION CHART

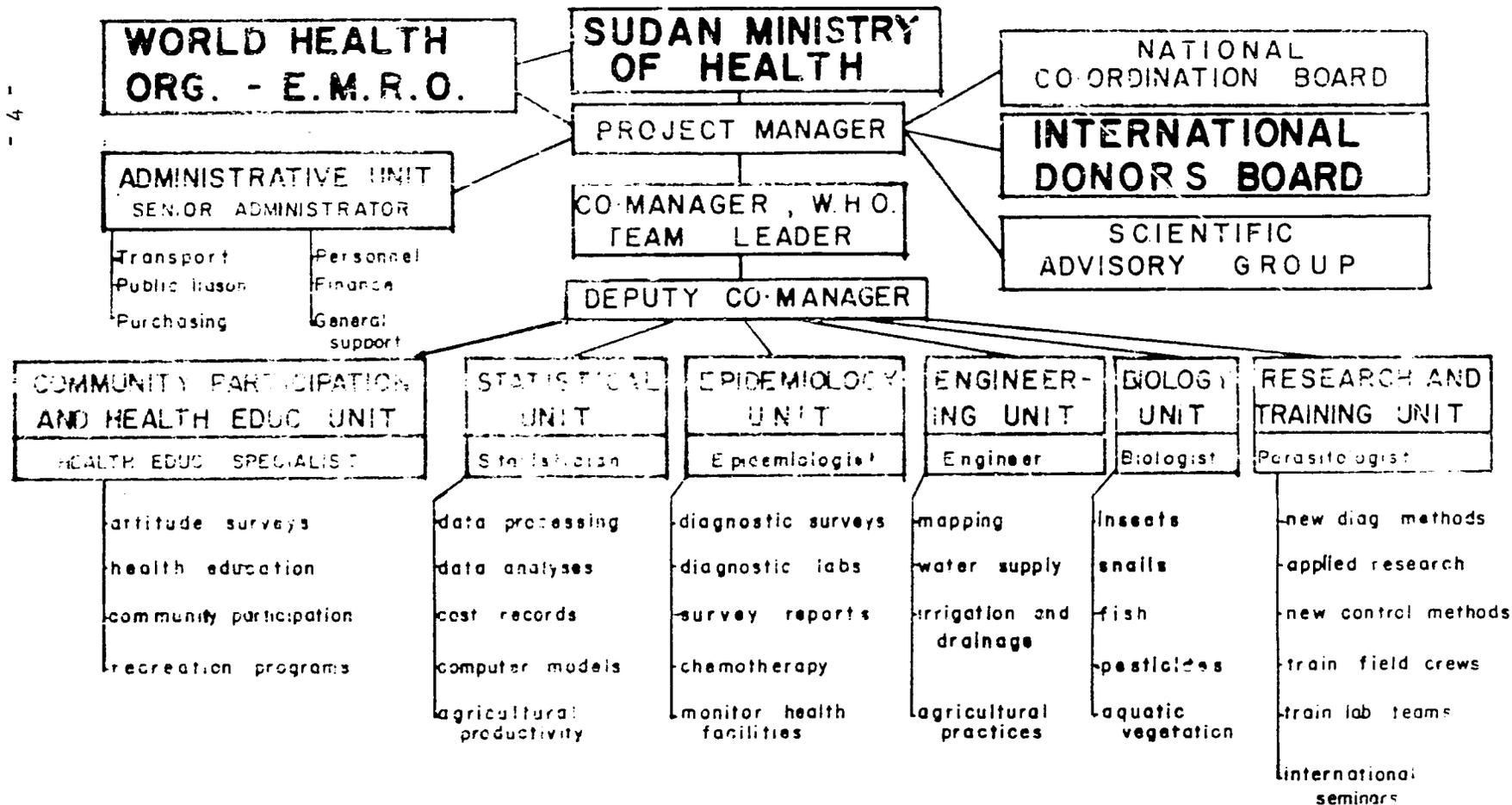


FIGURE 1 A

BLUE NILE HEALTH PROJECT

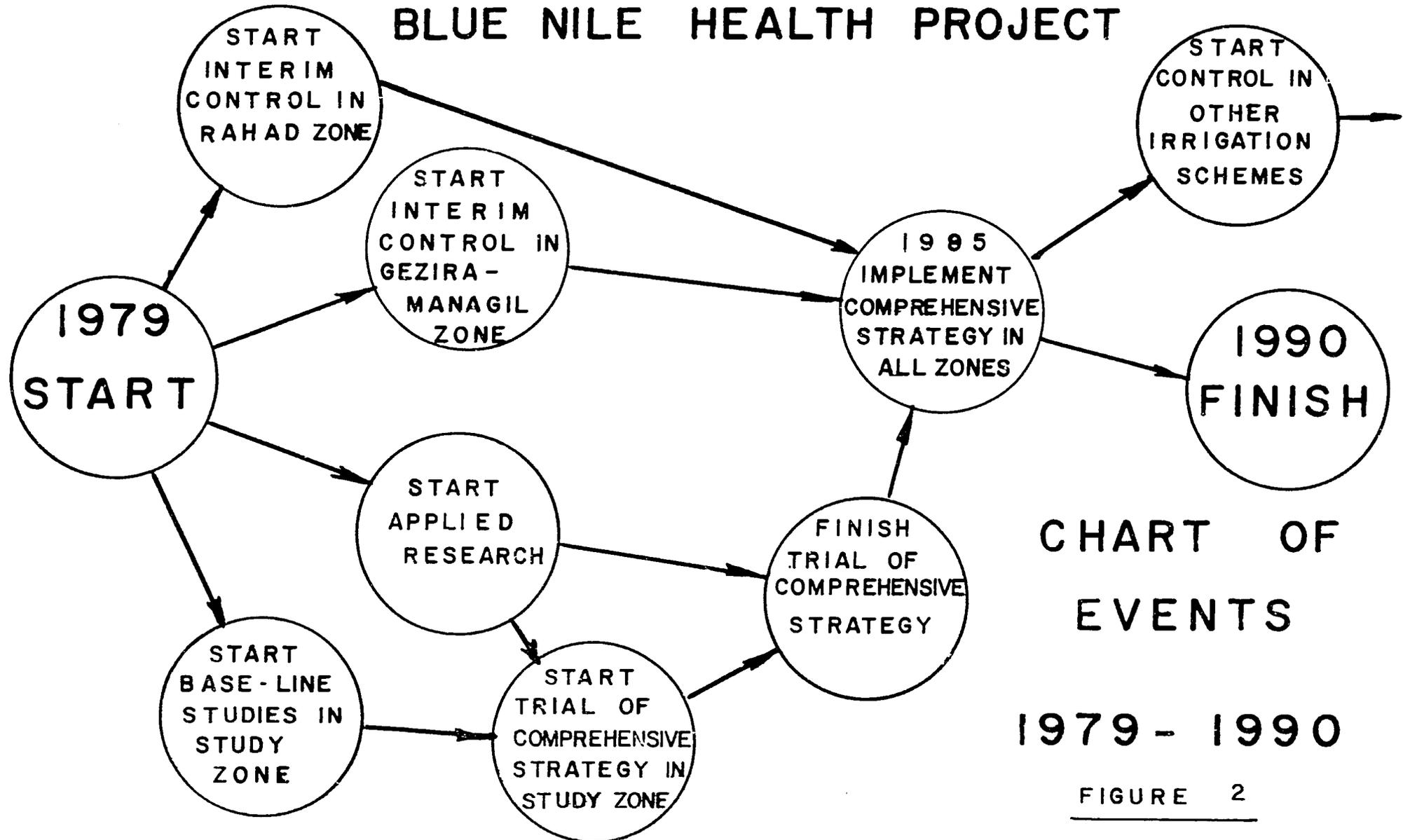


CHART OF
EVENTS

1979 - 1990

FIGURE 2

TABLE 1
SENIOR STAFF MEMBERS 1980

N A M E	T I T L E
<u>HEADQUARTERS</u>	
Dr Ahmed Ayoub El Gaddal	Project Manager
Dr William Jobin	Deputy Co-Manager
Mr Osman Bakri El Ganmaz	Director of Administration and Finance Unit
Dr Mutamid Ahmed Amin	Director of Research and Training Unit
Dr Abdel Aziz M. Haridi	Director of Biology Unit
Dr Osman Ahmed Zubeir *	Director of Epidemiology Unit
Dr Omer Tameim	Interim Epidemiologist
<u>RAHAD ZONE</u>	
Mr M.A. Haboub	
Mr Z.B. Zakaria	
Mr Samani M. Nour	
<u>GEZIRA-MANAGIL ZONE</u>	
Dr Hashim Hussein	
Mr Faisal El Tayeb	
Mr Hussein Abdel Gadir Waziri	
<u>STUDY ZONE</u>	
Dr Asim Dafaala	
Dr Alan Fenwick	
Mr Ahmed Babikir	
Mr Paul Manying	
Dr Mohammed Kardaman	

* deceased

TABLE 2
CONFERENCES AND MEETINGS ATTENDED BY
SENIOR STAFF
1980

1. Third Annual Scientific Conference of the Medical Research Council of Sudan in Khartoum.
Topic: Schistosomiasis, March 4 - 6 1980. All Staff.
2. The WHO Sponsored Workshop on Socio-economic Aspects of Schistosomiasis in Abu Ushar, 7 March 1980. Dr Amin, Dr Fenwick and Dr Jobin.
3. The Workshop on Engineering and Schistosomiasis at University of Southampton, England, 21 - 24 April 1980. Dr Amin, Dr Zubier, Dr Fenwick.
4. The 10th International Conference on Malaria and Tropical Medicine, Manila. 10 - 16 November 1980. Dr Gaddal, Dr Amin and Dr Haridi.
5. Study Tour to Brazil and Bulgaria on Environmental and Biological Control of Malaria and Schistosomiasis, August. Dr Gaddal and Dr Zubeir.
6. International Donors Meeting for Blue Nile Health Project, at Friendship Hall in Khartoum, February. All Staff.
7. First National Coordinating Committee Meeting for Blue Nile Health Project, Ministry of Health in Khartoum, December. All Staff.
8. World Health Assembly in Geneva, May. Dr Gaddal.
9. Japanese International Cooperation Agency, July and October. All Staff.
10. United States Agency for International Development in Khartoum and Wad Medani, August. All Staff.

CHAPTER II
THE RAHAD ZONE

A. Introduction

Interim Strategy

In 1980 the Rahad Zone was given priority among the three Zones, as it had been discovered that schistosomiasis snails had invaded the Rahad Irrigation System in December 1979, producing a high potential for transmission. The 1980 Interim Strategy for Rahad was:

1. Intensive schistosomiasis chemotherapy among residents
2. Mollusciciding during cotton-picking season
3. Routine anti-malaria operations
4. Routine water supply and sanitation activities, including continuing construction of the originally planned facilities
5. First annual epidemiological monitoring in all schools and in eight monitor villages.

On the basis of the first annual epidemiological survey (AES-1980) the interim strategy for 1981 has been developed. The results of AES-1980 are summarized herein. Detailed analysis of the data is scheduled for a final report in October 1981, but a draft will be ready in June 1981 for the second Scientific Advisory Group meeting (SAG-II).

Growth of the Rahad Irrigation System

The first phase of the 300 000 feddan Rahad Scheme was started in July 1978. By the end of 1980, over forty villages were settled and 224 000 feddans under cultivation. By the end of 1981, the first phase should be completed (Table 4).

In addition to the residents and seasonal labourers in the Rahad Irrigation System, the Blue Nile Health Project must also eventually concern itself with several existing villages outside the irrigated area and along the Rahad River, as well as nomads, construction personnel and travellers who constantly move through the Zone. These groups should be defined in the near future.

Activities in the Rahad Zone in 1980

Following the 1980 interim strategy, the following activities were carried out:

1. Epidemiological
 - Malaria surveys for prevalence rates
 - Schistosomiasis survey for prevalence and intensity of infection
 - Routine reporting of diarrhoea from village health units
2. Chemotherapy
 - Routine treatment in village units for malaria and diarrhoea
 - Prophylaxis of seasonal labour for malaria
 - Intensive diagnosis and treatment in villages 1 - 21 for schistosomiasis, Fau town and Kantara 36.
3. Vector Biology and Control
 - Annual DDT spraying of houses for malaria control
 - Snail inspections and spraying of molluscicides
 - Some spraying of labourers' huts for fly control
 - Spraying of larvicides for mosquito control
4. Water Supply
 - Construction of new systems and completion of others
 - Routine operation and maintenance
5. Sanitation
 - Minimal routine
6. Health Care
 - Routine in village health units

Personnel Working in Rahad Zone 1980

Under the supervision of the Deputy Co-Manager, three physicians conducted the epidemiological survey and the schistosomiasis chemotherapy in the Rahad Zone. In May 1980 Dr Osman Zubeir initiated the work, assisted by Dr Omar Tameim in August while Dr Zubeir was travelling. Dr Zubeir returned and continued the work in September and October until his tragic death on 14 October. On 1 November Dr Hashim Hussein began supervision of the field work until it was terminated on 4 December. For the rest of December Dr Hashim conducted the data processing and reporting in Wad Medani.

The routine operations within the Rahad system were supervised by Mr Haboub, Senior Public Health Inspector. As of 1 September the total personnel working in the Blue Nile Health Project in the Rahad Zone numbered about 120 from various health units and from the Rahad Corporation. This number was essentially constant throughout the year except that the special teams for epidemiology and chemotherapy only worked from 5 May until 4 December (seven months). Mr Zakaria and Mr Samani conducted the schistosomiasis and malaria control activities.

B. Epidemiology

The epidemiological work in 1980 consisted of a special survey for schistosomiasis and routine surveys and reporting on malaria and diarrhoeal diseases.

1. Schistosomiasis

The schistosomiasis survey had two components: an annual survey for monitoring transmission in all schoolchildren and in a 10% household sample of 8 monitor villages, and also a screening of all immigrants for chemotherapy. Samples were thus collected on all immigrants, plus 10% of all residents of local origin, plus all schoolchildren.

Sampling

In May 1980 the monitor villages to be used each year in evaluation were selected. First, the 32 existing villages were divided into two parts: headquarters villages (3, 10, 18, 23 and 27), and the other 27 common villages, divided again by blocks to give uniform geographical distribution. It was expected that headquarters villages would have very different epidemiology as they include Rahad Corporation employees as well as farmers, and they are much larger. Using a table of random digits the monitor villages were selected (Table 3).

TABLE 3
MONITOR VILLAGES SELECTED BY RANDOMIZATION
FOR RAHAD ZONE, 1980

Block Number	Randomly Selected Villages	
	Headquarters Village Number	Common Village Number
1	3	1
2	10	9
3	-	14
4	-	16
5	-	25
6	-	28



The Late Dr. Osman Zubeir, Chief of Epidemiology Unit, provided careful supervision and quality control of bilharzia field laboratory in Rahad Zone.

PHOTOGRAPH 1



Fecal samples were processed in field laboratory prior to microscopal examination for bilharzia, Rahad Zone 1980.

PHOTOGRAPH 2

A census team completed the sketch maps and house numbering along with a household census in Arabic on form 1 and a school census in Arabic on form 2. All 32 villages were included in the census as well as Fau Town, the construction camps, Kantara 36, and the labour camps near Fau.

Within a monitor village a 10% household sample was selected after the household census was completed for the village. All persons in the household were included in the sample. These same households are to be sampled each year during the annual survey. All schools and all schoolchildren were also included in the annual monitoring.

Of the 2 804 households registered in the 8 monitor villages, 191 households contributed specimens for examination. This constituted a total of 628 persons or 5% of the total population, a low but acceptable rate of cooperation (Table 5).

Urine and faecal samples were collected from people included in the annual survey and from all persons coming from outside the Rahad irrigated area. The faeces were processed fresh by the modified Kato technique and the urine specimens processed fresh by centrifugation (see SAG-I report for details). Containers were sequentially numbered before distribution and the sequence number marked on the household census sheet which also had space for the laboratory results. A laboratory sheet was used with the sequence number of the sample, and the results of the microscopical examination.

Eleven per cent of the 628 persons tested in the random sample were infected with Schistosoma mansoni and less than 1% were infected with Schistosoma haematobium (Table 6). The prevalence of S. haematobium was too low to show a pattern related to the persons' age but there was a definite trend in the age-specific pattern in infection with S. mansoni. The prevalence of infection was low in young children, rising steadily to a maximum of 15% at 20 years of age, thereafter declining in an erratic pattern (Figure 3). Little significance can be given to the shape of the age-specific prevalence curve in this first survey as it is a composite from previous transmission patterns in the previous communities from which these persons emigrated. Although it appears that no transmission occurred within the Rahad Zone this cannot be confirmed until analysis of the 1981 survey is completed in which incidence rates from 1980 to 1981 can be calculated on persons who remained in the Rahad Zone during the entire interval between surveys.

The geographical distribution of the prevalence of S. mansoni showed a general tendency towards higher prevalence in the northern group of new villages, but the distribution was irregular (Table 6 c. Figure 4). The headquarters villages had a mean

prevalence of 10.9% compared to 11.0% in the common villages: not a significant difference.

In the 3 000 students examined the prevalence of S. mansoni infection was 14% and S. haematobium infection was 3%, with a generally higher prevalence in the newer villages and in Fau town (Table 7). Infection with S. haematobium was highest in the school in village 18 (11%) but 1% or 2% in the other villages.

The age-specific prevalence of S. mansoni infections in students increased from 8% at age 7 to 17% at age 14. The prevalence was slightly higher in the students than in the non-students of the same age, taken from the household survey (Figure 4). This is probably related to sex differences in school attendance and exposure to infection, as most of the students are boys with higher prevalence than girls.

2. Malaria Survey

The first malaria survey was done in October 1979 in 6 villages. Blood samples were taken from individuals 1 - 15 years old. The number of slides examined was 570, positive slides 54, a prevalence of 9.4% (Table 8). During 1980, 3 surveys were made, the first in March. In the first survey 300 slides were collected from villages 10, 13 and 18, all negative. In the second survey in July, 320 slides were collected from villages 31, 33 and 34, all negative also. In October 1980 a malaria survey was done in the 8 new randomized monitor villages; 976 slides were collected with 4 positive cases, a prevalence of 0.4% (Table 9).

The low prevalence in the surveys indicated the generally satisfactory operation of the mosquito control operations and anti-malaria drugs administration. However, the results do not coincide with the large number of reported fever cases from the local health units, nor with the large consumption of antimalaria drugs (Table 12/14). The reported fevers showed a high frequency in September and a low frequency in March and April, coinciding with the malaria cycle but probably including a large number of fevers of non-malarial origin.

3. Diarrhoeal Diseases : Reports from Health Units

Diarrhoeal diseases are endemic in the Rahad Scheme. They were more prevalent in the northern zone, especially among children. The incidence is higher during the rainy season, probably due to the intensive breeding of flies and the primitive methods of fly control (Table 13). There is also a shortage of vehicles and personnel to undertake the required sanitary measures.

C. Chemotherapy

The number of functioning health units in Rahad Zone during 1980 was 3 dispensaries run by medical assistants and 24 dressing stations run by qualified nurses. In all these health units there were no laboratories for diagnosing malaria, schistosomiasis or diarrhoeal diseases and therefore treatment was given on clinical grounds only.

1. Schistosomiasis Chemotherapy

In 1980 schistosomiasis surveys were done in Fau Town and villages 1 - 30 (Table 10). In the Southern Zone villages (1 - 20) the survey included all schoolchildren plus all immigrants. But in the Northern Zone, because of the high incidence of schistosomiasis found among the indigenous population, it was decided to survey all schoolchildren plus 10% of the local population, plus all immigrants. If prevalence in the local population exceeded 20% they were all examined (Table 10).

At the end of the survey, lists of positive cases were prepared and infected persons treated. Oxamniquine (Vansil) was used for intestinal schistosomiasis, dose 40 - 60 mg/kg body wt. Patients were treated alternately with 40 mg/kg or with 60 mg/kg to evaluate the cost-effectiveness of the lower dose in comparison with the 60 mg/kg recommended by Dr Abdel Hamid Omar. Metrifonate was given for urinary schistosomiasis dose 10 mg/kg, in 3 doses with a two weeks interval.

About 2 200 doses of oxamniquine were administered, using a total of 5 400 gms of capsules. About 120 doses of metrifonate were used (Table 11).

2. Malaria Chemotherapy

Due to the lack of diagnostic means in Rahad Health Units, malaria treatment is given on clinical diagnosis only. The number of reported cases and drugs used correspond in fact to the number of fever cases reported, far exceeding the malaria cases (Table 12).

3. Chemotherapy of Diarrhoeal Diseases

For diarrhoeal diseases, diagnosis was also on a clinical basis (Table 13). The drugs used are shown in (Table 14).

D. Vector Biology and Control

Snail Control

The new Rahad Scheme had been reported free of the snail intermediate host of human schistosomes up to the end of 1979. Snails (both Biomphalaria pfeifferi and Bulinus truncatus) were first discovered in the canal system of Rahad in January 1980. Subsequent surveys in the following months confirmed a wide distribution of snails in the canals.

Consequently, and as part of the interim strategy for the prevention of schistosomiasis transmission, intensive snail surveys and control were conducted between May and December 1980. The surveys covered most of the irrigated area, starting from Block 1 to Block 6. In May the first three blocks in the southern part of the scheme were found to be free of both Biomphalaria pfeifferi and Bulinus truncatus. Snail populations of both species were found to be highest in Block 4, situated in the middle part of the scheme, and to a lesser extent in blocks 5 & 6 in the north (Table 15).

Canals harbouring snails were sprayed with Bayluscide using Hudson Xpert sprayers. The infected canals were treated during June and July 1980. Mollusciciding was suspended during August and September because of inaccessibility as a result of the rains. During October and November mollusciciding was irregular as the staff and transport available were fully engaged in chemotherapy and in the epidemiological surveys. Hence the surveys showed again a high degree of infestation during November and December in Block 2 and in Block 4. Mollusciciding was resumed shortly thereafter and will continue during January, February and March 1981.

Mollusciciding was done focally by treating the positive canals, spraying along the canal edges. During 1980 the operation team consumed 436 litres of Bayluscide (25% emulsifiable concentrate). The canal volume treated was about 313 200 cubic metres, giving an average dose of 0.35 mg/l based on calculations after complete mixing, but a much higher dose in the actual snail habitats along the canal edges (Table 16).

Bayluscide produced an obvious impact on the snail population. The effect of Bayluscide can best be seen in the canals of Block 4, which remained virtually negative for the first month after treatment. However, canals sprayed in May/June were heavily infested in November/December.



Bilharzia snails were first found in Rahad irrigation canals in early 1980, first **Bulinus Truncatus** and then **Biomphalaria Pfeifferi**.

PHOTOGRAPH 3



During the cotton picking season in the Rahad Zone bilharzia snails were controlled by focal spraying of infested canals with the latest molluscicides.

PHOTOGRAPH 4

Of the several thousand planorbid snails collected, none were infected with schistosomes, indicating that little or no schistosomiasis transmission was occurring - a major objective of the Zone operations.

Mosquito Control

Malaria control in the Rahad Scheme started in 1977 with the first settlement. Malaria control is based mainly on one round of DDT T.G. (2 gm/m²) sprayed in all premises, usually during July. This is supplemented by larviciding using Abate, between November and June. Focal spraying of the temporary huts of the cotton pickers and mass chemotherapy was applied in December (Table 17). Adequate stocks of both DDT and Abate insecticides are available in the stores for the next season.

a) Annual household residual spray

Annual household residual spray for malaria is supervised by one Malaria Public Health Inspector, one sanitary overseer, 5 assistant sanitary overseers, plus 79 spraymen. The spraying campaign is carried out twice a year. The first round in January covered the temporary huts of seasonal labourers, and the second covered the permanent houses in villages.

b) Larviciding

Larviciding is carried out year round, except during the spraying campaign. It is supervised by 5 assistant sanitary overseers and 49 mosquito men, distributed in all seven agricultural divisions. Each mosquito man has a weekly programme to treat his area in 6 days time. Insecticide used: Abate, target dose of 150 gm/ha. The amount of Abate 500E. consumed up to October 1980 was 170 gallons.

Fly Control

Breeding places are treated by removal and burning of garbage and dusting with DDT powder. For the flying stage, Vapona diluted with water is used, especially during recruitment of seasonal labour.

E. General Status of Sanitation

Water Supply System

In the Southern Division there are 13 water filters and pumps which are fed from canal water. They consist of a sedimentation basin followed by a basin for filtering

water and another for clean water storage. The clean water is raised by a pump, to which a chlorinating apparatus is connected, to a high tank. From the tank, water is distributed to different parts of the village. Only 2 villages in this zone have wells. In the Northern Division 7 villages have water filters and 6 have wells. In headquarters of the agricultural divisions water is introduced into houses. In Fau Town and villages 10 and 40 the filters are large and include a rapid filtration system. Water is connected to every house in Fau (Table 18).

In spite of the wells and filters many of the inhabitants use canal water for the following reasons:

- a. In some cases water is not introduced inside villages, and because canals are nearer people prefer to use them.
- b. Some filters are small and their capacity cannot cope with increasing needs of the people, thus expansion has been approved.
- c. There is a shortage of spare parts.
- d. Most of the people are not aware of the health hazards caused by using canal water, thus a health education programme will be started in the Rahad Zone.

Sanitation System

Southern Zone

Sanitary work is run by one sanitary overseer and 5 assistant sanitary overseers distributed in the headquarters of the agricultural divisions and Fau Town.

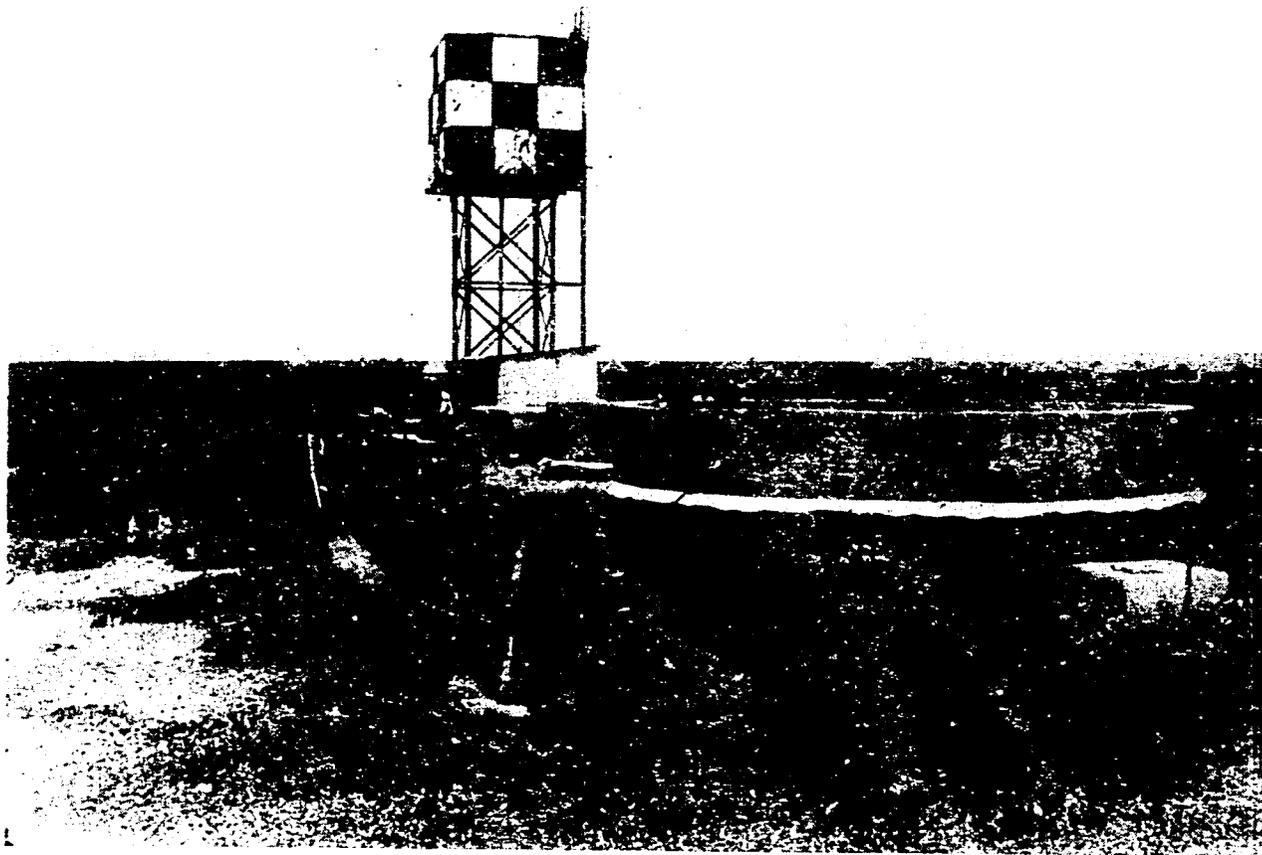
No sanitation work is done at village level. The same thing applies to the Northern Zone. The sanitary work is restricted to collection and burning of garbage and dead animals and, rarely, fly control.

Latrines

There are public pit latrines in all villages. In Fau Town and agricultural Division Headquarters there are public and private water system latrines (Table 19).

In spite of the presence of latrines most of them are not used by the villagers for the following reasons:

- a. Most of the villagers, especially women, were originally nomadic people not familiar with using latrines.
- b. Most pit latrines are in such bad condition that they cannot be used.



Filtered and chlorinated water supplies are being constructed in each village in the Rahad Zone. About half of the villages had adequate supplies by the end of 1980, such as the above system in village 17.

PHOTOGRAPH 5

Vehicles

Vehicles available for sanitary work in the whole Rahad scheme are:

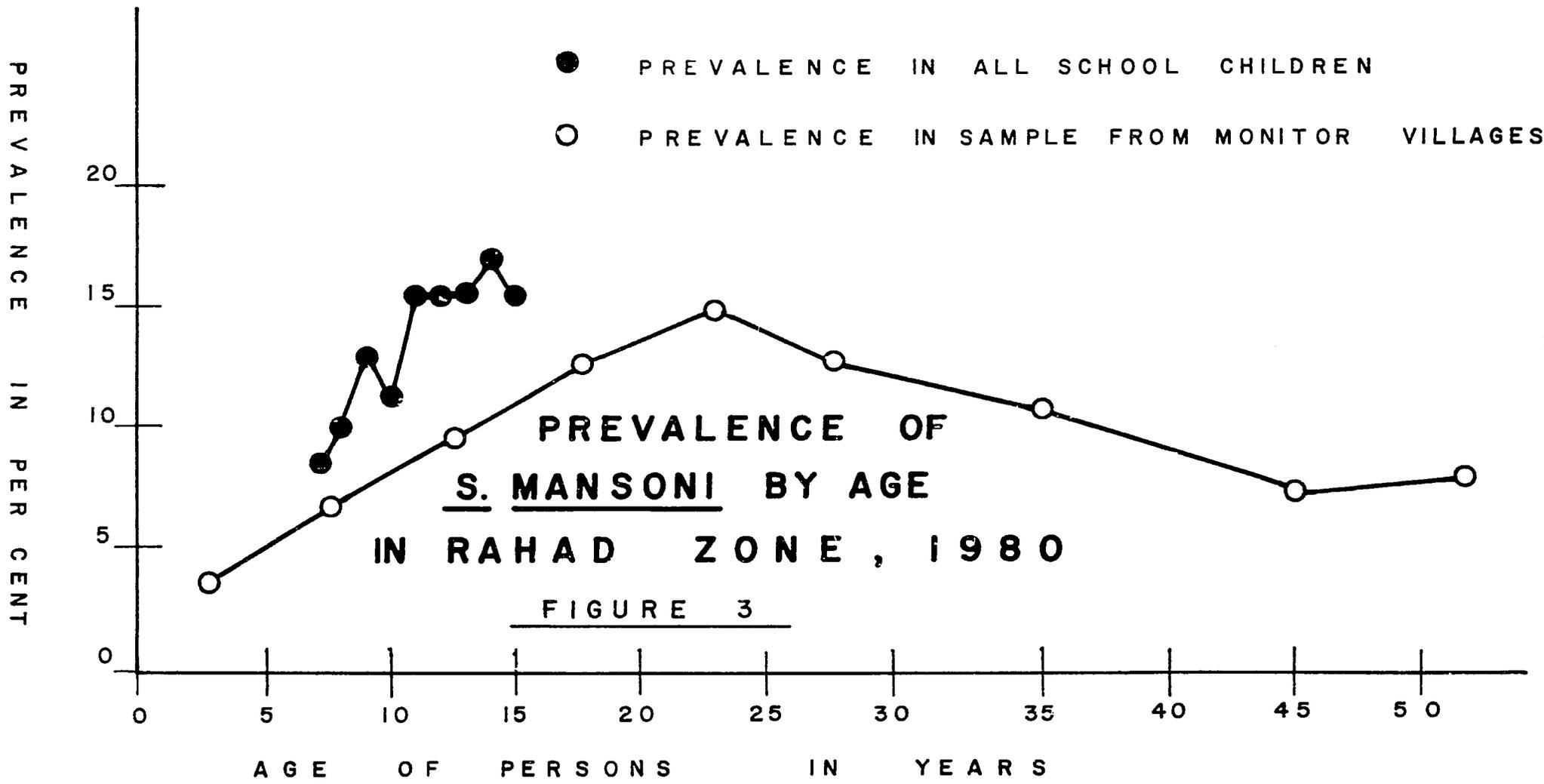
- a. One lorry in Fau Town
- b. One tractor with trailer also in Fau Town
- c. One tractor with trailer in village number 10.

Seasonal Labour

Cotton pickers, about 40 000, are recruited from all over the Sudan, especially from Kordofan and Kassala Provinces, and the irrigated schemes along the Blue Nile. Most of these labourers carry with them diseases such as malaria, schistosomiasis and leishmaniasis. Lorries which bring seasonal labourers must stop at check points at the entrances of the Scheme. All labourers are dusted with DDT powder against body lice and given presumptive treatment against malaria (chloroquine + pyromethemine). When they settle in their temporary camps, their units are sprayed with DDT by the malaria teams. Sometimes the insecticide Vapona is used for fly control.

Problems

1. The fact that Rahad Scheme lies in both Kassala and Gezira Provinces created administrative difficulties which hindered the work in health services, especially for the curative services.
2. There is a shortage of vehicles for field work supervision, thus most of the supervisors were doing only office work. The Blue Nile Health Project had to supply additional vehicles for the schistosomiasis mollusciding and chemotherapy teams.
3. There are no stores for insecticides.
4. There are no cleaners in the villages.
5. There are no laboratories in health units.
6. There is a shortage of drugs in health units.
7. There is a shortage of petrol.
8. There is a shortage of houses for accommodation of health personnel.



BILHARZIA PREVALENCE IN MONITOR VILLAGES OF THE RAHAD ZONE 1980

FIGURE 4

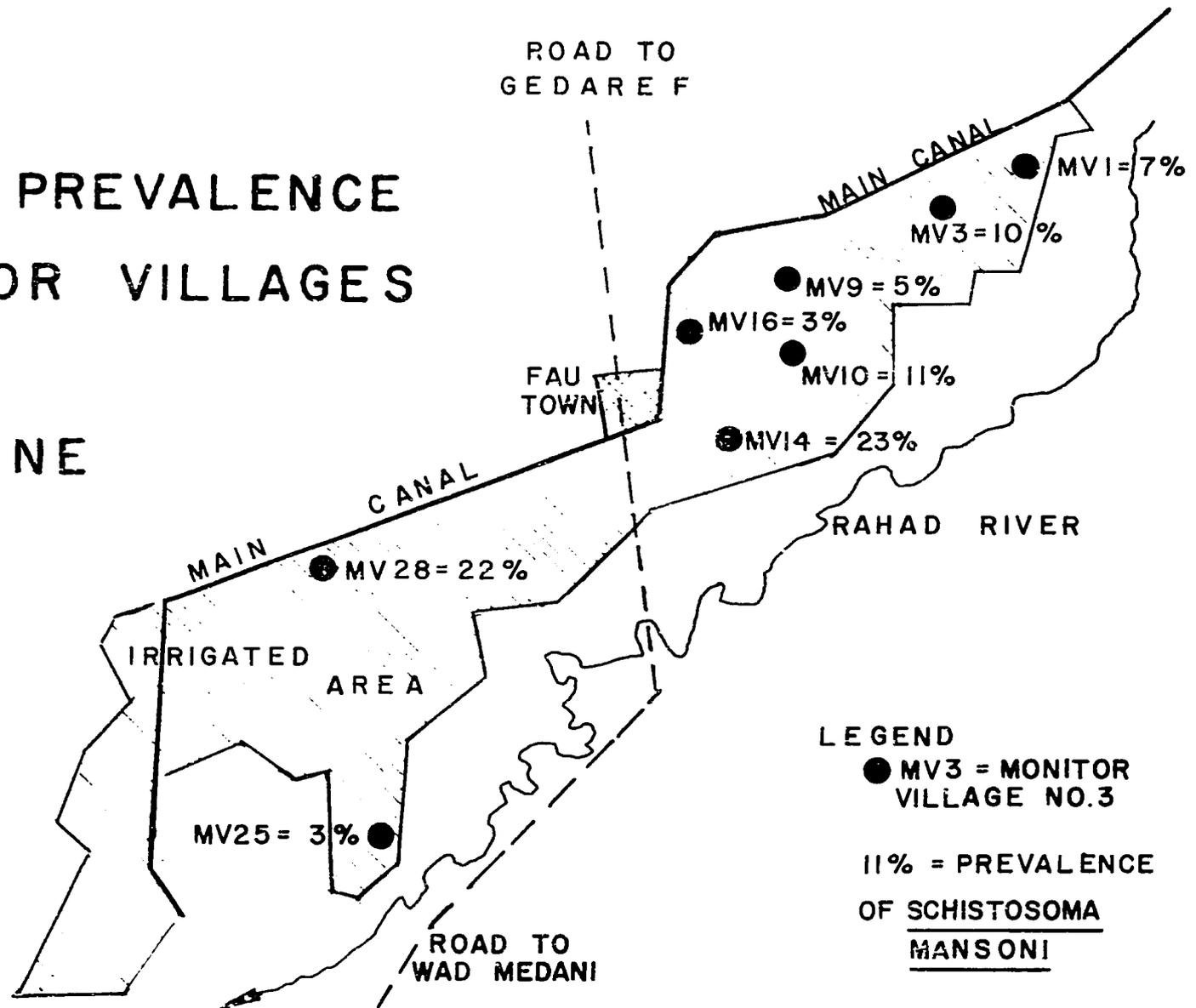


TABLE 4
GROWTH OF POPULATION, CULTIVATED AREA
AND AGRICULTURAL PRODUCTIVITY FOR FIRST PHASE OF
RAHAD IRRIGATION SYSTEM, 1977 - 1982

AGRICULTURAL SEASON JULY TO JUNE	P O P U L A T I O N			CULTIVATED AREA			
	Villages	Residents	Seasonal Labour	Cotton Feddans	Ground Nuts Feddans	Gardens In Feddans	Total Area Under Cultivation in Feddans
1977-1978	18			50,000	0	10,000 *	60,000
1978-1979	30			83,498	36,570	-	120,000
1979-1980	32		45,000	91,137	89,014	-	180,000
1980-1981	40	80,000		113,000	107,000	4,000	224,000
<u>PLANNED</u> 1981-1982	46						300,000

* Wheat, 1977 only.

TABLE 5
SIZE OF SAMPLE SELECTED FROM 8 MONITOR VILLAGES OF RAHAD ZONE 1980
DERIVED FROM RANDOMLY SELECTED HOUSEHOLDS

VILLAGE NUMBER	HOUSEHOLDS REGISTERED		HOUSEHOLDS SELECTED IN RANDOM SAMPLE	SELECTED HOUSEHOLDS CONTRIBUTING SPECIMENS	PERSONS REGISTERED IN VILLAGE	PERSONS TESTED FOR S.MANSONI
	LOCAL	IMMIGRANT				
1	246	159	20	21	1952	86
* 3	494	197	65	25	1946	78
9	0	222	22	20	1144	63
* 10	0	602	60	53	2676	160
14	176	60	23	14	1093	48
16	105	101	20	19	1243	64
25	160	0	16	14	873	38
28	143	134	27	25	1358	91
TOTAL	1324	1475	273	191	12285	628 5.1%

* Headquarters villages

TABLE 6

PREVALENCE OF SCHISTOSOMIASIS BY VILLAGE
FROM RANDOM SAMPLE IN 8 MONITOR VILLAGES
IN RAHAD ZONE 1980

VILLAGE NUMBER	TOTAL NUMBER OF PEOPLE TESTED	PREVALENCE OF SCHISTOSOMIASIS			
		MANSONI		HAEMATOBIMUM	
		Number	%	Number	%
1	70	6	7.8%	1	1.1%
* 3	78	8	10.3%	0	0
9	63	3	4.80%	0	0
* 10	160	18	11.2%	2	1.2%
14	48	11	22.9%	0	0
16	64	2	3.1%	3	4.0%
25	38	1	2.6%	0	0
28	91	20	22.0%	0	0
TOTAL	628	69	11.0%	6	0.9%

* Headquarters villages

TABLE 7

PREVALENCE OF SCHISTOSOMIASIS INFECTIONS IN STUDENTS BY SCHOOL
IN RAHAD ZONE, 1980

VILLAGE	SCHOOL	TOTAL NUMBER OF STUDENTS	NUMBER EXAMINED FOR S. MANSONI	INFECTED WITH	
				S. MANSONI	HAEMATOBIMUM
Fau	1	395	283	84	7
Fau	2	30	30	4	0
1		84	83	3	0
2		304	300	2	1
3	1	70	62	2	0
3	2	274	226	18	2
5		47	46	1	0
6		38	38	2	0
9		46	38	3	0
10	1	253	237	19	4
10	2	190	146	6	1
10	3	139	128	18	1
13	1	250	226	52	12
13	2	42	41	6	0
16		60	59	5	0
18		316	297	37	33
19	1	155	149	37	2
19	2	29	27	8	0
23		161	133	29	4
25		99	91	1	0
27		226	221	74	8
15	18	3208	2861	411	75
PERCENTAGE INFECTED				14.4%	2.6%

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TABLE 8

MALARIA SURVEY OCTOBER 1979
IN OLD MONITOR VILLAGES IN RAHAD ZONE

VILLAGE NO	NO. SLIDES	MALARIA POSITIVE SLIDES	MALARIA PREVALENCE	REMARKS
2	131	9	6.8%	
7	100	9	9%	
11	98	5	5.1%	
20	100	17	17.0%	NO LARVICIDING ACTIVITIES
21	71	5	7.0%	
30	70	9	12.1%	NO LARVICIDING ACTIVITIES
TOTAL	570	54	9.4%	

TABLE 9

MALARIA SURVEY OCTOBER 1980
NEW MONITOR VILLAGES IN RAHAD ZONE

VILLAGE NO	NC. OF SLIDES	NO. POSITIVE SLIDES	PREVALENCE
1	151	Nil	
3	200	Nil	
9	100	Nil	
10	100	2	
14	77	Nil	
16	100	1	
25	97	Nil	
28	151	1	
TOTAL	976	4	0.4%

SUMMARY OF POPULATION CENSUS
PERSONS EXAMINED AND PERSONS FOUND
INFECTED WITH SCHISTOSOMIASIS, RAHAD ZONE 1980

VILLAGE	CENSUS OF POPULATION	PERSONS EXAMINED	PERSONS INFECTED WITH	
			S. MANSONI	S. HAEMATOBIIUM
1	1952	377	32	6
2	1193	9	2	0
3	1946	401	155	2
4	1300	3	0	0
5	1177	282	17	3
6	873	506	49	0
7	1900	643	22	0
8	786	425	89	1
9	1144	866	98	0
10	2676	1577	187	12
11	1154	496	111	3
12	1021	512	111	3
13	1647	1077	132	1
14	1093	178	60	1
15	1152	231	117	1
16	1243	622	41	6
17	775	615	185	7
18	2741	1656	349	17
19	1319	552	92	1
20	1164	700	164	0
21	1175	91	21	1
22	583	435	39	1
23*	1768	470	118	2
24*	1948	307	43	0
25*	873	132	2	0
26*	2338	1129	367	3
27*	2490	555	158	5
28*	1358	807	166	0
29	1529	0	-	-
30	1234	0	-	-
Fau	5033	3046	851	26
All 21 schools	**	2861	411	75
TOTAL	48585	21561	4189	177

* No chemotherapy

** Census in village

TABLE 11

SCHISTOSOMIASIS CHEMOTHERAPY IN RAHAD ZONE, 1980

	IN SCHOOLS	IN CENSUSED VILLAGES	TOTAL IN 1980 CENSUS
Total population	3408*	48,585*	48,585
Persons examined	2861	18,700	21,561
Persons found infected with <u>S. mansoni</u>	411	3,778	4,189
Persons treated with Oamniquine	350	1,850	2,200
Persons found infected with <u>S. haematobium</u>	75	102	177
Persons treated with Metrifonate	70	80	150
TOTAL PERSONS TREATED	420	1,930	2,350

* Census taken in villages

TABLE 12
REPORTED MALARIA CASES FROM HEALTH
UNITS IN RAHAD ZONE, 1980, BASED ON
CLINICAL DIAGNOSIS (FEVER CASES)

VILLAGE NO	TOTAL	MONTH	TOTAL
1	1643		
2	1593	January	2783
3	2538	February	2780
6	1315	March	2542
10	8360	April	2584
11	963	May	2668
13	2409	June	2797
15	1581	July	3328
16	1618	August	4269
18	1499	September	4070
19	1422	October	3973
-		November	5708
21	1673	December	5632
		T O T A L	<u>43144</u>
22	1660		
23	1613		
26	1279		
27	1765		
28	2185		
29	2057		
30	2092		
31	1050		
33	1094		
36	443		
37	1292		
T O T A L	<u>43144</u>		

TABLE 13

REPORTED DIARRHOEAL DISEASES FROM HEALTH
UNITS IN RAHAD ZONE, 1980

VILLAGE NO	TOTAL	MONTH	TOTAL
1	594		
2	556		
3	1444	January	1475
6	363	February	1636
10	963	March	1883
11	59	April	2482
13	1021	May	2425
15	511	June	3143
16	454	July	3894
18	836	August	4176
19	531	September	3098
-		October	2528
21	1226	November	2945
22	1587	December	2135
		T O T A L	<u>31820</u>
23	2802		
26	2334		
27	2884		
28	2443		
29	3001		
30	3201		
31	957		
33	1652		
36	605		
37	1797		
T O T A L	<u>31820</u>		

TABLE 14

CHEMOTHERAPY OF MALARIA AND DIARRHOEA IN RAHAD ZONE

1980

Drugs used for malaria :

- Chloroquine injections	28,690	
- Chloroquine tablets	271,000	
- Chloroquine syrup	2,332	bottles (125 ml)

Drugs used for diarrhoea :

- Sulfaguanidine	257,500	tablets
- Tetracycline	17,542	capsules
- Kaomycine syrup	561	bottles (125 ml)
- Tetra syrup	782	bottles (125 ml)
- Glucose and normal saline	914	litres

TABLE 15
SNAIL SURVEYS IN RAHAD ZONE, 1980

Month	Block No. Before Treatment	No. of Canals Surveyed	No. of Lips	No. of Spots Positive	No. of Snails Collected			
					Biom.	Bul.tr.	Bul.f.	Melanoides
May	4	47	2000	109	434	512	146	0
June	1	29	1120	44	0	0	26	1472
	2	2	90	1	0	0	0	4
	3	18	460	1	1	0	0	0
	4	17	1500	31	0	0	28	0
	5	28	960	28	0	18	3	0
	6	30	670	30	10	66	4	0
<u>After treatment</u>								
June	4	28	1600	41	0	53	28	0
September	1	7	210	4	0	0	0	15
	2	24	1020	7	17	0	5	24
	3	22	620	1	0	0	15	0
	4	14	800	56	9	95	0	0
October	2	3	70	2	0	2	0	10
	4	13	520	25	0	93	0	0
November	2	17	560	41	4	0	180	120
	3	47	1060	25	1	0	32	35
	4	65	1400	154	1216	304	1112	10
December	1	78	2420	175	0	0	263	1129
	2	35	1020	50	336	30	221	127
	3	87	1990	70	3	3	53	91
	4	50	2660	59	210	270	82	0
	5	49	1860	31	0	51	11	17
	6	62	1760	32	34	25	93	0

TABLE 16
MOLLUSCICIDE CONSUMPTION AND VOLUME TREATED
IN RAHAD ZONE, 1980

MONTH	BLOCK NO.	AMOUNT OF BAYLUSCIDE USED IN LITRES	VOLUME TREATED IN CUBIC METERS
May	4	42	31,000
June	1	20	14,750
	4	42	30,750
	5	11	7,500
	6	13	10,750
July	-	-	-
August	2	0.3	250
September	1	2	1,000
	2	3	1,750
	3	0.3	250
	4	57	37,050
October	2	1	500
	4	20	14,500
November	2	16	12,250
	3	13	8,750
	4	30	21,750
December	1	54	40,250
	2	16	12,000
	3	14	9,450
	4	49	36,750
	5	18	11,700
	6	15	10,250
TOTAL		436.6	313,200

TABLE 17

SUMMARY OF DATA OF ANNUAL SPRAY ROUND FOR MALARIA CONTROL
IN RAHAD ZONE, 1980

SPRAYING OPERATIONS STARTED ON 17.6.80 AND FINISHED BY 30.6.80

Number of villages sprayed	50
Number of population covered	57086
Number of rooms sprayed	25781
Number of sq.m. sprayed	824,992 sq.m.
Amount of insecticide consumed	2,706,624 grams of D.D.T. of 75.w.d.p.
Technical dose to be applied	2 grams/sq.m.
Technical dose actually supplied	2.46 grams/sq.m.

TABLE 18

CONDITION OF WATER SUPPLY SYSTEM IN
RAHAD ZONE, OCTOBER 1980

VILLAGE NO.	SOURCE OF DRINKING WATER	CONNECTION	CONDITION
1	Filter	Public	Closed
2	"	"	
3	"	Public/Private	
4	"	Public	
5	"	"	
6	"	"	
7	"	"	
8	Well	"	
9	Filter	"	
10	"	Public/Private	
11	"	Public	
12	"	"	
13	"	Private/Public	
14	"	Public	
15	Well	"	
16	Filter	"	
17	"	"	
18	"	"	
19	"	"	
20	"	"	
21	Well	"	
22	"	"	
23	"	Public/Private	
24	"	Public	
25	"	Public/Private	
26	Filter	Public	
27	"	Public/Private	
28	"	Public	
29	"	"	
30	"	"	
31	"	"	
32	"	"	
Fau Town	"	Private/Public	Good

TABLE 19
CONDITION OF LATRINES IN RAHAD ZONE
OCTOBER, 1980

VILLAGE	TYPE OF LATRINE	USAGE	CONDITION
1	Pit	Public	Bad
2	"	"	"
3	"	Public/Private	"
4	"	Public	"
5	"	"	"
6	"	"	"
7	"	"	"
8	"	"	"
9	"	"	"
10	Water/System	Public/Private	Public Closed
11	Pit	Public	Bad
12	"	"	"
13	Water/System	Public/Private	Closed
14	Pit	Public	Bad
15	"	"	"
16	"	"	"
17	"	"	"
18	"	"	"
19	"	"	"
20	"	"	"
21	"	"	"
22	"	"	"
23	"	Public/Private	"
24	"	Public	"
25	"	"	"
26	"	"	"
27	"	Public/Private	"
28	"	Public	"
29	"	"	"
30	"	"	"
31	"	"	"
32	"	"	"
Fau Town	Water System	Private/Public	Good

CHAPTER III

GEZIRA-MANAGIL ZONE

1. Introduction

The Gezira-Managil Zone is the largest of the three project Zones and has long-established programmes for prevention and control of water-associated diseases, the most successful being the malaria control programmes. The Interim Strategy for this zone is to make basic, simple improvements in the existing programmes, awaiting the final Comprehensive Strategy which will be defined in the Study Zone.

Malaria control is presently based on :

1. an annual spraying of houses with residual insecticide in June and July, before the transmission season;
2. control of mosquito vector larvae from October through May and
3. treatment of infected persons.

In addition treatment is given to persons suspected of malaria infection, based on clinical diagnoses. Schistosomiasis control is based primarily on focal application of chemicals to kill the snails. Diarrhoeal diseases are not under a specific control effort but a large number of water-supply systems were constructed in the past with this as one objective.

2. Epidemiology

Malaria

Only malaria has been monitored to any extent in this zone, by annually testing 27 scattered villages every January and irregularly in October, and also by continuous diagnostic services in the various health units. The summary of January surveys for prevalence of malaria in children shows the impact of the control operations which began in July 1975, and indicates that the control programme is generally effective (Table 20 and Figure 5). The January 1980 survey indicated a prevalence of 1.6% in children, compared to 20.4% in January 1975 in the absence of control measures.

Another malaria evaluation system, the monitoring of slides for malaria parasites in blood (malaria slide positivity rate) takes place in 28 malaria laboratories with 21 microscopists. They are placed in 20 hospitals and 8 health centres, distributed throughout the irrigated area. All fever cases referred to the malaria laboratories are checked microscopically and treated accordingly (Table 21).

Schistosomiasis Diagnostic Services

A group of 28 schistosomiasis microscopists are distributed throughout the rural hospitals and some dispensaries. During 1980 46, 443 patients were microscopically examined and 20% were positive for schistosome eggs, the predominant parasite being Schistosoma mansoni.

For treatment of schistosomiasis, limited amounts of drugs are available in hospitals, health centres and dispensaries. The drugs at present used are:

Fuadin
Ambilhar
Etrezol
Bilharcid

Selection of 28 New Monitor Villages

In October 1980 a careful randomized selection was made of 28 new villages in the Gezira-Managil Zone, to be used for monitoring disease transmission during the coming 10 years of the project. These new villages are in addition to the previous 27 villages which have been monitored for malaria transmission in the past. The new villages were added to ensure that their selection was random. The total number was set at 28 to give roughly 2 villages for each of the 14 agricultural blocks.

The selection proceeded in 3 steps. First the total population was obtained for each of the 14 Agricultural Groups of the Sudan Gezira Board, using 1979 population figures from the annual malaria surveys (Table 22). Secondly, each of the 107 blocks (about 7 per group) was numbered and 1, 2 or 3 blocks selected from each group depending on its population size. A table of random digits was used for this selection of the blocks.

Finally, a list of all villages in each of the 28 selected blocks was obtained from the malaria survey records, and the villages were numbered. One village was selected from each block, again using a table of random digits. Thus the 28 villages were randomly located within the blocks and groups and also evenly distributed geographically with a density proportional to the human population.

These 28 new villages and the 27 old villages will be sampled for malaria in January 1981. If there is no significant difference in the results, then all 55 villages will be used in the future, with 1 new village added to give a total of 4 villages per Agricultural Group, making it possible to calculate mean and standard deviations for each group. The total sample size will still be quite small: 56/1,515 registered villages, or 3.6%.

C. Vector Biology and Control

The Gezira-Managil Zone has had a well-established mosquito control programme since 1975 and a snail control programme dating back to 1955.

1. Mosquito Control

Residual Spraying of Houses

Residual spraying of houses started on 20 June 1980 on schedule. Spraying was partially interrupted during Ramadan (15 July - 15 August), but after Ramadan the total area was finally covered.

The Gezira and Managil area is divided into 4 operational zones, each under a Zone Chief. Each Zone Chief supervises three Rural Councils. The Council is supervised by one public health officer and two sanitary overseers. The spraying campaign utilizes all the permanent labour force available in the Gezira, supplemented by daily paid spraymen.

The area showing resistance of the vector Anopheles arabiensis to Malathion was sprayed with Fenitrothion at 1 gm/m² and the rest of the area was sprayed with Malathion at 2 gm/m² (Table 23).

Larval Control

Larviciding was started in October using Abate 500 E applied at the target dose of 150gm/hectare. Chemical larviciding is mainly directed to the breeding places around the villages and in all the towns.

Larviciding is carried out by larviciding squads under the direct supervision of the public health officer and the sanitary overseers of each Council.

Monthly consumption of Abate 500 E is 340 litres. The total amount consumed in 1980 was about 2720 litres.

Entomological Evaluation

Entomological evaluation was based on monthly indoor vector density in 1980 (Table 24). During the first half of 1980 a high vector density was encountered only during February. Out of 20 localities surveyed during February, only one village was positive, with an exceptionally high vector density. This village has a high potential for mosquito breeding because of its location near a eucalyptus forest and fruit gardens. Such situations are normally encountered in the Gezira. Those localities with potential for continuous or permanent breeding should be detected and mapped in order to be given special attention in the future.

During the second half of 1980 and after the area was sprayed in July and August, a fairly low density was observed in August in the areas that had not yet been sprayed. However, after the whole area was sprayed, the vector density in the indicator localities remained at zero level during the subsequent months up to December.

Due to petrol shortage, most of the entomological observations were made in the Medina Arab Council which was sprayed with Fenitrothion.

Susceptibility tests conducted during February on An. arabiensis collected from Alam El Hudan locality gave an average mortality of 66% on 5.0% Malathion for one hour exposure (Table 25). Mortality on 1% Fenitrothion for one hour was 100%. Tests conducted in June in Wad El Shafae locality in Medina Arab Council gave 91% mortality on 5.0% Malathion.

2. Snail Control

The snail control operation in the Gezira-Managil Zone continued in 1980 as before. Copper sulphate, Frescon and Bayluscide were applied in a limited area within the Zone by the existing staff of the Gezira Province Schistosomiasis Unit.

The Schistosomiasis Unit is composed of the following staff:

- 1 Senior Public Health Inspector - Chief of the Unit
- 1 Public Health Inspector
- 2 Public Health Officers
- 1 Sanitary Overseer
- 5 Squad Leaders
- 136 Labourers
- 28 Microscopists

The unit has 5 functioning vehicles. The amount of molluscicides received during 1980 was:

- 10 775 litres of Bayluscide
- 75 tons of copper sulphate

In addition, some quantities of Frescon have been stored from previous years. The unit has carried out focal mollusciciding in the Gezira area using mainly Frescon and copper sulphate. During 1980, 45 tons of copper sulphate and 4757 litres of Frescon were applied around villages for focal treatment.

D. General

Water supply, sanitation and health services continued as before without any changes. Improvements will begin during 1981 if funding is obtained. Activities are severely hampered by lack of vehicles and equipment.

TABLE 20

PREVALENCE OF MALARIA IN CHILDREN OF GEZIRA /
MANAGIL ZONE FROM ANNUAL JANUARY PARASITE SURVEYS
1975-1980

YEAR OF JANUARY SURVEY	MALARIA PREVALENCE IN CHILDREN
1975	20.4%
Introduction of control programme in June 1975	
1976	3.4%
1977	2.6%
1978	0.1%
1979	0.6%
1980	1.6%*

* Slight increase in 1980 was due to delay in spray round caused by late arrival of insecticide shipment.

MALARIA PARASITE PREVALENCE IN CHILDREN

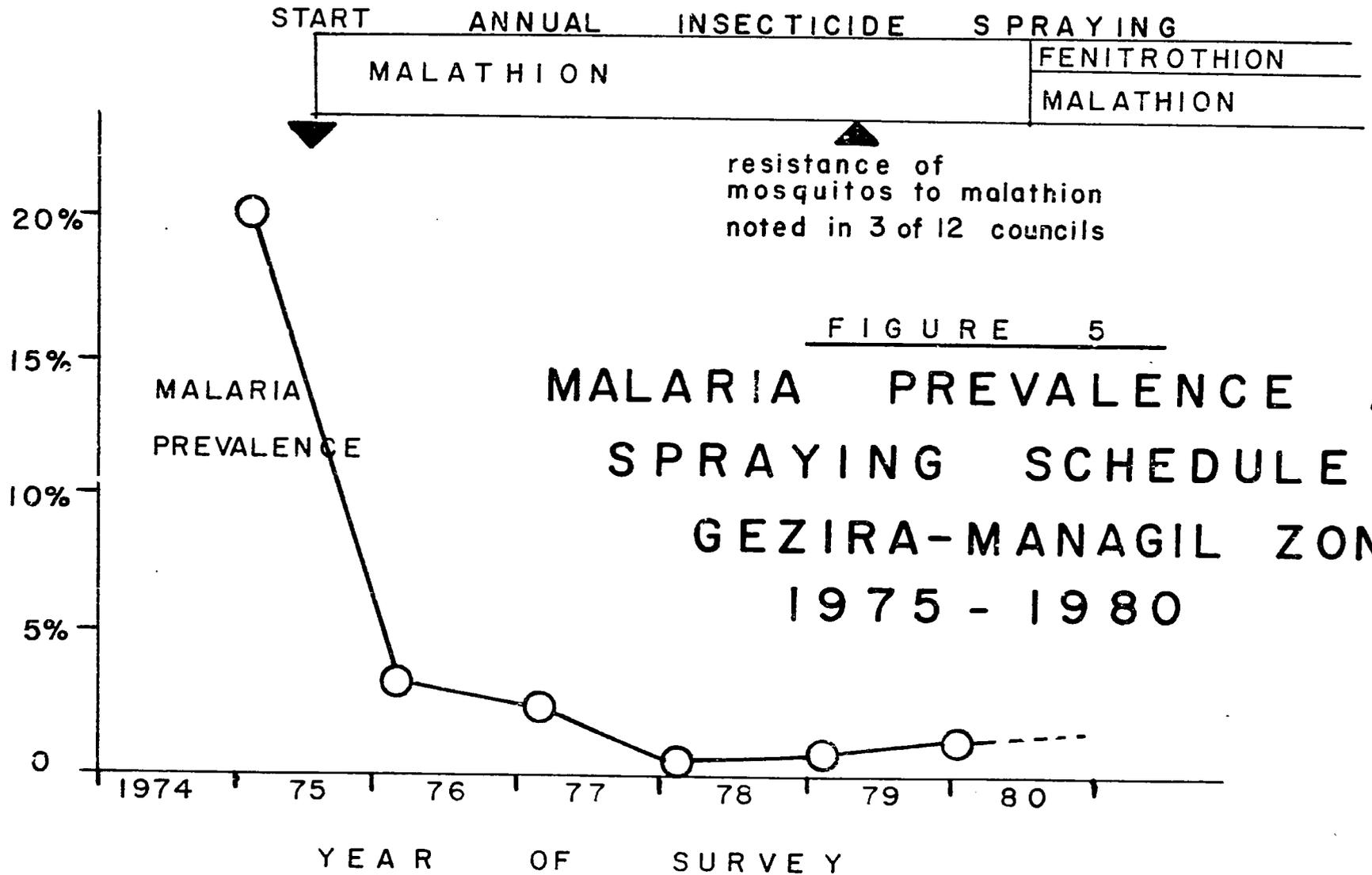


TABLE 21

MONTHLY SLIDE POSITIVITY RATE FOR MALARIA
IN GEZIRA - MANAGIL ZONE, 1980

MONTH	TOTAL SLIDES EXAMINED	POSITIVE SLIDES		PERCENTAGE POSITIVE
		P.F.*	P.V.**	
January	10797	235	2	2. 20%
February	12062	153	2	1. 28%
March	11776	124	1	1. 06%
April	10983	65	10	0. 68%
May	9121	30	2	0. 35%
June	9748	33	5	0. 39%
July	6346	15	3	0. 28%
August	6144	24	6	0. 48%
September	11470	141	6	1. 28%
October	8150	86	-	1. 05%
November	10829	108	-	0. 99%
December	9611	65	-	0. 67%
T O T A L	117037	1079	37	0. 95%

* P.F. = Plasmodium falciparum

** P.V. = Plasmodium vivax

NEW MONITOR VILLAGES SELECTED FOR
GEZIRA-MANAGIL ZONE, 1980

SUDAN GEZIRA BOARD AGRIC- ULTURAL GROUP	REGISTERED VILLAGE POPULATION IN GROUP 1979	RANDOMLY SELECTED BLOCK	RANDOMLY SELECTED VILLAGE	VILLAGE POPULATION 1979
South	120,660	Gobshan	Hilal Hassan	249
		Rimaitab	M.Ali	54
		Wad El Hadad	Wadi El Aros Shendi Fouq	199
Middle	125,542	Seed Farm	Mayo Abbas	563
		El Radma	El Shilaikh	685
		El Mandeena	El Bataheen	596
Masalamia	88,192	Wad El Nur	30 Wad El Nur	112
		Abdel Galeel	Wad Soliman	975
Wad Haboub	72,576	Istarihna	Managaza	2083
		El Rukon	Habeeb Allah Burgo	662
Wadi Shaier	81,528	Toris	Saleem	3219
		El Fawar	Agan	508
North	65,725	Um Dagursy	Tayba El Naiem	667
		Kab El Cidat	Four	502
North West	79,539	El Gwaiz	Al Laota	1508
		El Farageen	Habeeba	1410
El Mikashify	51,203	Abu Digin	Cambo WadHomeir	251
El Huda	49,514	Surhan	Cambo Salama	269
Wad El Mansi	53,486	Mabrouk	El Amara abdalkh	237
		El Gadeed	El Amara Karama- Ilah	634
El Tanameed	63,711	Baida	Um Dakat El Dar	1964
		El Swairif	Cambo WadEl Daly	140
Matoug	73,707	El Maturab	Matoug H.Q.	1161
		El Hashaba	Cambo David	384
El Matory	55,619	El Rahama	Cambo Mamoun	939
		Um Sinaita	Um Sinaita Block Office	132
El Gamusi	72,708	El Radi	El Radi	2187
		El Waha	Tayba Jabir	1588
14	1,053,710*	28	28	23878

* This population total excludes residents of towns and communities outside the irrigated area.

TABLE 23

DATA SUMMARY FOR ANNUAL MOSQUITO SPRAY ROUND
OF HOUSES IN GEZIRA-MANAGIL ZONE, 1980

Fenithrothion-Sprayed Area:

- Villages covered	239
- Population covered	124,488
- Rooms sprayed	112,711
- Total sq.m. sprayed	5,297,417 sq.m.
- Coverage	86.4%
- Fenitrothion consumed	13,729,375 grams
- Dose applied	1.03 T. gram/m ²

Malathion-Sprayed Area:

- Villages covered	1958
- Population covered	1,097,184
- Rooms sprayed	770,918
- Total sq.m. sprayed	36,233,146 sq.m.
- Coverage	82.2%
- Malathion consumed	157,607,000 grams
- Dose applied	2.2 T. gram/m ² .

TABLE 24

ADULT VECTOR DENSITY OF ANOPHELES ARABIENSIS
IN THE GEZIRA-MANAGIL ZONE, 1980

MONTH	NO. OF LOCALITIES SURVEYED	NO WITH MOSQUITOES	NO OF ROOMS SEARCHED	TOTAL MOSQUITOES COLLECTED	DENSITY/ ROOM
January	32	1	320	22	0.07
February	20	1	237	530	2
March	25	0	250	0	0
April	21	0	210	0	0
May	22	0	220	0	0
June	12	0	120	0	0
July	-	-	-	-	-
August	12	8	125	113	1
September	10	0	100	0	0
October	5	0	50	0	0
November	10	0	100	0	0
December	16	0	150	0	0

TABLE 25

INSECTICIDE SUSCEPTIBILITY TESTS OF ANOPHELES
ARABIENSIS IN GEZIRA-MANAGIL ZONE, 1980

DATE	INSECTICIDES AND DOSAGE	EXPOSURE PERIOD	NO TESTED	NO DEAD	% DEAD
February	Malathion 5.0%	1 hour	75	50	66%
	Fenitrothion 1.0%	1 hour	75	75	100%
	Control	1 hour	50	0	0%
June	Malathion 5.0%	1 hour	34	31	91%
	Control	1 hour	12	0	0%

CHAPTER IV

THE STUDY ZONE

A. Introduction

The Study Zone, Blocks 26 and 27, is an area of 50 000 feddans between Hasaheisa and Abu Ushar in which the Comprehensive Strategy will be evaluated. It includes 111 villages and a population of about 50 000 people (Figure 6). Activities in the Study Zone during 1980 were aimed at the establishment of facilities in preparation for a year of baseline studies on epidemiology, socio-economics and agricultural activities, and also initiation of data collection in three of the monitor villages which will be given intensive study.

B. Epidemiology

The primary activities during 1980 in the Study Zone were the geographical reconnaissance, mapping and census taking of the villages. By the end of December, 17 villages out of 111 had been sketch-mapped with numbering of the houses and a basic population count. Also precise maps of 8 other villages were obtained from the Town Planning Department of Gezira Province (Table 26). The geographical reconnaissance, mapping and census activities are being continued in 1981 with the goal of completion by the end of June.

A biological and parasitological monitoring programme was initiated in the three Intensive Study Villages, Tayiba Sheikh El Qurashi, Dolga and Gad El Ain/Awlad Yousif, in order to obtain information on the focality of schistosome transmission (Figure 6). The field work began in December 1980 with support from a grant of WHO Special Programme for Tropical Disease Research (TDR). After establishing monitoring activities in these three villages they will also be used as field training centres for new personnel. The new personnel will begin the same activities in an additional 17 villages, completing the total of 20 villages to be continuously monitored during the duration of the project.

The staff assigned to live and work in the three Intensive Study villages were:

Tayiba	-	Ahmed Babiker
Dolga	-	Dr. Asim Dafaalla
Gad El Ain	-	Paul K. Manying

Parasitological samples were collected and examined from about 1000 of the inhabitants of these 3 villages by the end of December 1980, the remaining 5 000 being collected in 1981.

C. Chemotherapy

One of the new drugs for schistosomiasis to be used in the Comprehensive Strategy in the Study Zone is Praziquantel, a product of the Bayer Company. It has been thoroughly evaluated clinically, thus it was ready for a trial to evaluate acceptance by local communities in the Study Zone. The trial was conducted in Angado Village of Block 26 and two small labour camps, T 16 and T 17, previously evaluated epidemiologically. About 2 000 persons gave faecal and urine specimens for diagnosis, and over 600 were found to be infected with Schistosoma mansoni or Schistosoma haematobium. A complete dose of 40 mg/kg of Praziquantel was given to 553 of those found infected. Follow-up examination showed a parasitological cure rate of over 90% after 1 month. The general toleration of the drug was good and it appears to be accepted by the local people for wide-scale use.

D. Training

In the Research and Training Unit, operating primarily in the Study Zone and the Khartoum Laboratories, the following post-graduate students were receiving training:

	<u>Purpose of Training</u>
1. Ahmed Babiker M.Sc.	Ph.D.
2. Dr Suad Suleiman - in USA	Post-doctorate
3. Paul Manying M.Sc.	Ph.D.
4. Wadida Suleiman	M.Sc.
5. Samia Karib	M.Sc.
6. Khalid Karoom	M.Sc.

Also Dr Asim and Samia Karib studied malacology in Denmark for three months.

In 1979 and 1980 ten of the field staff of the schistosomiasis Unit were trained as microscopists and then worked in the Rahad Zone. A series of courses have been held in which over 20 public health inspectors have received training in schistosomiasis epidemiology and control. Two of these inspectors also attended the malacology training course in Denmark. In-service training was started for mollusciciding also.

E. Research

The initial monitoring of the focality of schistosome transmission was begun in December 1980 under a WHO grant from the Special Programme for Research and Training in Tropical Disease Research (TDR).

Papers and Reports

1. The assessment of a large-scale snail control programme over a three-year period in the Gezira irrigated area, Sudan, by Amin, M.A.; Fenwick, A.; Teesdale, C.H.; McClaren, M.; Marshall, T.F. de C. and Vaughan, J.P. (Accepted for publication by Annals of Tropical Medicine and Parasitology).
2. Assessment of the Sensitivity of Plasmodium falciparum to Anti-malarial drugs at Sennar, Sudan : Use of the in vitro microtechnique and the in vivo method. By Kousnetzov, R.L.; Rooney, W.; Wernsdorfer, W.; El Gaddal, A.A.; Payne, D. and Abdalla, R.E. WHO informal publication.
3. The role of Field Irrigation Canals (Abu Eshreens) in the Transmission of Schistosoma mansoni in the Gezira Scheme, Sudan. By Fenwick, A. and Asim, M.A. (Accepted for publication by the WHO Bulletin).
4. Entomological, Toxicological and Epidemiological Evaluation of large-scale spraying of Fenitrothion 1 gm/m² in the Gezira. By Dr A.M. Haridi, presented at the Tenth International Congress of Tropical Medicine and Malaria, Manila, Philippines, November 1980.
5. Marking snails with nail varnish as a field experimental technique. By Fenwick, A. and Amin, M.A. (A draft research note).
6. Ecology of snails in major and minor canals in Gezira. A report by Fenwick, A. and Amin, M.A.
7. Schistosomiasis among three labouring communities in the Gezira Irrigated Area, Sudan. By Fenwick A.; Cheesmond A.K.; Kardaman M.; Amin, M.A. and Manying, P.K. (A draft paper).
8. The acceptability of Praziquantel in a mass chemotherapy campaign against schistosomiasis in Gezira. By Kardaman M.; Fenwick A.; and Amin M.A. (In preparation).
9. Host parasite relationship between S. mansoni miracidia and the intermediate host Biomphalaria pfeifferi under laboratory and field conditions, M.Sc. Thesis by Ahmed Babiker (University of Khartoum, August 1980).

STUDY ZONE

FIGURE 6

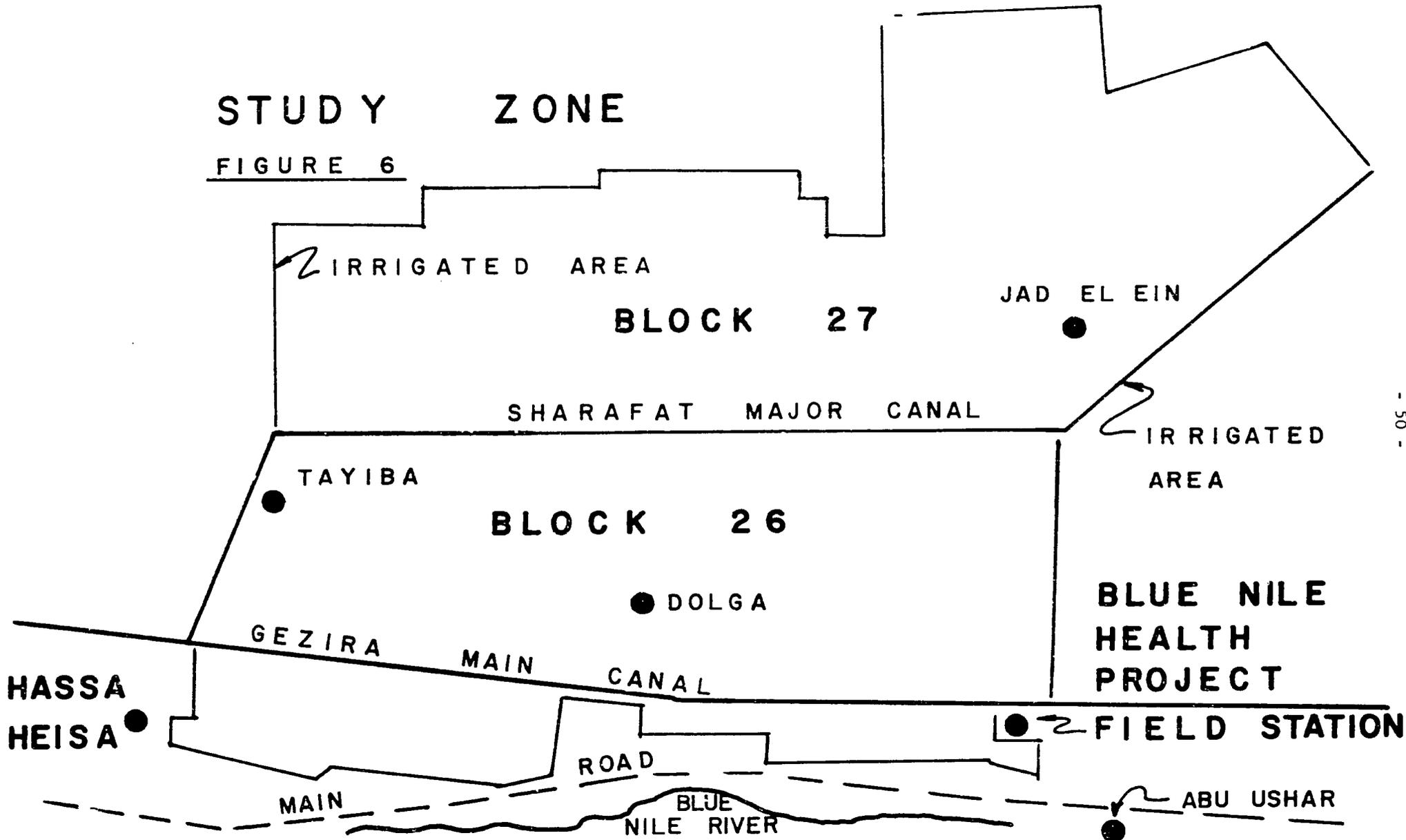


TABLE 26
LIST OF VILLAGES IN THE STUDY ZONE, 1980

NO	VILLAGE	EPIDEMIOLOGICAL STRATUM	SAMPLING CATEGORY
<u>Dolga Block</u>			
1	Tayiba Sheikh El Gurashi	Core	Intensive study
2	Saddaga	Road	Monitor
3	Abu Frua	Road	-
4	El Bataheia	Road	-
5	Ganneb	Road	-
6	El Shaurab	Road	Monitor
7	Al Kua	Road	Monitor
8	Al Talbab	Road	-
9	Mustafa/Gurashi	Core	Monitor
10	El Timeid	Core	Monitor
11	Takala El Gurashi	Core	Monitor
12	Sheikh El Basir/Hag Assaid/ Zarug	Core	Monitor
13	Huleila	Core	Monitor
14	Dolga	Core	Intensive study
15	Angado	Core	-
<u>Istarihna Block</u>			
16	Sharafat	Core	Monitor
17	Managaza	Core	Monitor
18	Abu Seir Al Hogzab/ Abu Seir Al Shenainab	Fringe	Monitor
19	Istarihna Jadida	Core	Monitor
20	El Turush	Fringe	Monitor
21	Katfia/Safya	Fringe	Monitor
22	Toba	Core	Monitor
23	Wad Battaro	Core	Monitor
24	Wad El Amin	Core	Monitor
25	Jad El Ein/Awlad Youssif	Core	Intensive study
26	Takala Gubara	Fringe	Monitor
27	Dar El Messeamia	Fringe	-
28	Shukeiras	Fringe	-
29	Wad Shencina	Fringe	-
30	Qoz Abdel Salam	Fringe	-
31	En Negarab	Fringe	-

TOTALS : 15 core villages, 7 road villages, 9 fringe villages

CHAPTER V

ADMINISTRATION AND FINANCE

Administration Unit

The Administration and Finance Unit is directly attached to the Office of the Project Manager, responsible for general management, budgeting, facilities, personnel and purchasing.

A. Management

The Blue Nile Health Project of the Ministry of Health is under the control of the Minister of Health who presides over the Coordination Committee, including representatives of the Ministries and Departments concerned. (See organizational chart, Chapter 1).

The National Coordination Committee, the principal body for national management of the Project, held its inaugural meeting on 9 December 1980 and passed the following resolutions:

1. Due to the importance of the project, it should be run as a corporate body.
2. Each of the Departments or Ministries concerned should list its requirements related to the Project in the coming budget for 1981/1982 under a separate heading marked "Blue Nile Health Project".
3. Each Ministry or Department concerned should name a responsible employee to be the Liaison between it and the administration of the Project.
4. The Project should contact the Ministry of National Planning to allocate funds for construction of stores for the Project.
5. The Project should contact the Ministry of Agriculture to allocate one of their stores temporarily to the Project.
6. The Project should forward to the National Administration of Water Supplies, the Project plans to improve water supplies in the different villages in the Project area, for inclusion in the National Plan.
7. The Project should have a representative on the National Committee for Water Supplies who can advocate Project needs.
8. The Committee should direct those concerned to contact the representatives of WHO, UNDP and UNICEF to secure hard currency for the necessary spare parts for water supply systems, in exchange for local currency at official exchange rates.

B. Funding

Evaluation for 1980

The first meeting of the donors was in February 1980 with informal pledges of US \$ 5.5 million, followed by a further informal pledge during the year of US \$ 2.5 million, sufficient to meet the foreign currency requirements for 1980 - 1982. However, by 1983 the Project will need an additional US \$ 5 million each year and by 1985 an addition of US \$ 8 million will be needed annually.

The following table shows the aid received and the potential pledges as of 31 December 1980:

	<u>Aid received by 1980</u>
WHO	US \$ 320 000
UNEP	US \$ 206 000
Japanese Grant	US \$ 1 800 000
	<u>Pledges</u>
USAID	US \$ 2 123 000 (signed February 1981)
UNDP	US \$ 1 100 000
Arab Fund for Economic Develop- ment	US \$ 1 000 000
Kuwait	US \$ 1 500 000

C. Accommodation

The activities of the administration unit started by seeking approval for buildings at the Headquarters of the project and the creation of posts for the necessary staff. Eight offices and two laboratories were built near the existing schistosomiasis research laboratory in the Agricultural Research Station at Wad Medani. In addition overall maintenance was given to the existing schistosomiasis laboratory. House construction in Barakat was started and of three new houses one is completed, the second is being finished and the third is at roof level.

In addition to these new buildings, which cost approximately LS. 300 000 the Province authorities allotted three houses for the lodging of the administration officer, the malaria epidemiologist and the irrigation engineer. At the same time the Managing Director of Gezira Scheme welcomed the residence of Dr Gaddal, Project Manager, in one of their Senior Houses in Barakat.

D. Supplies and Equipment

Supplies and Equipment Received During 1979

1 Toyota Station Wagon
Laboratory and Office Supplies
Photocopy Machine
Desk Calculators

Supplies and Equipment Received During 1980

1 Toyota Station Wagon
3 Refrigerators
1 Air Conditioner
5 Typewriters
6 000 gm Oxamniquine
10 Microscopes

CHAPTER VI

PLANS FOR THE FUTURE

The Blue Nile Health Project is firmly established, with a basic budget and Headquarters provided by the Government of Sudan. Sixteen senior scientists and supervisory personnel from the Government of Sudan are working on the Project and secondment has been approved in principle for the final three senior staff members. The Project has also received external financial support to cover many of the planned activities for the next four years, and there are good prospects for continuation to the ten-year goal. The Government intends to continue the Project and most of the needed funds appear to be forthcoming.

External Assistance

The present situation regarding external aid is very encouraging; however, the project is pursuing the possibility of obtaining additional support from International Donors; as follows:

1. The Minister of Health is planning to visit Gulf States in 1981.
2. Efforts will be made to renew the Japanese Grant for another year.
3. The Government of the Federal Republic of Germany will be approached for support, particularly for the supply of schistosomiasis drugs and molluscicides.
4. It is confidently expected that the World Food Programme assistance will begin in 1981.
5. The UNDP promised assistance will be finalized in 1981.
6. The IBRD support will be negotiated with the Gezira Rehabilitation Planning team during 1981.

Plans for 1981

The contemplated activities for 1981 are well underway and will be accomplished in each Zone as follows:

Rahad Zone

The Second Annual Epidemiological Survey will be initiated in May to determine the prevalence of the three diseases and to monitor transmission of schistosomiasis. The Emergency Control Strategy will continue until results of the Second Survey are analysed and an Interim Strategy is developed for the period up to 1984.

Gezira-Managil Zone

The First Annual Epidemiological Survey will be conducted to establish geographical distribution of the diseases and to monitor changes throughout the duration of the Project. The Interim Strategy will be continued, adding improved mollusciciding, water supply and sanitation health education, strengthening of health services, and diagnosis, and chemotherapy in the North Gezira Group.

Study Zone

The First Annual Epidemiological Survey will be completed and the first year of pre-treatment baseline surveys carried out by all Units. The Trial Comprehensive Strategy will be developed for implementation after July 1982 when the baseline surveys are completed.

Now that the USAID grant for schistosomiasis research in the Study Zone has been concluded, it will help a great deal in carrying out the work. Several scientists will be recruited under the USAID grant to carry out special research activities on weed problems, pest management, sociology, economy, schistosomiasis transmission and epidemiology.

Computer simulations of alternative strategies for malaria control in the Study Zone will be developed in June 1981, during the visit of Dr Molineaux and Mr Thomas from WHO.

In conjunction with the American consultant from CDC, Dr J. Hughes, Dr Omer Tameim, Epidemiologist, will develop a plan for assessing the diarrhoeal disease problem and developing the control strategy for the Study Zone.

Research

Pilot research projects will be completed on:

1. The use of machinery for weed control in canals
2. The control of schistosomiasis transmission by focal mollusciciding
3. The use of low dosage of Oxamniquine for schistosomiasis treatment
4. The use of biological agents for vector control
5. Community organization methods
6. Health education materials and methods
7. Alternative water supply and sanitation systems.

Training

The major training effort will be for fifty new microscopists to be assigned to the North Gezira dispensaries for improved diagnosis and treatment of the three diseases. Also, international meetings will be initiated to inform neighbouring countries as well as donors of the results obtained from the Project and potential applications to their own countries.

Plans for 1982 - 85

Implementation of the Trial Comprehensive Strategy will be carried out in the Study Zone and monitored annually. The Interim Strategy for the Gezira-Managil Zone will be extended over additional areas, moving from the North Gezira Group to the South at about one Agricultural Group per year, if funds permit. In the Rahad Zone the Interim Strategy will be instituted and means developed for dealing with the large transient population.

Plans beyond 1985

After full coverage of the Gezira-Managil and Rahad Irrigation Schemes by the Comprehensive Strategy, the Blue Nile Health Project will develop similar strategies for control programmes in other water resource schemes in Sudan. Also, in cooperation with international agencies, the Strategy will be developed or extended to similar situations in other countries with the goal of providing enduring and effective control of these water-associated diseases throughout Africa and the Middle East. Thus the international supporters of this project, who have contributed so much in technical and financial assistance, will ultimately benefit from the experience and information generated by the Project. The staff of the Blue Nile Health Project are proud to be part of this international effort to improve health and agricultural productivity in these critical areas of the tropics.

General Map of the Blue Nile
Health Project Location

