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NEPAL

MULTIDONOR REVIEW OF

MALARIA CONTROL PROGRAM

March 10 - April 4, 1986

by

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Author

Alan L. Steffen, M.Sc., is an independent consultant. He worked for the Agency for International Development for more than twenty years as a medical entomologist. He served as chief malaria advisor to the governments of Thailand, Indonesia, Nepal, Ethiopia, and Pakistan.

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Note

The report of the Situation Analysis Team is contained in Annex 1.

OBJECTIVE

During the period of March 10 to 26, 1986, a Situation Analysis Team (SAT) met in Nepal to evaluate the progress, or lack thereof, of the Nepal Malaria Eradication Organization (NMEO) during the period of 1984-1985 or that period which had elapsed since the last SAT assessment of the malaria program in July 1984.

MEMBERS OF THE SITUATION ANALYSIS TEAM

The team was led by Dr. B. R. Pande, Chief of the Planning Division, Ministry of Health, His Majesty's Government of Nepal (HMG). Other team members were Dr. E. Onori, Chief, Epidemiology Methodology and Evaluation Unit, WHO/Geneva; Dr. David Muir, Entomologist, Malaria Action Programme, WHO/Geneva; Dr. C. C. Draper, Professor, London School of Hygiene and Tropical Medicine, and the writer, Alan L. Steffen, USAID/VBC Consultant.

GOALS OF THE SITUATION ANALYSIS TEAM

Goals of the SAT were as follows:

1. To evaluate current malaria control activities in Nepal as a member of a multi-donor team, with emphasis on elucidating those epidemiological, entomological and/or programmatic factors which will be most important in influencing malaria transmission over the medium term;

2. To estimate various possible levels of resources both, from the government of Nepal and foreign donors, which might be available to control malaria over the medium term;

3. To make recommendations regarding control strategies which can be implemented at different levels of resource availability; and

4. To collaborate on a written report to the government of Nepal and donors.

ACTIVITIES

The team visited 17 NMEO districts. These included those of Kailalo/Kanchanpur in the Far West and Morang, Jhapa, Sansari, Illam and Siraha in the Far East. These most distant areas in Nepal had been reported to have experienced large numbers of malaria cases.

Field time was severely limited, but the team tried to cover the worst trouble spots as well as those integration and NMEO areas where no significant problems had been reported in the recent past.

In the course of discussions between the team members and officials of USAID/Nepal and the Nepal Malaria Organization, the team learned that large quantities of insecticide would be unavailable at least for the next three to four years. The team decided that in addition to the usual technical recommendations, some thought should be given to alternative control measures that do not rely heavily on the traditional, broad average of households with insecticides.

PROGRESS OF NMEO PROGRAM

As the following table indicates, Nepal as a whole has experienced a rise in malaria cases in the past five years. Incidence of P. falciparum has increased during the past five years, with significant increases in the past two years.

	Cases	
Year	Total	P. falciparum
1981	16,087	716
1982	16,902	1,068
1983	16,719	1,885
1984	29,419	5,568
1985	42,321	7,497

The SAT-86 made the following comments with regard to the malaria situation in Nepal for 1984 and 1985. "There has been a definite deterioration in the eastern and the western regions and an even greater increase in the Mid-Far West where significant epidemics occurred in 1985. The prevalence of the more deadly form of malaria parasite, Plasmodium falciparum, was also highest in the Midwest and Far West. A total of 51.9 percent of all cases in Nepal were also in the Mid/Far West where P. falciparum accounted for 72.9 percent of the total cases."

As far as surveillance activities are concerned, Active Case Detection (ACD) accounted for 25.1 percent of all cases. The slide positive rate (total positives/total slides) was highest in Passive Case Detection (PCD) - (ACD-1.5% vs PCD 15.8%). The implications are that the high costs of ACD are not justified by the value and quantity of the data collected.

OBSERVATIONS OF THE SAT-1986

All of the observations and recommendations are covered in the formal SAT-1986 report. The writer will attempt to highlight only those which might have the greatest relevance to in USAID planning.

1. The entomological data supplied to the team was for the most part incomplete. In many cases, too few insecticide susceptibility tests had been done, and then they were confined to only DDT and malathion. The vectorial role of the DDT-resistant anophelines - A. subpictus, A. culicifaces and A. annularis is largely unknown, particularly in the potentially epidemic areas of Far West Nepal. No entomological data at all was available for integration districts.

2. In spraying operations, the lack of insecticides means NMEO will have to adjust its spraying operations to those areas of most critical need. It may be necessary to modify coverage or timing to conserve insecticide.

3. The Hetauda Research and Training Center functions well as a training center, but needs additional facilities such as training space and hostels.

4. There are a number of new techniques available in vector-borne disease control which have not been used in Nepal. Some of these are sporozoite detection using monoclonal antibodies, blood meal determination, and cytotaxonomic techniques.

5. A shortage of primaquine during 1984 prevented many malaria patients from receiving needed radical treatment. The shortage was not countryside, but it did cause many people to refuse to have blood films made without getting an anti-malaria drug.

6. Little information is available on various aspects of NMEO's programs, including rising trends of malaria incidence, population movement, ecological changes, the spread of P. falciparum, and the role of chloroquine resistance in P. falciparum.

SPECIFIC RECOMMENDATIONS

1. A larger role should be assigned to surveillance activities in laboratory diagnosis, case finding, and treatment. Additional microscopes and laboratory equipment are needed.

2. The malaria program should be given permanent status and eventually made a part of a larger program to control vector-borne diseases, including Japanese B encephalitis.

3. Efforts should be made to clarify the epidemiological and entomological situations in the explosive areas of the Far West.

4. Entomological data collection needs to be expanded, particularly regarding testing for insecticide susceptibility and vectorial capacity. Gaps in entomological data from integration areas need to be filled.

5. Newer techniques in sero-epidemiological and vector incrimination need to be introduced following the re-training of personnel.

6. The HMG must make a concentrated effort to locate funding from all possible sources for future supplies of insecticides.

7. The HMG and NMEO must develop a sense of urgency regarding the critical malaria situation in the Far West and to a lesser degree to similar areas in Far East Nepal.

GENERAL COMMENTS

This will be the Ninth Malaria Assessment that the writer has served on either as a observer or as a team member since 1966. The 1986 SAT was also one of the better teams with which he has had the privilege of serving. There was an excellent spirit of cooperation between the various agencies involved. The results and recommendations were a real team effort, rather than one group attempting to force its dogma upon another.

Unfortunately, it is often difficult to point to specific instances where the team report can actually result in changes in the program. It seems that with each team the report is prepared and presented to a polite audience. A few noncommittal remarks

are made, and the report is put in the files and forgotten until the next team comes around in two years. This is not to say that the SAT has no value. It does. You can consider the present team and its observation that parts of Nepal can look forward to explosive malaria. However, one can only point out the problem and give some possible solutions. It is the Government of Nepal that must ensure that things get done.

SCOPE OF WORK - USAID/NEPAL

Upon completion of the international assessment of the malaria program of Nepal, the writer was asked to devote an additional week to work within the USAID mission, primarily with officials in Health and Family Planning (HFP) Section. Specifically the tasks assigned were:

- To provide a summary of the multidonor team report, with particular emphasis on aspects of greatest potential interest to USAID;
- To confer with USAID Health staff on use of available Project Development and Support (PD&S) funds to support control strategies as outlined in report; and
- To advise USAID on possible support for malaria control under a follow-up H/FP project in FY 88 and/or under the VBC Project.

History of USAID Involvement in NMEO

Since the Insect Borne Disease Control Project began in 1953, the USAID has played an important role in the Nepal Malaria Program. The peak of this involvement was from 1966 to 1971 when there were seven American advisors (entomologists, epidemiologists, administrators, sanitarians, and a vehicle maintenance specialist). In 1971, the level of positive cases dropped to approximately 2500 cases, and advisory and financial assistance was rapidly cut back. It seemed that, in fact, that by 1971, the Nepal Malaria Eradication Organization (NMEO) was coming close to reaching its goal of eradication. DDT spraying was discontinued in 90 percent of the covered areas. By 1972, most of the USAID support had been withdrawn or concentrated in other aspects of the health services, such as an integration project where several District Health and Family Planning activities were united under one organization for administration and management. By 1986, a total of 26 districts had been at least partially integrated and had taken over malaria control activities. The NMEO continued its malaria control efforts in 14 districts.

By 1973, the relatively effective control program began to break down. The reasons were many and complex. In addition to reduction of spraying, there was a massive migration of workers to and from India, widespread drug and insecticide resistance, and incrimination of new mosquito vectors (A. annularis and A. maculatus). By 1974, there was a total of 14,000 cases. During the period from 1981 to 1983, the positive cases apparently had stabilized at approximately 16,000 cases, leading to a theory that the malaria case rise had leveled off and might remain at that level indefinitely. This was a false hope, for in 1984 the number of cases had doubled to approximately 30,000 and the full year of 1985 showed 42,235 cases. Even at present there are indications of a rapid rise of positive cases in 1986 particularly in the Far West and the Far East.

Plans and Goals of the NMEO

The chief officer of the NMEO briefed the Situation Analysis Team on the program's future plans, which are:

1. To adhere to current goals, i.e., prevention of mortality and reduction of morbidity of malaria;

2. To increase cooperation with other HMG sectors;

3. To improve participation of the population through programs of health education;

4. To continued to monitor sensitivity of P. falciparum to available drugs;

5. To investigate alternative, less costly methods of control; and

6. To monitor the entomological aspects of the program, particularly changes of vector capacity and susceptibility.

The Government of Nepal, and to a lesser extent, any of its donor agencies must decide what level of malaria transmission the country can tolerate. The effects of the disease on agriculture, as witnessed by the development of the Rapti Valley following malaria control, are known, but there are also less obvious impacts on industrial development and tourism.

THE FUTURE ROLE FOR USAID

There are various ways in which USAID could participate in any future malaria program.

Insecticide

In the past, the USAID has been a major (and often the only) provider of insecticide. Current funding, though, calls for only 300 metric tons of malathion to be provided each year in CY 1986, 1987 and 1988. While it may be possible to maintain the program at its present level, the insecticide certainly would be used up rapidly under epidemic conditions. With a lead time of nine months, it is unlikely that a sufficient supply, at least of malathion, could be sent to Nepal in time to blunt an outbreak.

The WHO has provided 200 metric tons of DDT for 1986. There are no definite plans as yet for procurement of additional supplies. The report of the SAT-86 states that the Overseas Development Administration provided 94 metric tons of Ficam for 1985-86 at a cost of $2.82 million. This contribution, as well as some training in British Institutions, may be repeated in future years.

India produces both DDT and malathion, and seems to be a logical source of insecticides, particularly as malaria can flow back and forth across the countries' common border. To the knowledge of this writer, this source has not been actively pursued by the Government of Nepal.

Future levels of USAID assistance are unknown, but USAID could provide limited amounts of insecticides, subject to availability of funds. Limited amounts of insecticide could best be used in field trials against specific vectors or in potential outbreak areas or, USAID could provide an emergency supply of insecticide for use during a widespread outbreak. Considering the lead time on such a shipment, the insecticides could be supplied by direct purchase, shipped by air, or borrowed from vector-borne disease control programs in nearby countries. A precedent for the latter occurred when insecticide destined for Sri Lanka was sent to Nepal to fill an urgent need.

Research and Training

From discussions with USAID/Nepal health officers and with Dr. Lawrence Lacey of VBC, (see Annex for short description of VBC) it would appear that there are three obvious sources within USAID for assistance to the malaria program in Nepal.

Bilateral Project Funds

There are $50,000 available to the NMEO program from project funds for the next two years. USAID/Nepal staff has suggested that these funds be used to improve the quantity and quality of surveillance through the utilization of ex-NMEO personnel who either had retired early or had been cut in reorganization cut-backs.

Improvement of surveillance activities is one of the major recommendations of the SAT-86. Use of personnel, including retired or out-of-service soldiers, already trained in malaria control principles is one way to increase surveillance coverage. A part of the funds also could be utilized to expand the village health volunteer system.

Use of VBC in Research/Training Inputs in Far West Epidemic Areas

The lack of accurate data for most phases of the malaria program continues to be a serious problem. For example, after 27 years of malaria control efforts, it still is not certain whether certain anopheline mosquitoes are malaria vectors. As a case in point, large populations of A. culicifacies and A. maculatus are often found in areas of malaria outbreaks, although they are not incriminated as vectors. The susceptibility of the major vectors to insecticides other than DDT or malathion has never been established. The role and area covered by P. falciparum has been hinted, but never established. While the answers to these questions for some parts of Nepal would be welcome, for the Far West, they are critical.

The VBC could play a major role in research and training. Notably, it could help determine some baseline data in the Far West which would assist Nepal, and possibly other countries, in dealing with similar epidemic malaria.

Use of PD&S Funds

It has been suggested by the USAID/Nepal health staff that a one time input of $30,000 could be used by the malaria program. One idea is to use the funds to study the effectiveness of alternative insecticides to DDT and malathion. It is also possible that a cooperative project, perhaps with the British and FBC Limited (producers of Ficam) could be worked out.

The above are only some of the potential approaches to research projects. Other areas of importance to the malaria program are:

1. Indirect florescent antibody tests as a supplement to microscopic examination of blood films. The SAT-86 estimates that the total cost for setting up a sero-epidemiological laboratory, including training for a microscopist, would be about $20,000;

2. Population movements;

3. A study of the vectors associated with the rise in malaria incidence, such as ecological changes due to irrigation and deforestation, and effects of insufficient spray coverage;

4. Reestablishment of entomological baseline data, susceptibility tests, and utilization of larvivorous fish; and

5. Studies of chloroquine resistance of P. falciparum.

The Hetauda Training Center

This writer understands the reluctance of the USAID when it comes to construction of buildings, but nevertheless, he suggests that the improvement of the training facilities at Hetauda should have some priority. It would not have to be a big fancy building such as USAID has constructed in other projects. The SAT-86 members visited the Hetauda facility, and found that it was doing an excellent job with despite primitive and overcrowded facilities. The staff is capable and the courses given are badly needed. In 1984, a total of six basic and refresher courses involving malaria control were given to 123 students. In 1985, a total of 159 people were trained by both the integration and the NMEO organizations. In addition to training, two entomological teams are working in the field in spray and non-spray areas and in connection with the environmental area study in East Nepal.

It is understood that there are not sufficient funds available for construction and improvement of the facilities at Hetauda. It is, nonetheless strongly suggested that improvement of the training facility be given some consideration in future fiscal planning. Even if construction costs are not presently available, it is possible that USAID could provide needed equipment or books.

Epidemic Malaria

Nepali officials and the international community expressed their concerns about the malaria epidemic now occurring in the far western part of Nepal. While the epidemic is not specifically covered in the terms of reference, the writer

believes that some comments should be made concerning the outbreak and its possible ramifications.

As early as 1977, local outbreaks were occurring in the far western area of Kanchanpur. According to the January 3, 1986 report of the USAID Malaria Advisor, this same area had a total of 7,118 cases in 1985 (3,000 cases during the month of September alone). This was a 180 percent increase over the previous year, during which there were 2,541 cases. The case load in the entire Far West shows the following trends:

	1983	1984	1985
Darchula	0	6	295
Baitadi	29	131	1,263
Kanchanpur	431	2,541	7,118
Kailali	532	1,606	4,648

While the Kanchanpur area shows the most marked increase, all four areas show an increase in positive slides.

To deal with the situation, the NMEO elected to spray the most highly positive villages (100,000 total population) using DDT against the sole known vector, A. fluviatilis. In the cases cited by the USAID Malaria Advisor's report, it appeared that in localized areas, DDT played no role in reducing malaria. While this matter was discussed with the SAT-86, the consensus was that there was just not enough data to justify any change in plans. For example, entomological data is too incomplete and inaccurate, susceptibility tests are too few and confined only to DDT and malathion, and there are no entomological data at all from the integrated areas of Darchula and Baitadi. Unofficially, one team member said that malathion might be tried in some limited areas, but that the Far West is largely unknown as far as actual vectors, susceptibility, and drug responses.

Answers to several questions are required if one is to predict resource needs for the next several years of the malaria control program. Will the development of P. falciparum resistance to chloroquine expand rapidly through Nepal? Will insecticide resistance develop or expand among the several mosquito vectors? Will the surveillance and drug treatment system be sensitive enough to reduce the need for widespread insecticide coverage? Will training be sufficient to meet needs for qualified surveillance and control personnel?

Such issues are especially important in light of the consequences of a malaria epidemic. A malaria control program demands continual funding even in times of low disease incidence.

Slighting expenditures for routine operations may force a much larger unplanned expenditure in case of an epidemic. In South Sumatra during the 1960s, for example, emergency funds were required for several years to stem a malaria epidemic, even with coordinated program efforts, a known vector, DDT susceptibility, little migration of the population, and strong financial support from the government. In Nepal, an epidemic is quite possible, and without even the strong positive factors experienced in Sumatra. In Nepal, neither the mosquito vectors nor insecticide susceptibility are known, the population migrates across borders, and the government support for malaria control efforts reflects no sense of urgency.

For the remainder of the decade, the writer believes that a program of research and training would enable VBC and USAID to play a more effective role in the malaria control program, without incurring the massive costs of large quantities of insecticides.

ANNEX 1

REPORT OF AN ANALYSIS OF NMEO'S ACTIVITIES FOR 1984 AND 1985

BY THE JOINT HMG/WHO/USAID/ODA (UK)
EXTERNAL SITUATION ANALYSIS TEAM

K A T H M A N D U

MARCH 1986

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1. Introduction

Upon the invitation of His Majesty's Government of Nepal (HMG), an External Assessment of the Malaria Control Programme of Nepal was carried out by a Team composed of representatives of His Majesty's Government of Nepal (HMG), the World Health Organization (WHO), the United States Agency for International Development (AID) and the United Kingdom Overseas Development Administration (ODA).

Dr B.R. Pande, Chief Planning Officer, Planning Division, Ministry of Health was the Chairman of the Team. The other members were Dr E. Onori and Dr D. Muir (WHO), Mr A. Steffen (AID), Prof. C. Draper, London School of Hygiene and Tropical Medicine (ODA). Dr K.M. Rashid, Senior Regional Advisor from WHO, SEARO participated in the discussion.

Dr M.B. Parajuli, Chief Officer and Mr S.L. Shrestha, Mr J.P.B. Shrestha, Deputy Chief Officers of the NMEO, Nepal, Dr M.K. Nushin, WHO Senior Malariologist assigned to Nepal and Mr Shreedhar Prasad Pradhan, USAID Malaria Advisor, contributed valuable support and assistance throughout the period the Team spent in Nepal.

The Team, after a series of meetings at which the epidemiological malaria situation in Nepal was presented and the main problems and constraints were reviewed, made field visits to:

Region	District
Eastern	Morang, Jhapa, Sunsari, Illam, Siraha
Central	Dhanusha, Mahottari, Chitwan Bara, Parsa, Makwanpur
Western	Kapilvastu, Palpa, Rupandehi, Nawal Parasi
Far Western	Kailali, Kanchanpur

2. Terms of reference

The terms of reference of the Team were the following:

2.1 To study the overall malaria situation during 1984 and 1985 and evaluate the antimalaria activities being carried out and make recommendation for improvement and changes, if deemed necessary.

2.2 To study the continued rising trend of malaria incidence and recommend further appropriate measures to be taken.

2.3 To study the exacerbation and spread of P. falciparum and recommend measures to contain the further rise and spread of this species.

2.4 To review the existing workplan in entomological activities and give proper suggestions for further improvement.

2.5 To study the progress of the programme and adequacy of financial and administrative support provided by HMG and assisting agencies for the Seventh Plan period.

2.1 The overall malaria situation during 1984 and 1985

There has been a deterioration of the malaria situation in Nepal in recent years as shown in the following table.

Table I - Number of positives, number of P. vivax and P. falciparum infections with the relative prevalence of the two parasites, recorded in Nepal from 1981 to 1985.

Table I

Year	Total number of cases	P. vivax	P. falciparum	Mixed	Relative prevalence P. vivax	Relative prevalence P. falciparum
1981	16087	15354	716	17	95.5	4.5
1982	16902	15825	1068	9	93.6	6.4
1983	16719	14772	1885	62	88.4	11.6
1984	29419	23753	5568	98	80.8	19.2
1985	42321	24740	7497	84	82.1	17.9

From 1981 onwards there has been a o constant increase of the number of cases year after year and, in parallel, an increase in the number of P. falciparum cases.

In 1985, however, the total number of cases increased by 30.5% compared to 1984. In order to understand whether the increase affected simultaneously all different regions of the country, a comparison has been made of the evolution of the malaria situation region-wise during the years 1984 and 1985.

TABLE II. Evaluation of the malaria situation in the four regions of Nepal during the years 1984-1985

Regions	1984								1985							
	Population	Slide examined	Slide Pos.	Pv	Pf	Mx	Rel. preval Pv.	Rel. preval P.fal	Population	Slide examined	Slide Pos.	Pv	Pf	Mx	Rel. preval Pv	Rel. preval Pf.
Eastern	599079	421773	3939	3299	653	31	83.8	17.2	2619931	416947	5135	413	[illegible]	[illegible]	8.5	11.5
Central	3207244	433746	9074	7932	1319	14	85.6	14.4	3979933	551853	9454	[illegible]94	55.	3	94.1	5.[illegible]
Western	1365537	5[illegible]79	753	6554	999	17	87.4	1[illegible].6	4896574	311834	7373	6701	531	11	92.[illegible]	8..
Far West	1460729	105333	8656	5960	2650	36	69.1	30.9	1536480	261649	[illegible]353	14835	5[illegible]142		72.9	27.1
TOTAL	9133319	1630420	29419	23753	5568	98	80.8	19.2	9332211	1542583	40321	34741	7497	84	82.1	17.9

From Table II it appears that in 1985, while the endemicity remained more or less at the same level in the Central region, a deterioration was noted in the Western and Eastern and much more significantly in the Mid-Far Western region of the country. In the Mid-Far western region in fact, the districts of Kailali and Kanchanpur experienced epidemics in the course of 1985. P. falciparum relative prevalence was also the highest in the Mid-Far west. The total number of cases found in this region accounted for 51.9% of all cases discovered in Nepal in 1985 and P. falciparum for 72.9%.

2.1.1 Evaluation of the antimalaria activities

A. Surveillance activities

Tables III and IV show the number of slides examined, the number of positives detected, the slide positivity rate (S.P.R.) and the percentage of total positives found by different active and passive case detection activities respectively, covered by the NMEO. Table V provides similar figures for the integrated control areas.

Table III. Slides examined, slides positive, S.P.R. and percentage of total positives obtained by ACD, APCD, Mass Blood Surveys (M.B.S.) and follow-up in areas covered by the NMEO in 1985.

TABLE III : Slides examined, slides positives, S.P.R. and percentage of total positive cases obtained by A.C.D. activities in areas covered by MEEO in 1975

	A C D				A F C				M B S				FOLLOW UP			
Region	Slide Exam	Slide Pos	SPR	% total Pos	Slide Exam	Slide Pos	SPR	% total Pos	Slide Exam	Slide Pos	SPR	% total Pos	Slide Exam	Slide Pos	SPR	% total Pos
Eastern	13514	1[illegible]1	.6	[illegible]	[illegible]67	5[illegible]	.5	1[illegible]	[illegible]63 3	165[illegible]	.[illegible]	3.[illegible]	152[illegible]4	3[illegible]4	[illegible].5	[illegible].[illegible]
Central	[illegible]63461	15[illegible]	[illegible].3	[illegible]1.3	14[illegible]3	643	4.5	[illegible].5	43[illegible]3	[illegible]30	[illegible].[illegible]	3.[illegible]	39[illegible]75	1[illegible]6	[illegible].5	13.4
Western	1[illegible]39	15[illegible]3	[illegible].2	[illegible].3.	[illegible]5197	[illegible]03	.9	1[illegible].	[illegible]3[illegible]4	11[illegible]	0.9	1.[illegible]	3[illegible]9[illegible]	[illegible]13	[illegible].[illegible]	1[illegible].3
Far West	12[illegible]4[illegible]6	4[illegible]16	3.4	[illegible]6.[illegible]	1[illegible]566	[illegible]4[illegible]4	1[illegible].9	11.4	[illegible]3[illegible]95	453	10.6	[illegible].6	165[illegible]1	914	5.5	5.[illegible]
[illegible]OTAL	[illegible]1[illegible]61	[illegible]2[illegible]2	1.5	5.1	[illegible]0161	3014	5.	1[illegible].[illegible]	15[illegible]2[illegible]	1 34[illegible]	[illegible].[illegible]	[illegible].[illegible]	1 464[illegible]	3 1[illegible]	[illegible].[illegible]	[illegible].3

ACDC : Slides collected by MEEO supervisors while visiting the localities

MBS : Mass Blood Survey

TABLE IV : Slides examined, slides positives, S.P.R. and percentage of total positives obtained by PCD activities in areas covered by PMEO in 1985

Region	PCD (V)				PCD (H)				PCD (M)				Malaria Clinics			
	Slide Exam	Slide Pos	SPR	% total Pos	Slide Exam	Slide Pos	SPR	% total Pos	Slide Exam	Slide Pos	SPR	% total Pos	Slide Exam	Slide Pos	SPR	% total Pos
Eastern	[illegible]	11	.1	15.6	3113	[illegible]	6.7	4.3	2504	1[illegible]	1.5	13.6	5[illegible]	69	1.3	1.6
Central	333[illegible]	[illegible]	5.6	[illegible]	3[illegible]	311	[illegible].1	4.1	1313	115[illegible]	[illegible].3	15.3	3955	333	[illegible].1	4 4
Western	41[illegible]	15.1	3.3	[illegible].4	[illegible]334	[illegible] 4	9.5	3.3	[illegible]936	1[illegible]6	13.	13.9	3673	641	17.5	9.4
Tar West	1[illegible]33	[illegible].3	14.[illegible]	15.1	35[illegible]	631	17.[illegible]	3.6	15[illegible]51	4[illegible]9	[illegible]6.6[illegible]	[illegible]3.[illegible]	[illegible]5[illegible]	2069	[illegible]4.1	11.[illegible]
TOTAL	[illegible]3641[illegible]	[illegible]93	[illegible].4	15.5	1[illegible]11	1374	1[illegible].[illegible]	3.3	4[illegible]4[illegible]	[illegible]765[illegible]	15.[illegible]	[illegible]1.1	[illegible]1471[illegible]	3111	14.4	[illegible].3

(V) = Village Health Workers

(H) = Health Service Staff

(M) = Malaria (personnel) Office

In analysing Table III and IV the following conclusions can be reached:

(i) The number of positives discovered by different surveillance activities expressed in percentages of total positives showed that the highest number of cases were discovered by ACD (25.1%) and the lowest by MBS (2.8%). The other case detection activities provided the following results: PCD (M) = 21.1%; PCD (V) = 19.5%; APCD = 10.8%; malaria clinics = 8.6%; follow-ups = 8.3%; PCD (H) = 3.8%. The output of surveillance activities showed little variation from region to region.

(ii) If the S.P.R. is considered, however, it can be noticed that the greater number of positive slides among those collected were obtained by PCD (M) = 15.8% and the lowest by ACD = 1.5%. The slide positivity rates obtained by other surveillance activities were the following: Malaria clinics = 14.4%; PCD (H) = 10.7%; MBS = 8.0%; APCD = 5.9%; follow-up = 2.9%. In other words, it can be concluded that the highest number of positives were obtained among the slides collected by PCD (M), Malaria clinics, PCD (V) etc. and the lowest by ACD. ACD, though providing the highest number of positive cases, is an expensive operation.

(iii) Better results would have been expected from the malaria clinics. Their partially unsatisfactory results can be explained by the fact that they are still too much centralized (district headquarters) and patients have still to walk long distances to be examined. A decentralization of the microscopists at unit level would certainly be more productive.

(iv) The relative high slide positivity rate observed among the slides collected by PCD (H), 10.7% and their low contribution in case detection (only 3.8% of total positives) would indicate that much better results could be obtained with an improved collaboration of the health service staff.

(v) The high number of positive cases found by follow-up (8.3% of total positives) confirms that without a 14 day primaquine treatment, P. vivax cases are bound to relapse.

In those districts where the antimalarial activities are carried out by an integrated service (Table V), the SPR and the percentage of total positives obtained by different surveillance activities were the following:

	S.P.R.	% of Total positives
APCD	7.4	37.1
PCD	5.8	21.0
ACD	0.6	19.9
MBS	2.1	5.4
Follow-up	2.3	2.8

TABLE V : Results obtained by different surveillance activities in the integrated control areas of Nepal in 1985

Region	Population protected	A C D		A P C D		P C D		M E S		FOLLOW UPA	
		Slide Examined	Slide Pos	Slide Examined	Slide Pos	Slide Examined	Slide Pos	Slide Examined	Slide Pos	Slide Examined	Slide Pos
Eastern	[illegible]	[illegible]	145	4919	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	415	[illegible]
Central	[illegible]	[illegible]	[illegible]	[illegible]	341	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Western	[illegible]	[illegible]	55	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Far West	[illegible]	[illegible]	35	[illegible]	[illegible]	43	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
TOTAL	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5634	[illegible]

In terms of cost/effectiveness APCD and PCD produced the most satisfactory results, whereas ACD, once again, admittedly discovered a consistent number of positives but at a very high cost.

B. Entomological activities

An analysis of actual entomological data collected is not presented in either of the internal evaluation reports (1984 and 1985). The epidemiological information provided in the annexes to these reports is confined to the malariometric component only. Some indication of the entomological situation is given in the narrative under each Region, however, supporting data is not presented.

The information given in the text on resting densities, biting rates and parous ratios tend to be rather fragmentary. From the data supplied it is not possible to assess trends for any of the parameters used so as to relate the entomological situation to the malariometric findings. Susceptibility tests have been too few in number over the two year period and confined to DDT and Malathion. More tests, both in space and time, and with a wider range of insecticides are indicated. Tests reported are as follows:

Year	Species	Insecticide	% Mortality
1984	A. fluviatilis	DDT 4%	98-100%
	A. maculatus	DDT 4%	80-100%
	A. annularis	DDT 4%	0 %
	A. annularis	Mal 5%	100%
	A. culicifacies	DDT 4%	0 %
	A. culicifacies	Mal 5%	100%
1985	A. annularis	DDT 4%	0 %
	A. annularis	Mal 5%	100%

Other points may be mentioned briefly as follows:

In 1985 a bioassay carried out on Ficam in the East Region indicated a six weeks residual effect on mud and thatch.

In 1985, in Dhanusha District of the Central Region, positive glands were found in both A. fluviatilis and A. maculatus.

In the Mid-Far West Region, the presence of DDT-resistant species such as A. subpictus, A. culicifacies and A. annularis in biting collections must be viewed with concern. The role, if any, played by these species in transmission requires urgent clarification.

No entomological information was available from Integration Districts. This is a very dangerous state of affairs, since the ecology and mosqito production in many of these districts is changing. Without entomological information there can be no early warning system for epidemics.

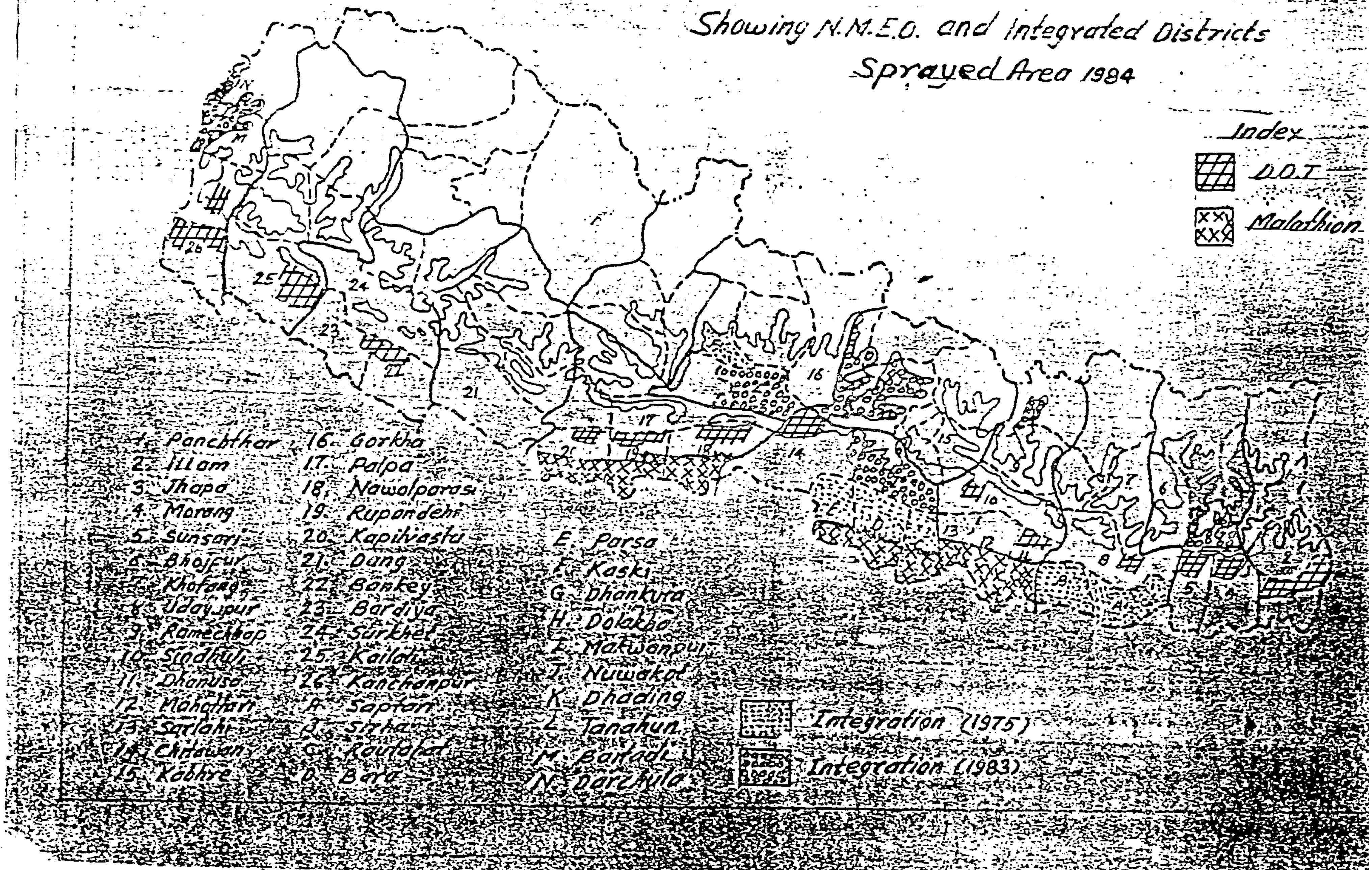
Finally, with the reservations noted under point 2.4 of the present report, the entomological operations as laid down in the Plan of Action for 1985/86 appear to be quite adequate as far as operational monitoring and epidemiological spot checks are concerned. The important features are the quality of the data obtained and the use to which this is put.

It is essential that the particular objectives of their work be clearly understood by the team members.

C. Spraying Operations:

Since there was little spraying going on during the visit of the team, most of the information concerning spraying operations had to be obtained from the internal assessment team reports of 1984 and 1985 (See Annex II). Discussions in the field however and previous observations and reports focussed on a widespread lack of supervision of spray operations. As the 1984 Internal Assessment team pointed out "Although the spraying reports in all districts have shown very satisfactory coverage, in many districts it is doubtful and could not be ascertained during the assessment. This may have happened because of inadequate supervision during spraying, both from Regional and Central levels. Such supervision from higher levels should be intensified". One factor which had a definite effect on the quality and scope of supervision was a lack of TA/DA funds-particularly at the lower levels. Since 1975-76 the general criteria for beginning of spray operations in Nepal has been a 0.5 API (minus imported cases) in the low receptive areas of the terai where A. annularis is the major vector. In hill areas of moderate receptivity (vectors - A. fluviatilis and A. maculatus) a API of 1.0 is being followed. Unfortunately this schedule could not always be followed due to a number of reasons including, but not confined to, a shortage of insecticide. Due to an increase of malaria cases in the hilly moderately receptive areas, it is suggested that some adjustment of spray activities may be needed in the future.(See MAP I & II)

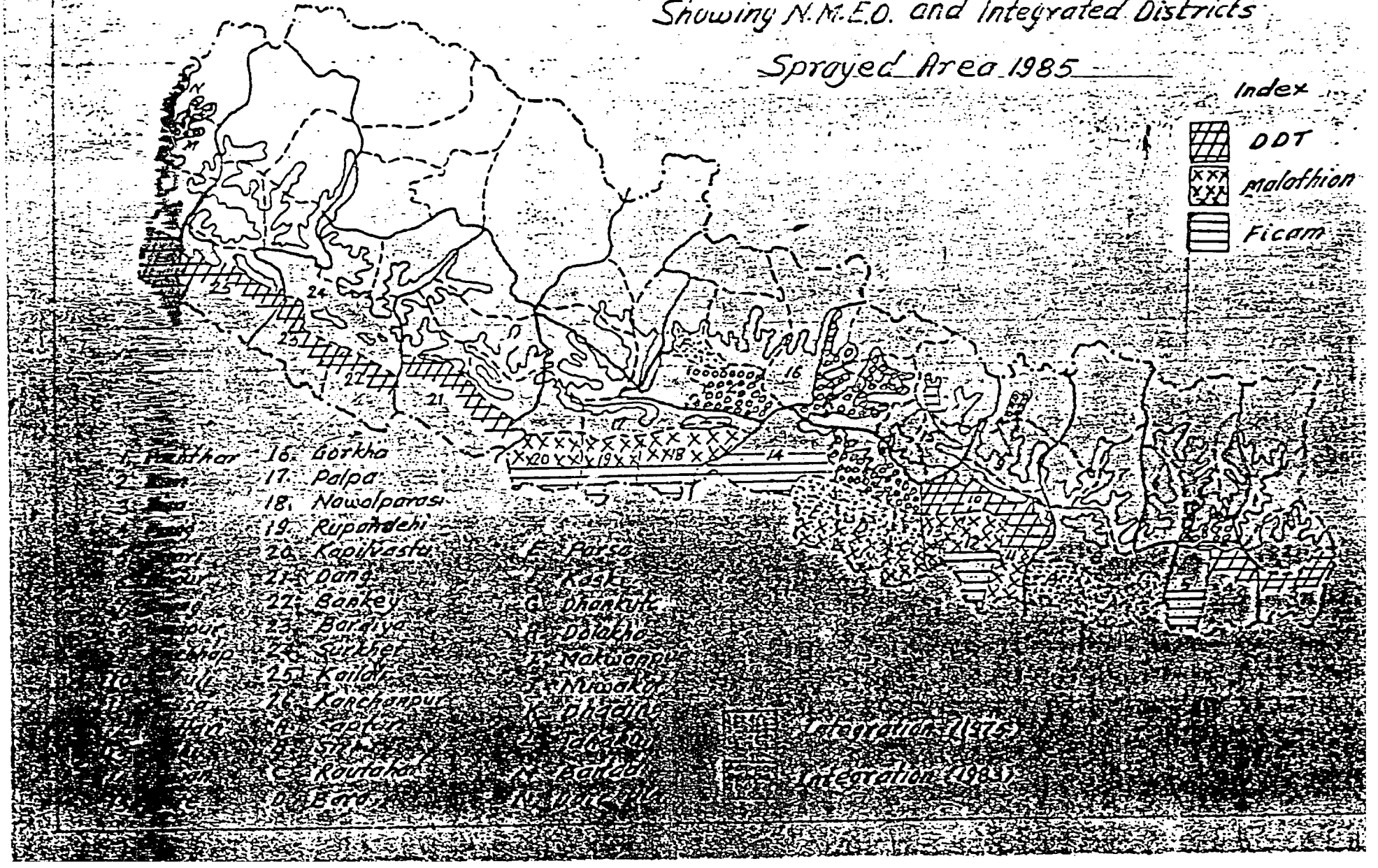
NEPAL
Showing N.M.E.O. and Integrated Districts
Sprayed Area 1984



NEPAL

Showing N.M.E.O. and Integrated Districts

Sprayed Area 1985



At present, USAID has agreed to finance Malathion 50% until 1988. In the Calcutta port now is 300 MT of Malathion for the current year and 300 MT each year are planned for spraying cycles in 1987-88. This amount is a bare minimum for selective spraying and would not take into consideration any rapidly rising malaria epidemic should one occur. While an improved surveillance system would assist, through drug treatment, to blunt a rapid rise of malaria there would still continue to be a critical need for focal or even widespread spraying to prevent malaria's spread. It is recommended that at least 10% of the total insecticide need be in reserve for outbreaks.

It is critical that the NMCP focus now on the problem of future supplies of insecticides-particularly for DDT for its alternate prior to 1988 and for all insecticides after 1988. As a whole, worldwide insecticide sources are being greatly reduced. Malathion and DDT are being produced in India but their availability and cost have not been investigated by HMG to the teams' knowledge.

In the short term every effort must be made to utilize the insecticide now available. Possible approaches might include limitation of some sprayable surfaces and a close monitoring of the epidemiological picture to determine if some areas can be reduced to one round of spraying or can even be eliminated. It must be emphasized that any proposed reductions must be backed by actual trials prior to use.

Priorities need to be established as to where insecticides can be utilized most effectively. These are in order of importance:

1. Areas of epidemic malaria.
2. Areas where P. falciparum is becoming resistant.
3. Areas of increasing numbers of P. falciparum cases.

In all cases, these first three priorities take precedence. Other areas to be monitored for possible insecticide spraying are development project areas where a high proportion of the cases are imported; areas of high receptivity and vulnerability and in areas where the number of malaria cases is rising in spite of drug treatment.

The NMCD must ensure that spray operations are done at the optimum times and that there is total coverage. In those areas where DDT remains effective it should continue to be used and the HMG should initiate efforts to locate sources of DDT or alternative

D. Malaria Check-posts

Four check-posts are in operation along the international border with India: the Kakarvitta check-post in the Eastern region, which detected 326 cases (144 P. vivax and 182 P. falciparum) when screening 36805 fever cases during 1985; the Bhitamod check-post in the Central region which discovered 42 cases among 2587 fever cases; the Belahiya check-post in the Western region which found only 3 cases among 1547 blood examinations, and the Gaddachauki check-post in the Mid/Far Western region which was established in October 1985.

Of the four check-posts, Kakarvitta certainly carried out an excellent work. The MMEO should, on the other hand, try to find out for what reasons the output was relatively so low from the other three check-posts and explore the possibility to find other important crossing points along the 800 Km long boundary with India, which may produce better results.

E. Laboratory services

There were 26 district laboratories and 16 malaria clinics, and 4 Regional cross-checking laboratories in the MMEO in 1985, for a total of 162 microscopists.

From spot-checks carried out during the Team's field visit, it would appear that the laboratory services have maintained a satisfactory standard: the microscopes, most of them rather old, are well kept and are functional: the stain was in most instances good despite the utilization of tap water and the microscopists showed the required ability in identifying the parasites. The relatively good standard of the laboratory services is most likely due to the consistent cross-checking which is carried out at the Regional and Central laboratories.

Such cross-checking must be maintained in view of the decentralization of the district laboratories to the different units and a mechanism for field supervision will have to be developed.

F. Integrated Community Health Services Project Area

Organization and Administration

The District Health Office, Health Posts and 'Veks' are in some ways similar to District Malaria Office, Units and localities under NMEO.

In the District Health offices, the staff consist of 20 persons including one Senior Malaria Assistant.

In the districts visited, in Bara, there is one Laboratory Technician without any training in Malaria and one Lab Assistant, who has been deputed elsewhere, The posts of Lab Technician and Statistical Assistants had been filled only recently. A senior Malaria Assistant also joined only 4 months ago. One village health worker within the district has been trained locally as a Lab Assistant in place of the one who had been deputed elsewhere.

In the other district, Parsa, out of two Lab Assistants, one has been deputed elsewhere and in his place, one VHW from the health post has been locally trained and placed in the position of Lab Assistant.

In another district, Makwanpur, one Lab Technician is in place, the staffing pattern as in Bara and Kaski has not been approved. Presently there are no approved posts of either Lab Technician or Lab Assistant. However, two Lab Technicians from NMEO are in position in ICHSDP Headquarters, of which one is deputed to work in Hetauda. There are no Lab Assistants.

At the health post level, there are problems of frequent transfer and deputations of paramedical and auxiliary staff in all these districts, although Makwanpur suffers the most. The VHW is expected to visit 50 to 60 houses per day for 15 days in a month, followed by immunization activity for next 5 days out of 25 working days, at best, a difficult task !

At the Vdc level, there are problems in Makwanpur, where quite an appreciable number of posts of Village Health Workers have not yet been filled. While there were substantial numbers of community Health Leaders in Bara and Parsa, there were none in Makwanpur and very few of the CHLs have been involved as PCD (Volunteers in malaria activities). There are two couriers who move from the health post to the district in a month.

The Health Inspector is the chief of the District Health Office and runs the day to day administration. No written job descriptions have been provided to the staff nor is the line of authority functioning effectively at that level. There are also serious budgetary constraints - especially in travelling (TA/DA), stationeries, repair costs. The budget is also not released in time.

Supervision

Supervision from the district to the periphery is lacking due to a shortage of funds. Also, all staff member of the

District, including Lab Technician and Lab Assistant, are deputed to bring in clients during the winter months when sterilization camps are organized. All activities including collection and examination of slides come to a virtual standstill during this period lasting for 4-5 months. Only Bara and Parsa have one vehicles each. Parsa also has one motor cycle in working condition. Makwanpur has nothing. All bicycles are old and most of them need replacement. This has also not helped in supervision.

Logistics

Besides vehicles, as stated above, most of the sprayers are not functioning. In Bara, the new cylinders have shown a crack. In Parsa, out of 456 pumps, 50 are working and 193 are repairable. In Makwanpur, out of 222 sprayers, 100 are in working condition and 34 are repairable.

Bara has 3 microscopes in the District Office out of which 2 are in working condition. At Parsa, out of 5 microscopes, only one is in working condition and Makwanpur has 3 - all working. Except for Parsa, no office faced the problems of shortage of reagents. The accommodation problem was most acute in Makwanpur, but other districts also had accommodation problems.

Reporting

For reporting purposes and blood slide collection, courier service is provided twice a week from the health post to the district office and yet reports were not available in time. This was so especially in Bara.

Spraying

Malathion (2/gm per sq. meter) spraying was carried out on a selective basis in Bara and Parsa. In Makwanpur, DDT (1/gm per sq. meter) was sprayed in the first round and Ficam (0.4/gm per sq. meter) in the second round in 1985. Spraying was done as follows:

	Parsa	Bara	Makwanpur
Target population (00)	15,531	18,871	12,907
Protected Population	15,536	18,519	13,006
No. of villages sprayed	20	31	28
Percentage coverage	99	100	90

Overall epidemiological situation

The epidemiological situation is presented in the following table:

	Parsa		Bara		Makwanpur	
Particulars	1984	1985	1984	1985	1984	1985
Total blood slides collected	24094	24104	31010	31705	15568	14473
Positive cases	298	194	464	207	304	264
P. vivax	297	193	456	206	244	239
P. falciparum	1	1	8	1	56	25
Mixed	-	-	-	-	4	-
Indigenous	256	178	441	172	252	162
Imported 'A'	18	4	5	3	16	12
Relapse	2	2	1	1	12	57
Untreated	17	5	17	23	24	7

Particulars	Parsa		Bara		Makwanpur	
	1984	1985	1984	1985	1984	1985
Indigenous Pf	-	1	-	1	-	8
Recrudescence Pf	-	-	-	-	-	10
ACD Coll. + ve	75 / 16897	57 / 17381	133 / 23947	64 / 23876	52 / 10237	36 / 9554
PCD Coll. +ve	168 / 3269	89 / 3311	185 / 4047	106 / 4144	167 / 1304	149 / 1799
Other sources Coll. +ve	55 / 3928	30 / 3412	46 / 2874	143 / 3552	85 / 4017	779 / 3120
ABER	8.46	7.8	9.4	9.2	7.7	5.5
API	0.9	0.6	1.4	0.6	1.8	1.18

The cases investigated and treated are as follows:

Total cases investigated	189	176	245
Total Case treated	189	176	245
Treated within 7 days	60	12	100
Treated within 14 days	89	12	48
Treated after 14 days	40	152	97

In Makwanpur the time lag between slide collection and treatment in majority cases is within 7 days, in Parsa, between 7-14 days and in Bara above 14 days.

Malaria Clinics

There are no malaria clinics in the districts visited as the District Health Office is located in the hospital compound. In cases of fever referred from hospital the blood slide collection is made at the DHO.

Passive Case detection

The CHLs in general, did not take blood slides as there was a problem of receiving the slides in the district office in adequate time. There were also not enough RDT kit bags available for the CHLs.

Training

It was noted, in general, that wherever the original staff from NMEO were in position, the staff at least had had basic training, through some refresher training was badly needed. Other staff did not have training and were in bad need of it.

Health Education

No health education materials produced by NMEO was available at any office.

Laboratory Services

No backlog of slides were observed in District Health Office at Parsa, though slides with unstained films were present in Sirsiya Health Post. At the District Health Office at Bara, the time lag was unacceptably high and the back log of slides were noted in every month except in the month of January 1985. In a surprise visit to a health post, Fetah, was found the same situation, though in another health post, Rampur, there was no back log seen. In Makwanpur also there was a back log of 1100 slides and the district had only one lab technician.

Cross checking

10% of negative slides and all positive slides were sent to the Regional Laboratory, Hetauda for cross checking. 5 cases of negative slides sent from Bara were found to be positive, two of them quite heavy infections.

Chloroquine resistance

It has been observed in Makwanpur district and is currently the subject of an investigation.

G. Research and Training

Certain current research topics and research proposals are mentioned under other sections of the report. Here more reference is made to some additional aspects of research and training not covered by the above.

Hetauda Research and Training Centre

After a difficult initial period the centre is functioning, both in research and training despite the rather primitive facilities presently available. Accomodation is basic and relatively cramped. The centre has an allotted staff of 37 of which there are 9 vacancies consisting of the senior Malaria Officer and eight Malaria Assistants.

Despite the present constraints, an insectary has been established and colonies of A. annularis, A. maculatus and A. fluviatilis are maintained. These are intended to be used in trials of comparative susceptibility to infection.

The Centre appears to be functioning well as a training facility, there being 6 courses involving 123 participants in 1984, and 5 courses for 159 participants in 1985. The teaching programme included refresher and basic courses for Malaria Inspectors, laboratory technicians, and Unit-in-charge. A basic course on vector control was held in 1985 for 18 participants consisting of District Malaria Officers, Entomologists and Assistant Entomologists. This course lasted 5 weeks, and it is intended to hold a similar course every year.

It is hoped to steadily develop the supportive research activities of the Centre, particularly as regards the newer sporozoite detection techniques, bloodmeal analysis, insecticide resistance characterization and possibly sero-epidemiology. Activities will naturally expand to include other disease vectors as the range of activities in vector control continues to grow.

As indicated in previous assessment reports the Centre is badly in need of additional training and hostel accommodation facilities. One serious problem reported was the difficulty in locating lodgings among the local community for large numbers of course participants. It would seem possibly that some local costs in construction might be absorbed by N.G.O.

Seroepidemiology

The detection of parasites in a thick blood film is the standard method for diagnosis of malaria. However, a mass blood film survey will always give an under-estimate of the amount of malaria present in a community because, depending on the volume of blood examined in each film, it will always miss low parasitaemias, particularly in semi-immunes, and infections in the latent stage. Like any other infection malaria stimulates the production of antibodies which appear within a few days and can persist for years, declining slowly. A survey for antibodies can usefully supplement blood film surveys as it shows not only those who have malaria at the time (point prevalence), who have high levels of antibodies, but also those who have had malaria in the past (period prevalence), who will have lower levels of antibodies. There is considerable immunological cross reaction between the different species of malaria parasites so that it is possible to use a single readily available antigen (cultured P. falciparum) for testing blood samples but in order to determine the infecting species it usually necessary to use several antigens. The standard test for malaria antibodies is the indirect fluorescent antibody test (IFA) which can be done on 50 blood spots collected on absorbent paper, and a skilled operator can test 200 samples a day, considerably more than the number of blood films he could examine. In practice blood samples are usually screened against P. falciparum and any positive are then retested against one of the simian parasite antigens (P. fieldi or P. cynomolgi) which structurally not P. vivax. It is probable that an ELISA test for

malaria antibodies will be available in a year or two which will increase the speed at which samples can be tested. A number of of countries, in different parts of the world, have found antibody surveys useful as a supplement to blood film surveys to determine more accurately the amount of malaria that has occurred recently or in the past. In some countries large antibody surveys have been done before certifying eradication of malaria transmission.

In Nepal it is probable that more transmission is occurring than is shown by the blood films collected by the various MMCO surveillance services. It is not suggested that serology should be adopted as a routine for malaria surveillance but that it should be used in a few problem areas with apparently low occasional transmission in order to define more accurately what is actually occurring. During the visit of the assessment team 55 blood samples were collected in such a small village in Morang District in the Eastern Region, and pieces of absorbent paper were left behind sufficient to collect another 500 blood samples. These samples can be tested in London.

However, it is recommended for the future that steps should be taken to set up a Sero-epidemiological laboratory at MMCO HQ at Kathmandu. The function of this laboratory would be to carry out serological surveys in selected problem areas in different parts of the country in order to define more clearly their epidemiological picture. This would be the first priority,

but, later, other research projects could be added. For example, serological screening could be done on a large sample of recent immigrants from India in order to define more clearly the risk of imported malaria. This has been found useful in other countries with a risk of imported malaria. Another research project could be to study the immune response in the Tharu people, who appear to have some natural resistance to malaria, compared to other ethnic groups.

Although the work would at first be wholly on malaria it could later be extended to the study of other endemic infections diseases in Nepal, for which seroepidemiology is essential in order to define the situation. The same principles would apply for the planning and execution of surveys and in the techniques of the tests. For example, either or both the IFA and ELISA tests are used for the serology of Leishmaniasis, leptospirosis, and JBE, all of which are potentially important for Nepal. The ability to do such sero-epidemiological surveys is essential if the NMEO is to broaden its activities and become a Division of Vector-borne Diseases. The ELISA test is also being developed for the identification of insect blood meals.

In the first place it will be necessary to approach a donor agency to obtain funding for a senior scientist for a practical training course of at least 3 months. This could be at the London School of Hygiene and Tropical Medicine. One scientist has already

recently attended a short theoretical course on this subject. Secondly, it will be necessary to ask the same, or another agency for funds to buy a fluorescence microscope and possibly an ELISA reader, together with the necessary test reagents to last at least for one year. Thirdly, it is considered important that a later visit should be made to Nepal by the consultant responsible for the training, in order to check that the tests, and the sampling methods, are being done satisfactorily. An approximate estimate of the total costing of the above would be about US $ 20,000.

2.2 A study of the continuous rising trend of malaria incidence

In assessing the evolution of the malaria situation during the last two years, the continuous upward trend of the malaria incidence since 1981 and its sharp increase in 1985 has been shown already.

Most of the reasons for this rapid deterioration of the situation will be analyzed when dealing with the exacerbation and rapid spread of P. falciparum. At the risk of being repetitive, the Team believes that three main factors are responsible for this unsatisfactory situation, namely:

A. Population movements: Three different movements can be distinguished: (i) massive influx of people from India, where the malaria situation has consistently worsened in recent years, mainly composed of labourers employed by socio-economic development projects in outer and inner terai; (ii) limited Nepalese labour force migrating to Indian Punjab for temporary agricultural work;

(iii) movement of people from the hilly areas of Nepal to the terai for work and resettlement. All the three components contribute to the dispersal of the disease and even to its introduction in high valleys of northern Nepal where transmission never occurred in the past. An indication of the importance of this factor can be found in the results of the investigations and classification of positive cases which showed that imported malaria represented 20.7% of all infections in 1983 and 26.0% in 1985.

B. Ecological changes: Large development projects such as road construction, which quite often leave behind a lot of borrow-pits and irrigation schemes have been seen by the Team's members wherever they have been in the Terai areas. In addition, in inner terai intensive deforestation and resettlement is taking place.

C. Insufficient spraying coverage due to lack of insecticides and replastering or white-washing of sprayed surfaces soon after the insecticides have been applied.

In view of the limited existing resources, the Team has recommended a revised control strategy in the hope that the new approach will be able to contain the present situation if not to improve it, as is desired.

The exacerbation and spread of P. falciparum

From table I it can be seen that there has been a constant annual increase of P. falciparum infections from 1981 (733 cases) to 1985 (7581 cases).

Regarding the spread of this Plasmodium species, a comparison has been made of the number of P. falciparum cases reported in 1984 and in 1985 in different regions of the country and the percentages of P. falciparum cases found in each region in respect to the total number of infections. The results are shown here below:

Region	1984 No of P. falciparum	1984 % of total P.falciparum infections	1985 No. of P.falciparum	1985 % of total P.falciparum infection
Eastern	690	12.2	906	12.0
Central	1342	23.7	560	7.4
Western	946	16.7	592	7.8
Far West	2688	47.4	5523	72.8

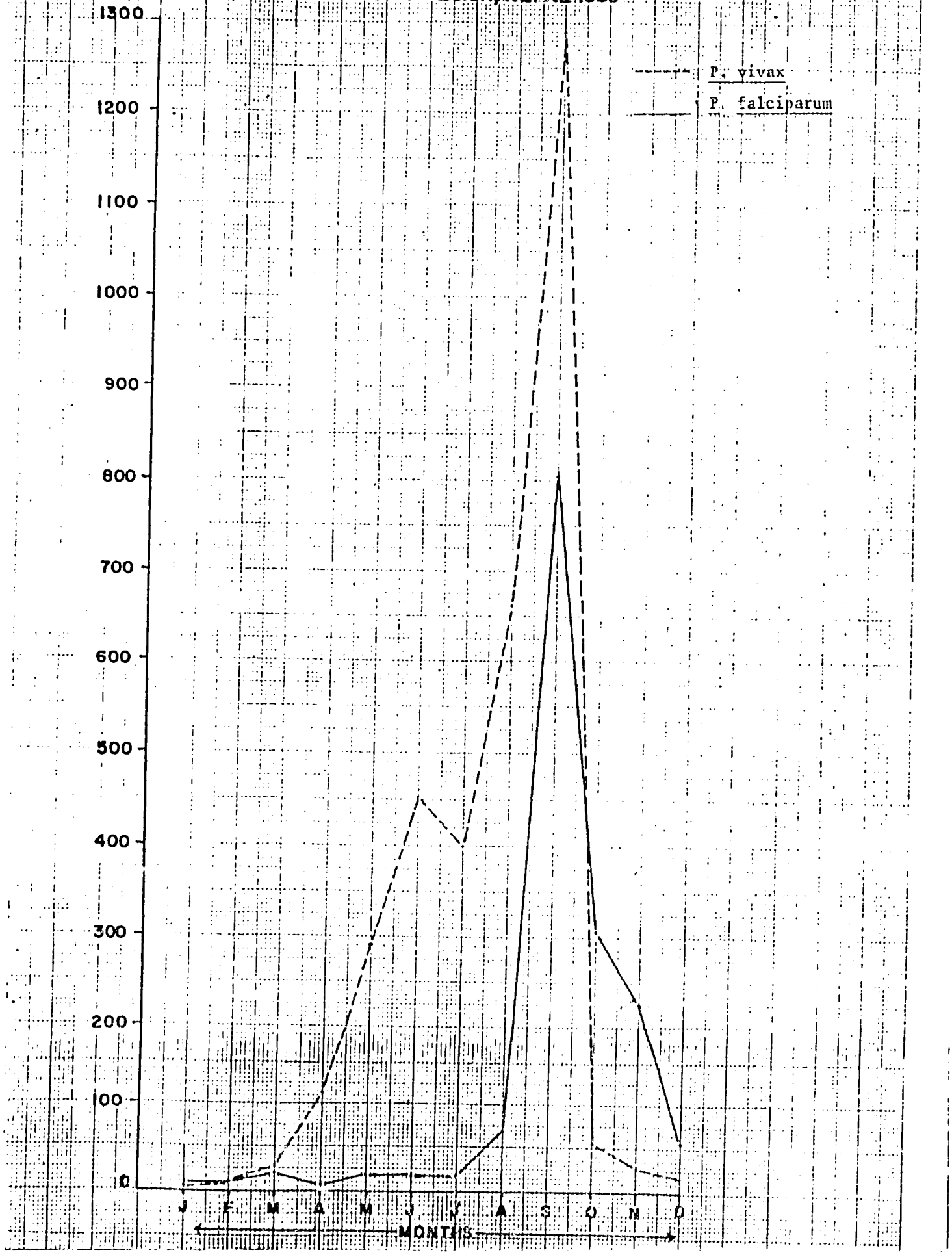
From these data it would appear that the main reservoir of P. falciparum lies in the Far Western region, where it accounted for 47.4% of all cases in 1984 and for 72.8% in 1985. The situation remained practically the same in the Eastern region (12.2% in 1984 and 12.0% in 1985, whilst a significant reduction was observed in 1985 in the Central and Western Regions (58.3% and 37.4% respectively).

An explanation for the spread of P. falciparum in different regions can be only conjectural as for a detailed analysis of the phenomenon much more time than that allowed to the Team would have been required. The following hypothesis can be formulated:

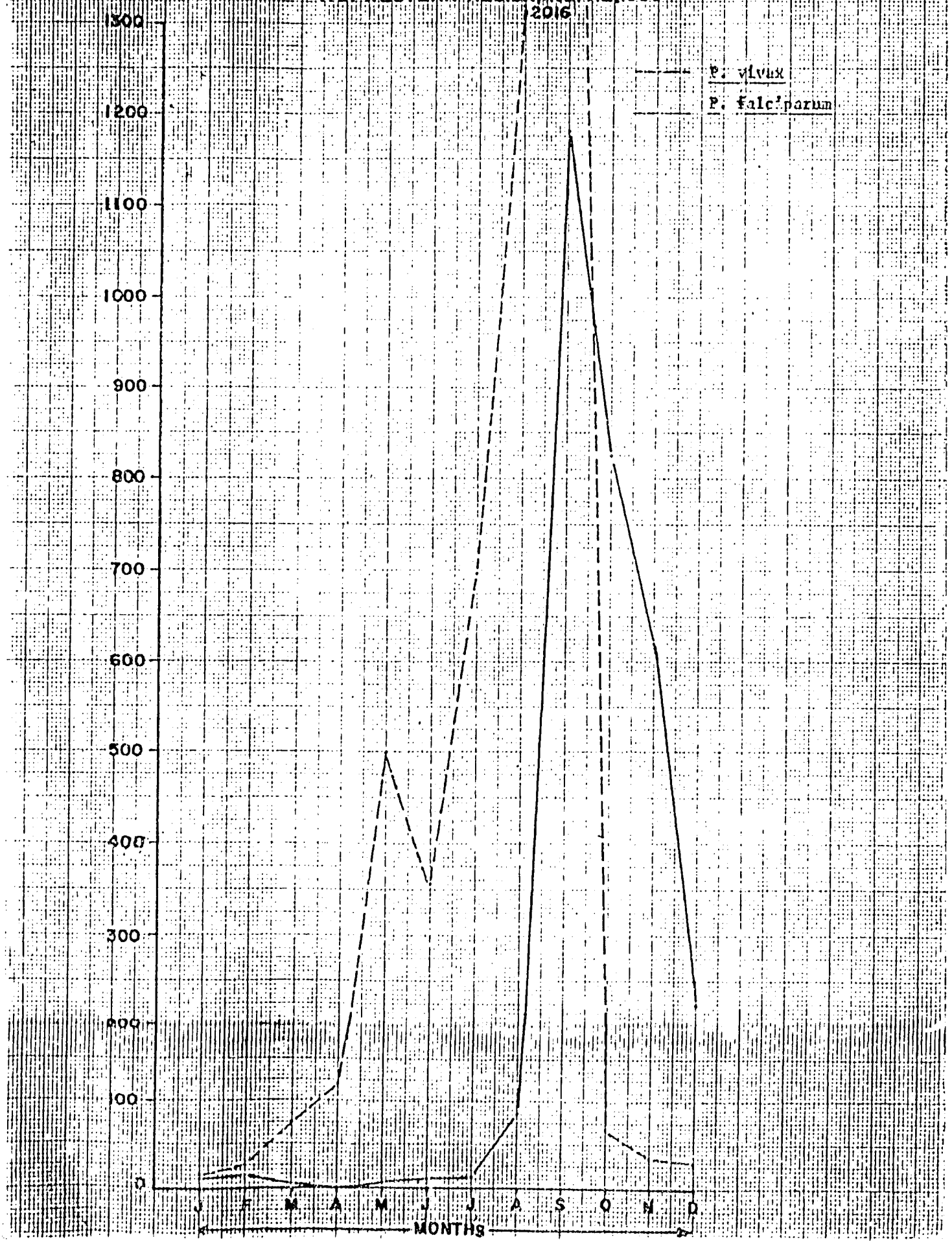
(i) The explosive situation in the Far Western region did not come as a surprise, as the reservoir of malaria parasites in this part of the country was building up from 1983 onwards. The antimalaria activities carried out in 1984 and 1985 were inadequate to cope with the situation. In 1984, only one round of selective spraying with DDT at a dosage of 1.5 g/m^2 was carried out (only 56289 people were protected); in 1985, two rounds of selective DDT spraying were carried out in Kailali and Kanchanpur districts covering a population of 108000 and 710.000 respectively.

In 1984, a considerable number of malaria cases did not receive radical treatment due to a shortage of primaquine. The monthly distribution of P. vivax and P. falciparum cases detected in Kailali and Kanchanpur districts in 1985 is shown in Graphs I and II. It can be noted that in both districts the number of P. falciparum infections remained at a very low level until August to reach a maximum peak in September. The densities of A. maculatus, A. subpictus, A. annularis and A. vagus increased after the monsoon season when the A. fluviatilis population, believed to be the main vector, decreased and this coincided with the rapid increased transmission of P. falciparum. A. subpictus,

GRAPH I. MONTHLY DISTRIBUTION OF P falciparum AND P vivax IN KAILALI DISTRICT FAR WESTERN REGION, NEPAL 1985



GRAPH II. MONTHLY DISTRIBUTION OF P.falciparum AND P.vivax IN KANCHANPUR DISTRICT FAR WESTERN REGION, NERAL 1985



A. annularis and A. vagus are known to be resistant to DDT, whilst the susceptibility of A. maculatus to this insecticide, has not been tested recently. Whether the species mentioned above play a role in transmission, especially with regard to P. falciparum, should be investigated.

ii) Spraying operations in the Eastern, Central and Western regions, though still selective, covered /a larger number population than in the Far Western region. In 1985, two rounds of DDT (1 gr/m^2) were carried out in moderate receptive areas, two rounds of Malathion (2 gr/m^2) in low receptive areas, and two rounds of Bendiocarb (0.4 gr/m^2) in low and moderate receptive areas of the Central region; in the Western region two rounds of selective spraying were carried out either with Bendiocarb or Malathion; DDT (one round) and Bendiocarb (two rounds) were selectively applied in moderate receptive areas of the Eastern region. This wider population coverage with different insecticides may have partially prevented the spread of P. falciparum in the Eastern, Central and Western regions.

iii) The factors mentioned in (i) and (ii) may tentatively explain the differences observed in the spread of P. falciparum in the four regions of the country. Otherwise, the major factors which are at the root of the worsening of the malaria situation in general and of P. falciparum in particular, are equally shared

by the four regions of the country, namely: (a) extensive and intensive population movements from and to India and from and to the hill districts of the country; (b) significant deterioration of the malaria situation in India in recent years; (c) large ecological changes taking place all over the outer and inner Terai areas due to deforestation and resettlement, proliferation of development projects such as road construction and irrigation schemes; (d) prolonged wet (monsoon) season for two consecutive years (1984 and 1985).

Another very important aspect related to the exacerbation and spread of P. falciparum is the resistance of this parasite to chloroquine which has been already demonstrated in a Nepal. Chloroquine resistant P. falciparum infections had been detected in the past in patients coming from India and in 1984 three resistant cases were detected among the indigenous population. Unfortunately, monitoring of P. falciparum sensitivity was not done in 1985. However, higher recrudescence rate among P. falciparum cases was recorded in those districts where high P. falciparum incidence occurred.

There is very little doubt that P. falciparum resistance to chloroquine is well established in Nepal. What remains to be studied is the geographical distribution of the phenomenon and the degree of resistance of the isolates.

There is also no doubt that this is one of the main technical problems that Nepal has to face in future years and which demands a timely concentrated effort for its control. The national authorities should consider the spread of P. falciparum chloroquine resistance as a very serious problem and should commit themselves much more consistently than in the past if their interest in controlling malaria in Nepal is genuine and sincere.

2.4 The Existing Workplan in Entomological Activities

1. Background

In a properly functioning vector-borne disease control activity, the entomological services should perform the following five major functions:

a) Provision of basic planning and stratification information.

b) Operational monitoring.

c) Epidemiological investigation of refractory situations.

d) Research

e) Training

The continuous feed-back of monitoring and epidemiological information is aimed at facilitating rapid adjustment of control methods while the research activities are intended both to upgrade the basic planning and stratification information and also to provide operational flexibility through improvement of existing control methods and development of new approaches.

The workplan of NMEO entomological activities has to be reviewed against this background.

2. Staffing

The entomological staffing pattern of the NMEO is given in Annex I. This appears to be barely adequate for the work presently being carried out, but at least forms a good frame-work on which to develop further capabilities. There are serious recruitment problems due to lack of career structure.

3. Current activities

At the present time any detailed special investigations required are carried out by the entomology section at NHQ, which is also responsible for overall planning and supervision of entomological activities.

The Regional teams on the other hand are the main sources of regular entomological monitoring data which are fed back to NHQ for purposes of programme planning and adjustment. Spot checks are carried out as indicated by epidemiological need. The areas for these spot checks are decided jointly by the Regional Entomologist and the Regional Malaria Officer, therefore, prompt local action should always be possible. Spot checks are also used as confirmation of validity of extrapolation of the results of the longitudinal regular observations.

It can thus be seen that greatest emphasis in relation to current entomological work is on operational monitoring and epidemiological checking. The other three components of legitimate entomological activities, i.e.

a) Provision of baseline planning data, including data for stratification,

b) Research, and

c) Training.

have played a relatively minor role so far, although some very useful research has been carried out. The balance of entomological functions should therefore be aimed at, and activities adjusted accordingly, relatively non-productive and labour intensive activities such as night biting catches for example, should be the exception, rather than the rule, and if employed should have a very definite epidemiological purpose.

4. Future Development

On the other hand, more emphasis should now be placed on the newer, recently developed entomological tools such as sporozoite detection and identification using monoclonal antibodies, bloodmeal determination, cytotaxonomic methods and biochemical resistance characterization. The use of these new methods will greatly facilitate the speed and accuracy of eco-epidemiological and

operational stratification thus enabling appropriate strategies to be deployed in support of Primary Health Care at the local level. Facilities now being offered by UNEP for small scale climatic mapping and temperature stratification should also be utilized for operational stratification and in the development of epidemic forecasting.

Appropriate training of entomological staff in the use of these new tools is therefore strongly indicated.

In the event of the possible conversion of NMEO into a Vector Borne Disease Control Division such acquired expertise would obviously be extremely valuable also in the control of the other vector borne-diseases.

It is therefore suggested that the entomological services of the NMEO should be consolidated and upgraded, with overall planning and supervision being exercised by NHQ, operational monitoring and intelligence gathering activities being performed by the Regional Teams with research support and training facilitieis being provided by the Hetauda Research and Training Centre. All these activities should gradually become multi-functional in relation to other vector borne diseases. Rodent control activities may eventually be included at a later stage.

The most recent estimates of receptivity for various parts of the country were carried out by White in 198[illegible] and 1981[1] and his observations have proved of great value in programme planning. Following this Chakrabarti and Prasittisuk made a further number of useful observations and recommendations after a three months visit to the country also at the end of 1981.[2]

Due however to continually changing eco-epidemiological features in the country, including population movements, changes in forest cover and agriculture, including increase in irrigation and artesian water, receptivity must be regarded as subject to change, and must be continually re-assessed as part of future activities.

1 White, G.B. 1982, Malaria receptivity stratification and projections for malaria control in Nepal. Report to WHO, SEA/MAL/144

2 CHAKRABARTI, S.C., and PRASITTISUK, C, 1982 assignment report on a visit to Nepal. Report to WHO, SEA/MAL/143.

5. Research

Recent entomological research has concentrated on clarification of the situation regarding anopheline species complexes in the country.

Species examined included:

A. annularis (two sibling species demonstrated)

A. culicifacies (A. culicifacies "B" was found)

A. aconitus (Chromosome map has been prepared)

A. maculatus (Work is continuing)

Preliminary work was carried out in cooperation with Tribhuvan University on the selection of suitable larvivorous fish for eventual field trials. These preliminary investigations indicated two "commercial" fish, the Grass Carp (C. idella) and Common Carp (C. carpio) as being the most promising. The two indigenous fish, Danio rerio and Puntius conchonius were also considered to be indicated for further trials.

Work carried out on possible insect predators, also in cooperation with Tribhuvan University, indicated the potential usefulness of the backswimmer Enitheres marginata (notonectidae) as a possible biological control agent for anopheline larvae.

Both larvivorous fish and the insect predator should now go forward to field trials. The choice for integrated control may possibly be fish for permanent and larger water bodies and the insect predators for small and temporary water bodies, and also larger permanent ponds where the use of fish may be inacceptable (e.g. for religious reasons).

Field applied research proposals

Two proposals for field applied research have been formulated one dealing with use of larvivorous fish, and the other with community-based environmental management methods. The following comments are offered on these proposals, from a purely technical point of view

a) Fish proposal:

The success of this trial will hinge to a large extent on appropriate selection of the water bodies. These should obviously be ones which at the outset already have an easily measurable mosquito production, otherwise the trial may prove inconclusive, some of the proposed ponds seen do not appear suitable as they are relatively new, have not yet acquired any aquatic vegetation and consequently, mosquito production would be low.

The scale of the trial testing 5 species of fish at once, seems rather ambitious, and it may be advisable to proceed more slowly, testing fewer fish at a time and postponing the expanded field studies until the village scale trials have produced convincing evidence of the efficacy of the various fish species in a field situation. Expanded field studies should only be launched after thoroughly satisfactory, village scale trials.

b) Community-based Environmental Management Proposal:

Dhanusha District which is the locality chosen for this proposed trial showed a marginal decrease in overall case incidence from 7347 in 1984 to 7156 in 1985. There was a slight increase in indigenous P. vivax from 1429 to 1557 and a fall in indigenous P. falciparum from 35 to 7 cases. There is a great deal of population movement, and most transmission takes place in the northern part of the District, in the villages along the Churia foothills and in the forest. A. fluviatilis and A. maculatus have recently been incriminated as vectors in this part of District. A. fluviatilis has been shown to penetrate down into the Terai area proper along the river channels.

The proposal appears to be adequate and well planned, however, certain changes have been made to the protocol as set out in the document dated 3.12.1985. The environmental management area and the control (surveillance only) areas have now been changed over so as to make the enviornmental management area more accessible for implementation and supervision. While Malathion will still be used in the buffer zone, Ficam will be used in the foothill area, and not DDT as indicated in the research proposal. The implementation area is scheduled for an increase in artesian water production and environmental management of this is strongly indicated.

2.5 Analysis of Financial and Administrative Support

In 1985 the NMEO provided to the HMG a project paper outlining the financial and commodity needs during the Seventh Five Year Plan (1985/86 - 1989/90). The Team studied the figures given in this document and met with the Chief Officer and Deputy Chief Officer for additional discussions.

The financial plan is given below. It should be pointed out that the figures do not reflect a 16% devaluation of the Nepali rupee in relation to the U.S. dollar nor do they include any factor for inflation over the life of the plan.

Year	Foreign Exchanges (in Million Rupees)	Local Costs (in Million Rupees)	Total
1985/86	76.95	40.50	117.45
1986/87	50.70	40.50	91.20
1987/88	48.83	40.50	89.33
1988/89	48.83	40.50	89.33
1989/90	46.52	40.50	87.02
Total	271.83	202.50	474.33

Of the total of Rs 271.83 million approximately 23.69 million would be made available by the USAID for the purchase of Malathion Another 0.75 million would be made available by WHO primarily for the purchase of laboratory supplies and anti-relapsing drugs. At present the source of the short fall of 247.39 million N.C. in foreign exchange is unknown. Unfortunately, this short fall means that there will be no funds available for critical needs such as replacements for vehicles which in many cases have outlived their useful life unless given major repairs and/or maintenance. The NMEO estimates it would need at least two new vehicles per year for replacement - a figure which might be too low given the difficulties in getting spareparts and the damage that vehicles take in off-road travel. Other commodities which would be eliminated are vehicle spare parts, sprayers and spare parts and additional

microscopes, if a stepped up programme of surveillance is to be instituted. All the above plus adequate stocks of insecticides, are essential to a successful programme even in an abbreviated form.

The Project Paper also proposes the amount of Rs 26,250,000 ($1.5 million) for construction of additional facilities at the Hetauda Training Centre during 1985/86. Although approaches were made to the Asian Development Bank and the USAID no funds could be made available. The Team believes that this construction remains a definite need and recommends that the HMG make efforts to locate funding for this project. If the entire amount cannot be located, a start possibly could make in limited construction if local funds could be made available.

Finally we must face the matter of insecticides which represents a large part of the total budget and the largest part of the foreign exchange input. The optimum planned needs for the Seventh Five Year Plan as proposed by NMEO are as follows:

Insecticides

(in Metric Tons)	1985/86	1986/87	1987/88	1988/89	1989/90
DDT	250	250	250	250	250
Malathion	680	680	640	640	600

b'

While USAID will fund 300 MT of Malathion for the spray seasons of 1986, 1987 and 1988 it can be seen from the above data that this represents less than half of the total needs.

Since the provision of both DDT and Malathion is problematical during the entire Five Year Plan the NMEO has proposed the use of other varieties and quantities of insecticides.

To replace Malathion a possible alteranate might be Fenitrothion and to replace DDT it was proposed to substitute either Ficam or Actellic. The proposed needs for the entire Five Year Plans for the alternate insecticides are 1087 MT Fenitrothion; 470 MT of Ficam and/or 3510 MT of Actellic. Unfortunately, these alternates may be less than perfect. The NMEO feels that b because of its relative safety, cost and long residual qualities DDT would be preferable if possible with Ficam as a second choice.

The ODA has already provided 94 MT of FICAM for 1985/86 at a cost of $2.82 million and has intimated that it may be able to repeat this in some future years which would be a significant contribution.

Actellic presents problem of bulk, complicating transport and its use in the sprayer itself where it causes frequent nozzle stoppage. While it is reported that a more concentrated form (40% active ingredient compared to the 25% concentrate tested in Nepal)

exists the NMEO staff is not sure as to the results which might be obtained with the 40% [illegible] 1/ It has been proposed that the 40% concentrate be tested in a village wise basis prior to actual ordering of large quantities of any insecticide. The use of Fenitrothion presents also problems primarily in the monitoring of its safe use in the field since it is the most toxic. The Team believes that while the pros and cons should be presented in this report, in the final analysis the probable choice of insecticide will be determined by current susceptibility status and sources of outside funding.

/formulation

The comparative trials of Malathion, Fenitrothion, Actellic and Bendiocarb carried out in Nepal during 1980/81 were rather inconclusive, and need to be repeated under more closely controlled conditions, including a malariometric component, before a technically sound choice of insecticide or range of insecticides can be made.

Recommendations:

1. The continuous deterioration of the malaria situation in Nepal is certainly a health problem of primary importance and the presence of P.falciparum resistance to chloroquine together with the increase and spread of this parasite in the country, do not allow optimistic forecasts for the immediate future. There is a need for a much more consistent and firm government commitment in the fight against the disease if this is recognized, as it should be, as a serious threat to the development of the country. Reliance on bilateral assistance, which is becoming more and more difficult to obtain, should be balanced by a more concrete and consistent input from HMG. The Team is convinced that this is the only way to secure the continuation of external support to the programme and to attract new potential donors.

2. On the occasion of the two previous External Assessments of the Malaria Control Programme it was recommended that "MMCO should be given regular government status under the Ministry of Health as a Directorate or Division, with increased responsibility for controlling other vector-borne diseases as the MCP phases into ECMEP." Until now, this recommendation has not been implemented.

In order to achieve this, it is essential as a first step, that facilities for the diagnosis and early treatment of malaria cases be extended as much as possible at the peripheral level. The team, therefore, recommends that:

a. facilities for microscopic diagnosis and treatment, e.g. malaria clinics, should be made available as far into the periphery as is feasible according to local resources and the nature and extent of the malaria situation;

b. External financial assistance to the programme for the procurement of microscopes and laboratory equipment should be explored. The aim should be to have the above mentioned facilities at the unit level* as a starting point and gradually extend them in problem areas as required;

c. a stock of insecticide be kept at regional level for use in emergency situations such as malaria epidemics.

Malaria unit = A peripheral establishment which covers approximately 40-50 thousand people where their microscopic diagnosis of malaria is made and treatment immediately started.

After a careful evaluation of the antimalarial activities being carried out by HMEO, the Team wishes to make the following recommendations:

Surveillance activities

Case detection

Considering the very good and encouraging results obtained by the village health volunteers, their number should be rapidly increased throughout the country and in areas where there is a CHU they should be charged with malaria, so as to secure adequate population coverage. It is recommended that in addition to blood film taking they should also administer radical treatment (see para 4.1.2 below). PCD (H) and PCD (M) activities are carried out by personnel attached to medical establishment, such as hospitals, dispensaries, aid posts (H) and malaria programme staff (M). Although an improvement has been observed in slide collection and detection of cases, the performance of the health service staff is far below expectation, and the Team recommends that efforts continue to be made to obtain this essential collaboration. At the moment the malaria clinics are usually attached to the district hospitals where diagnostic services are either not available or not

utilized for malaria diagnosis. Their number should be gradually increased as recommended in ? above. In the district of Kailali and Kanchanpur in Far-Western Nepal, the district laboratory microscopists have been decentralized so as to have one microscopist in each unit; the same should be done in other regions and districts. The microscopists working in the malaria clinics should be trained in the diagnosis of other vector-borne diseases.

The malaria field workers, at present engaged in active case detection activities which significantly contribute to the detection of cases but at a high cost, should be more profitably used in activities which should become more and more an integral part of the control strategy such as:

a. supervision of village health volunteers with timely supply of drugs, checking of records, feed-back of results;

b. motivation and mobilization of communities for the implementation of minor water management and environmental modification activities together with personal protection measures and by providing guidance and supervision;

involvement in the utilization of biological agents (larvivorous fish) if and when these agents have demonstrated their role in controlling malaria;

partial transfer to laboratory services (microscopists for the malaria clinics).

utilization in Development Project Areas, and in any emergency situations.

These field workers should also be made multi-purpose by being trained in other vector-borne diseases.

Treatment

Presumptive treatment should be replaced by radical treatment for P.falciparum infections (1500 mg base of chloroquine, given in a three day period, adult dosage) with the addition of primaquine (45 mg dose, adult dosage). Presumptive treatment may be responsible for selecting chloroquine-resistance of P.falciparum, especially when the interval between the blood taking and the initiation of radical treatment is long (quite often more than 14 days). Patients infected with P.falciparum sensitive to chloroquine will be cured, patients with P.vivax will be relieved from the clinical symptoms and

when relapsing can be treated again. P.falciparum infections which recrudesce a few days after the completion of radical treatment should be referred to the malaria clinic where, if P.falciparum is confirmed and there is evidence that the total amount of chloroquine has been taken, 3 tablets of Fansidar should be given.

4.1.3 Epidemiological investigations

With the present malaria situation it will be impossible to investigate all positive cases as attempted in the past. The Team, therefore, recommends that epidemiological investigations be mainly carried out in and around all P.falciparum cases with blood films taken from the relatives of the patients and their neighbours.

4.1.4 Follow-up of patients

Even with the adoption of radical treatment (see para 4.1.2 above) some P.vivax cases will relapse. Considering the high number of patients with this infection, it will be impossible to carry out regular follow-up of these patients and such an activity should, therefore, be stopped. On the contrary, all P.falciparum infections should be followed up for at least six months with checks carried out at fortnightly intervals during the first two months.

5. The exacerbation and spread of P.falciparum can be effectively controlled by the timely application of effective insecticides on a total coverage basis. In the event of an impossibility to do so, the Team recommends that special care be taken in future in delimiting the areas to be sprayed and in the choice of the insecticides to be used so that satisfactory results can be obtained.

6. In order to reduce the further spread of P.falciparum the Team also recommends that radical treatment be given at the time the blood film is taken. (See para 4.1.2 above).

7. Special attention should be paid to the P.falciparum chloroquine-resistance problems. In this respect the Team strongly recommends that:

a. in vivo and in vitro sensitivity studies should be carried out in all districts where P.falciparum is predominant. In vivo studies may be carried out by the District Malaria Officers who have recently attended a seminar organized for this purpose. When chloroquine-resistance has been found by in vivo tests, a team from headquarters should complete the investigations on a larger sample of the population by the in vitro technique.

b. If recrudescences occur a few days after the completion of radical treatment, the patient should be dealt with as indicated in recommendation 4.1.2. above.

c. About 90% of the labour forces employed by the irrigation schemes and road construction in the outer Terai and other areas are Indians coming mainly from the states of Orissa and Bihar. This labour force spends about 1-2 months in the project area later to be replaced by other co-nationals. It is strongly recommended that in order to discover quickly and promptly parasite carriers coming from abroad, a malaria field worker be assigned and made an integral part of the personnel engaged in project development activities.

d. Entomological staff are already involved in the control of Japanese Encephalitis. To fit them for this expanding role in vector borne disease control they should be given additional training in the control of a wider range of disease vectors.

e. In order to derive the maximum benefit from newly developed entomological techniques in sporozoite detection and identification, bloodmeal identification, taxonomic methods and insecticide resistance characterisation, appropriate entomological staff should

be given training in these techniques as soon as possible.

11. In view of the current serious problems in the Far West Region attention should be paid to clarifying the epidemiological situation in the Region by the identification of the vector or vectors involved as soon as possible. Some of the newer entomological methods mentioned above may be employed here.

12. Investigation on species complexes should continue and there should be coordination with other countries in South-East Asia on this topic so as to clarify the distribution of the various component taxa in the Region, and also their comparative epidemiological importance.

13. As insecticide application will remain the main method of epidemic control for the foreseeable future, insecticide susceptibility testing should be expanded to include various vector and potential vector anopheline species and a wider spectrum of insecticides. This will greatly facilitate the choice of the appropriate insecticide for each particular operational stratum.

14. Arrangements should be made to obtain entomological data also from Integrated Districts since it may be dangerous to leave such gaps in the overall epidemiological picture, particularly as regards epidemic forecasting.

15. Labour intensive and relatively non-productive entomological techniques, such as night biting catches, should be minimized except where they are carried out with a definite epidemiological objective.

16. Newer techniques for vector incrimination should now be introduced gradually, as they become available.

17. The introduction of sero-epidemiological methods for malaria and other diseases may be useful, and this is covered more fully elsewhere in the text.

18. The trials with larvivorous fish should proceed steadily and carefully, expanded trials not being implemented until the selected fish species have progressed satisfactorily through the village scale stage.

19. Biological control trials using insect predators, particularly the water bug ENTHERES HORCIUATA (NOTONECTIDAE) should also be considered, as insects may be used in some situations where fish are not acceptable.

20. The MMEO should make a concerted effort to locate funding and sources of required quantities of insecticides for future spray program, and that MMEO more closely monitor the operational program in order to determine if saving in the already minimized supplies of insecticide can be

The number of examinations of slides should be improved. Serious effort should be made to reduce the time lag between collection and treatment.

c. Courier service and supervision at field level need great improvement.

All staff should have training in malaria.

The provisions made under the Decentralization Plan of His Majesty's Government should be fully exploited for Intersectoral Coordination and collaboration.

DF NMEO

a. The District Health office should be involved more in training and participation in meetings and conferences, including Border consultative meetings

Health Education materials, and PCD kit bags should be provided so that all CHLs could be utilised as PCD (V).

NMEO must provide technical guidance in a regular manner at all levels. There should be frequent discussions between NMEO and ICHSDP staff at district and regional level.

c. UNEO should monitor progress regularly and make sure that the guidance provided is seriously taken.

d. UNEO should encourage TCHSDP to start examination of slides in each Health Post through provision of microscopes, slides, reagent and training to one of the auxiliary staff.

Malaria Field Workers should also be trained in Primary Health Care.

Monitoring for vector susceptibility and parasite sensitivity should be carried out.

The Ministry of health

The numerous teething difficulties which have been observed in the TCHSDP Districts, and which have been outlined in the report, need immediate action to remedy the situation.

At the moment the malaria situation in the country is deteriorating with P.falciparum and its resistance to drugs representing a very serious threat to the control of disease, much to the Team's concern.

Therefore, while recognizing that it is the policy of the Government to proceed with integration as expeditiously as

possible, the Team would strongly urge that the antimalaria activities in the Districts already integrated should be upgraded to a satisfactory level as a matter of highest priority in order to provide a suitable pattern for further progressive integration.

24. In view of the rapid build up of malaria cases in the Kanchanpur/Kailali area the Team suggests that the existing malaria office in Dhangadhi be upgraded with trained personnel and if possible, a vehicle should be assigned at least during the period of maximum transmission. Difficulties of communications between the area and the administrative control of Surkhet or even between Kailali/Kanchanpur might result in a situation getting out of control before the news can get out to the concerned organizations.

Pending clarification of the situation the Team does not recommend any change in the existing spray program in the Kailali/Kanchanpur area but does suggest a close watch be kept on the adjoining border areas of Darchula, Baitadi and Dandeldhura.

Acknowledgement

The Team is grateful to His Majesty's Government, and to the Ministry of Health for facilitating its visit. The support of the Directorate of Health Services and the participation of Dr. B. D. Pande as Team Leader was particularly appreciated.

Dr. M. B. Parajuli, Chief Officer, NMEO and all his staff cooperated fully and assisted the work of the Team in many ways. Field visits were smoothly arranged, and the accompanying staff most competent and helpful.

The team realizes that while it is impossible to mention everyone who assisted the Team in their efforts, special mention should be made of Dr.M. B. Parajuli, S. L. Shrestha, B. P. Sharma, J.D. Shrestha, J. P. B. Shrestha and U. D. Bhatta of the NMEO; H. L. Rajbanshi from ICHSDP; Dr. M. K. Nudhin and K. B. Shrestha of the WHO and S. P. Pradhan and T. M. S. Pradhan of USAID. Finally we would like to thank the NMEO field staff for their help and hospitality. It is very much appreciated.

The administrative support of the local representatives of USAID, WHO and UK ODA is gratefully acknowledged.

ANNEX I

ENTOMOLOGICAL STAFFING PATTERN

Location	Post Description	Grade	No. of Posts	Vacancies
NMQ Ent. Section	Senior Entomologist	G.II	1	1
	Entomologist	G.III	1	
	Malaria Assistant	N.G. I	1	
	Malaria Inspector	N.G. II	5	
	Lab. Aide	G.S.S.	1	
Planning Research and Training Section	Entomologist	G.III	1	
	Malaria Inspector	N.G. II	1	
	Lab. Aide	G.S.S.	1	
Research and Training Unit, Metauda	Entomologist	G.III	1	
	Assistant Entomologist	N.G. I	2	
	Insect Collector	N.G.III	9	
	Malaria Inspector	N.G.II	4	
Regional Offices Entomology and Parasitology Section	Entomologist	G.III	4	1
Entomology Unit	Malaria Assistant	N.G. I	8	4
	Malaria Inspector	N.G. II	14	
	Insect Collector	N.G. III	14	
	Lab. Aide		1	

ANNEX II a

Consolidated Spraying Data of

1984 (NMEO)

	Region	Spraying cycle	Insecticide used	Pop. targetted	Pop. protected	House/Structure sprayed	Insecticide consumed in Kilos
I	East Region	Summer cycle	DDT	65,360	66,751	11933/12347	12710
II	Central Region	Summer cycle	DDT	25,008	24,414	4195/3831	5149
		Summer cycle	Malathion	231,960	230,184	34913/38461	39217
		Autumn cycle	Malathion	212,516	216,532	31914/35574	35575
III	West Region	Summer cycle	DDT	44,470	44,525	7569/7535	9559
		Summer cycle	Malathion	82,326	81,083	12558/14167	13557
		Autumn cycle	Malathion	82,509	81,469	12718/14651	13946
IV	Mid/Far West Region	Summer cycle	DDT	65,717	68,242	10377/9573	10497
		Autumn cycle	DDT	84,372	80,659	12592/11593	12379
			1984 (ICHSDP)				
	Central Region	Summer cycle	Malathion	303,602	274,565	47677/	131574
		Autumn cycle	Malathion	313,602	320,113	48347/	139941

ANNEX II (b)

Consolidated Spraying Data of
1985 (NMEO)

	Region	Spraying cycle	Insecticide Used	Population Targetted	Population Protected	Houses/Structure sprayed	Insecticide consumed in Kilos
I	East Region	Summer cycle	DDT	71,678	72,252	1340/9157	11777
		Summer cycle	Ficam	55,985	57,409	9883/5142	1728
		Autumn cycle	Ficam	166,130	172,715	29718/24946	2557
II	Central Region	Summer cycle	DDT	49,307	46,715	8138/7543	7239
		Summer cycle	Ficam	85,080	86,813	14541/13733	3024
		Autumn cycle	Ficam	100,557	109,736	18316/14092	3748
		Summer cycle	Malathion	196,127	194,604	30171/33875	86913
		Autumn cycle	Malathion	201,532	199,654	29967/29446	83874
III	West Region	Summer cycle	DDT	2,534	2,535	495	494
		Summer cycle	Ficam	68,551	66,989	11888/9759	2367
		Autumn cycle	Ficam	97,514	98,966	16183/13475	3093
		Summer cycle	Malathion	95,439	99,944	13999/14557	35559
		Autumn cycle	Malathion	98,121	97,693	13519/13044	37199
IV	Mid/Far West region	Summer cycle	DDT	235,011	253,578	41319/35307	92842
		Autumn cycle	DDT	200,664	200,031	34553/29716	81774

ANNEX II(b) Contd.

Region	Spraying cycle	Insecticide Used	Population Targetted	Population Protected	Houses/Structure sprayed	Insecticide consumed in Kilos
			1975 (ICHSDP)			
	Summer cycle	Malathion	112,[illegible]33	115,247	17664/	33669.[illegible]
	Summer cycle	DDT	11,091	11,539	[illegible]135	1773.631
	Autumn cycle	Malathion	114,457	117,[illegible]4[illegible]	17335	49728
	Autumn cycle	Ficam	12,[illegible]97	13,[illegible]96	3144	374.4[illegible]