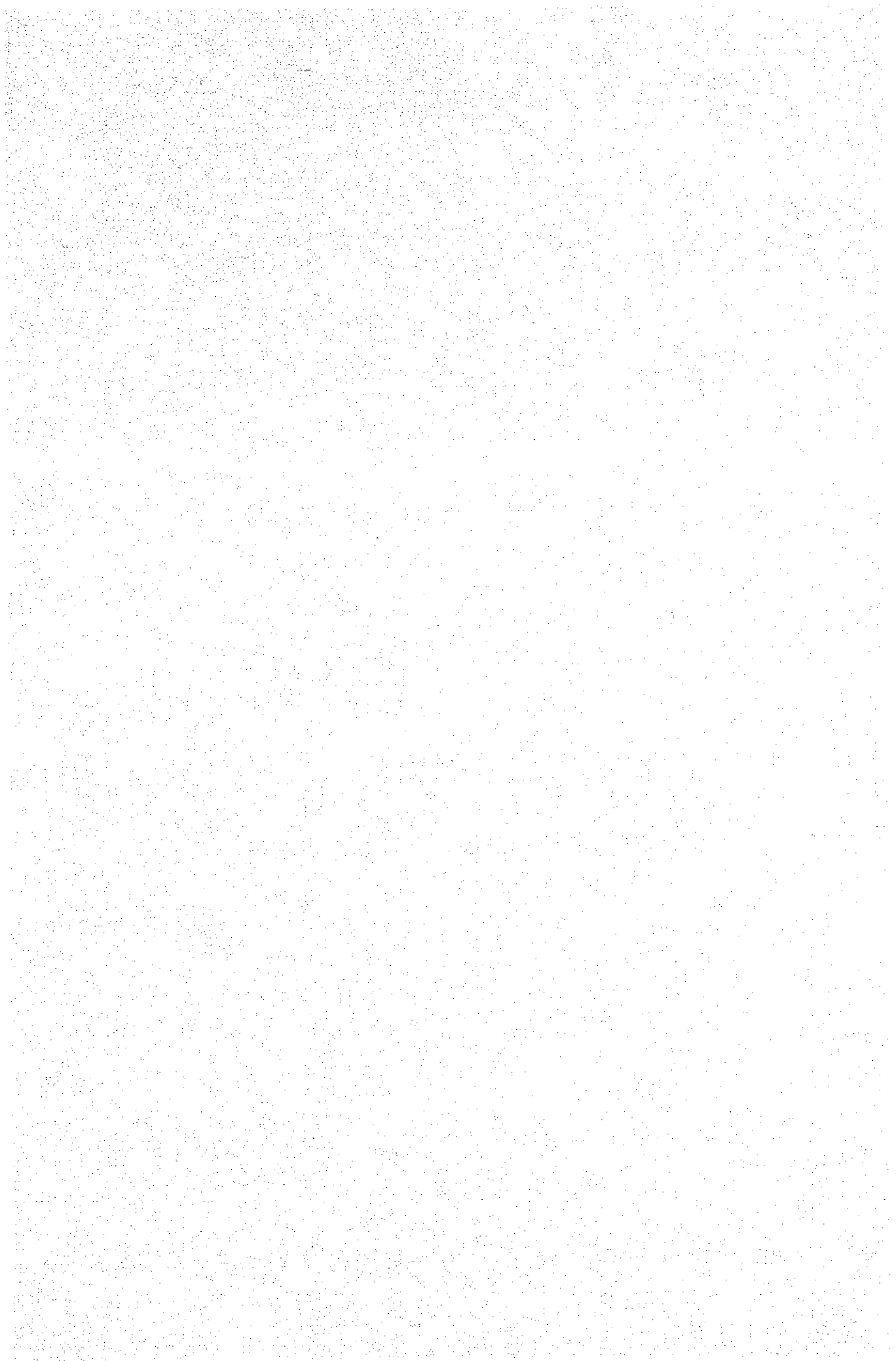


モンゴリア共和国  
北スマト地域保健対策プロジェクト  
第9回ステアリングコミティー報告書/  
その他関係資料・報告書

1985年10月

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## 序 文

当事業団は、昭和60年8月30・31日メダンにて開催された本プロジェクト第9回ステアリングコミティーへ橋本道夫本プロジェクト国内委員長を団長とする計画打合せ調査団を昭和60年8月25日より同年9月3日まで派遣した。

昭和60年度は、昭和59年4月より始った新5カ年協力期間の第2年目に当たり、今回コミティーでは昭和61年度計画、水供給施設建設、インドネシア側ローカルコスト負担問題等が論議された。

本報告書は、ステアリングコミティーでの論議の結果を取りまとめたものである。

ここに、本調査団団員各位および本プロジェクト国内委員会委員ならびにその他本プロジェクト支援機関各位に対し深甚なる謝意を表する次第である。

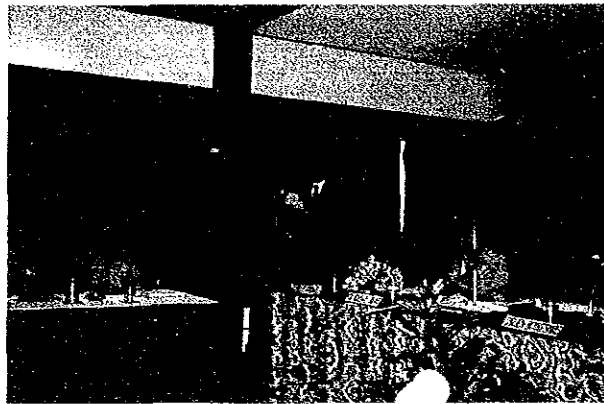
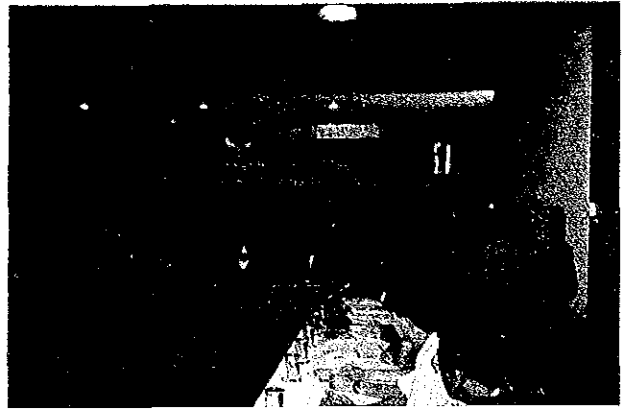
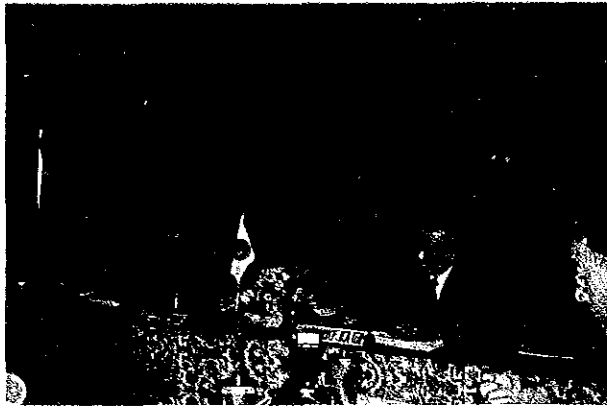
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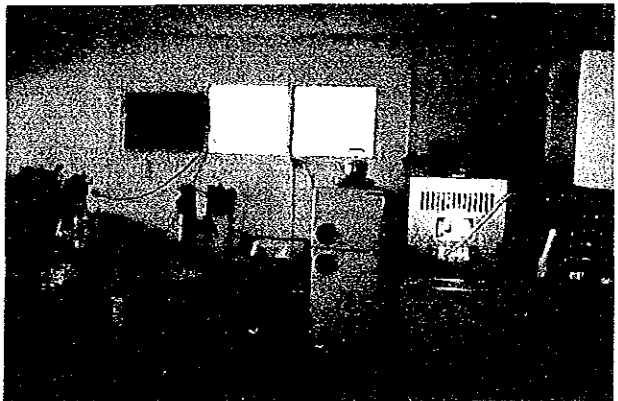
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ステアリングコミティー点描



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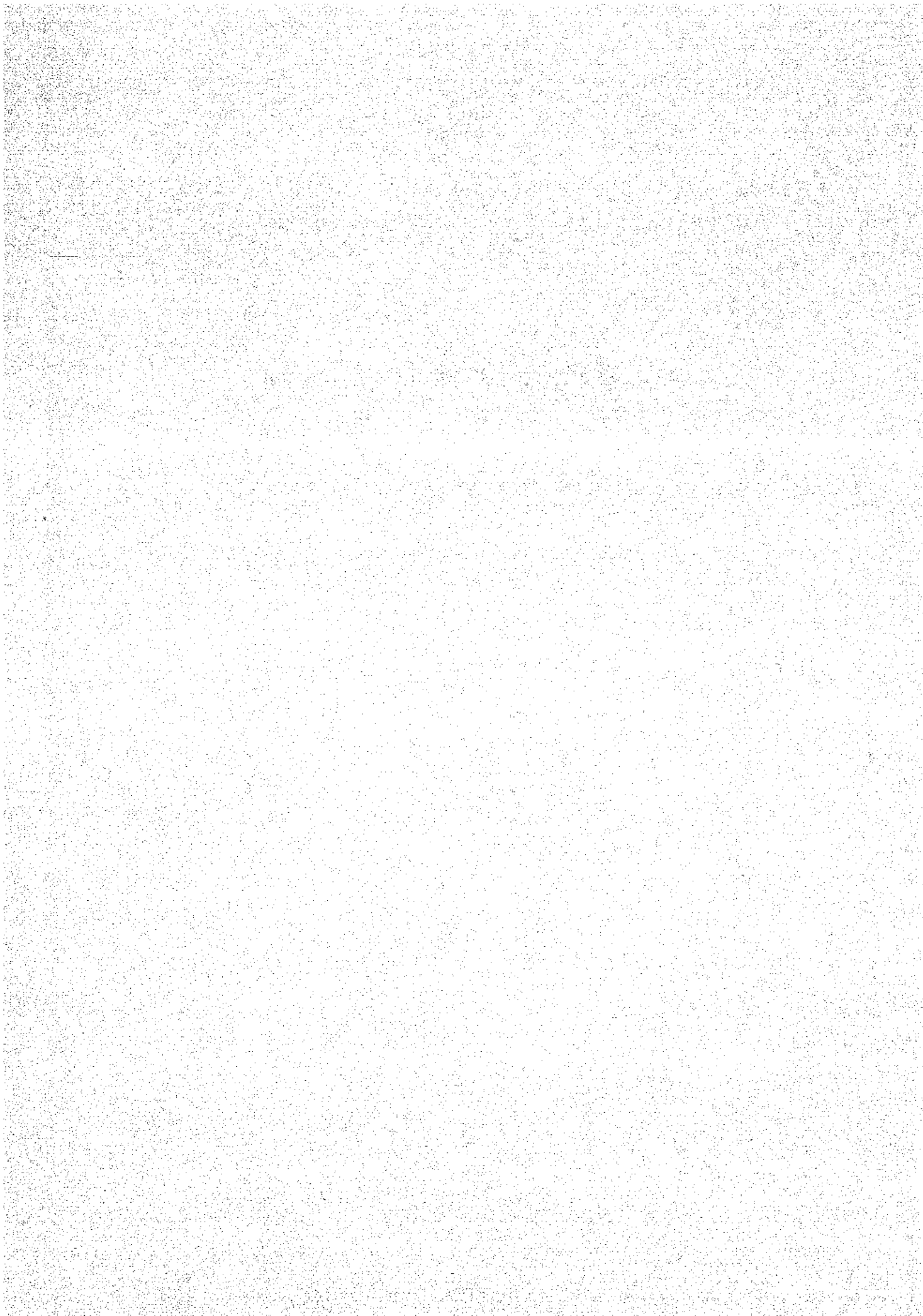
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1. 第9回ステアリングコミティー報告書



R E P O R T  
OF THE NINTH STEERING COMMITTEE MEETING  
NORTH SUMATRA HEALTH PROMOTION PROJECT  
(ASAHAN HEALTH IMPROVEMENT PROJECT)  
MEDAN, AUGUST 30 - 31, 1985

---

I. INTRODUCTION

The ninth steering committee meeting of the Asahan Health Improvement Project was held in Medan on August 30-31, 1985 under the chairmanship of Director General of Community Health, Department of Health, Republic of Indonesia.

The meeting was attended by representatives from Indonesian side and JICA.

II. SUMMARY OF THE MEETING

In the meeting, progress report was presented by Project manager and special report on technical progress was presented by Expert Team Leader.

Guidelines about policy of the government of Indonesia on the implementation of the project for the remaining years of the cooperation were presented by the Director General of Community Health.

Guidelines about JICA policy on the cooperation project were also presented by the leader of the planning and consultation survey team from Tokyo.

In the meeting, achievement and constraints in the implementation of the project were discussed by both sides. (See attached documents).

III. RESULTS OF THE DISCUSSION.

In accordance with the basic policies of the Government of Indonesia in the fourth Five Year Development Plan, both sides agreed that in the remaining years of the cooperation, more emphasis will be given on reduction of infant mortality rate, in line with the national health development plan in Indonesia.

For that purpose, in the coming fiscal years JICA is expected to provide service of experts in community health programs such as M.C.H, and others.

In an effort to supply safe water supply for community people, both sides agreed to take necessary procedures for dispatch of a JICA implementation survey team, for construction of some deep or semi deep wells in the project area.

#### IV. PLAN OF ACTION.

Plan of action for the remaining months of FY.1985/1986 was presented and discussed.

Plan of actions (proposals) for FY.1986/1987 for M.C.H, Nutrition, C.D.C and Environmental Health Programs were discussed and formulized within the scope of budget availability. For details, see Annex : 8.

An idea to build a monumental project before termination of the cooperation was presented by Indonesian side and discussed in the meeting.

The Indonesian side is expected to furnish a detailed proposal to JICA relating to the matter.

#### V. SUPPORTING SERVICES.

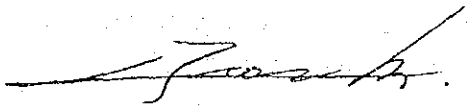
- a). List of experts to be requested to JICA in FY.1986/1987 (See Annex : 9. )
- b). List of fellowship and training programs to be requested to JICA (See Annex : 10. )
- c). List of equipment requested for FY.1986/1987 should be submitted early.

#### VI. MISCELLANEOUS.

Specific issues related to problems and constraints faced in the implementation of the project in the past were discussed by both sides. (See Annex : 6. )

Within the spirit of cooperation, both sides agreed to take maximum efforts to overcome problems which may arise in the course of the project.

List of the participants of the meeting (See Annex : 12. ).



HIROSHI YAMAMURA

*Jor:* Resident Representative  
Japan International Cooperation Agency.  
Jakarta , Indonesia

Signed at Jakarta  
on October , 1985.



dr. SUYONO YAHYA, MPH

Director General of Community Health.  
Department of Health Republic of Indonesia.

LIST OF ANNEX

1. Progress Report by Project Manager
2. Special Report on Technical Progress  
by JIOA Expert Team Leader
3. Quarterly Progress Report No 2/1985
4. Guidelines from Director General of  
Community Health ( English Translation )
5. Guidelines of the Project, addressed by  
Chief of the Japanese Mission
6. Statement of JIOA/HQ Mission
7. Agreement between the Government of Indonesia  
and JIOA Mission
8. Plan of Action FY 1986/1987
9. List of experts to be requested in FY 1986/1987
10. List of fellowship to be requested in FY 1986/1987
11. List of equipment to be requested in FY 1986/1987  
( To be submitted later )
12. List of attendance.





PROGRESS REPORT  
BY  
PROJECT MANAGER.



ASAHAN HEALTH IMPROVEMENT PROJECT  
PROGRESS REPORT  
F.Y.1984/1985 AND 1985/1986

---

INTRODUCTION.

The Record of Discussion between the government of Indonesia and the government of Japan concerning the extension and expansion of the technical cooperation project for another period of five - years, was signed on the 12<sup>th</sup> of March 1984, a few weeks before the end of F.Y. 1983/1984.

Therefore, the activities of the cooperation project could not be implemented according to the schedule because budget proposal for F.Y.1984/1985 should have been submitted early in F.Y.1983/1984.

The activities of the cooperation project in the last part - of F.Y.1984/1985 and the first part of F.Y.1985/1986 were carried out in accordance with the guidelines for the second five year technical cooperation project between the government of Indonesia and the government of Japan (JICA) for the promotion of health in Asahan Regency, North Sumatra, which was signed by the representatives of both sides in Jakarta on the 13<sup>th</sup> of August 1984.

Details of the activities in the second period of cooperation were reported in the Quarterly Progress Reports, Asahan Health Improvement Project, No.1 (issued in April 1985) and No.2 (issued in July 1985).

ACTIVITIES.

Summary of the activities can be reported as follows :

\* Malaria Control

Activities in malaria control were carried out in an effort to develop an appropriate control method to meet the environment and state of Malaria in the Asahan regency area, especially the coastal malaria transmitted by Anopheles Sundaicus. Studies in the past six years indicated that Anopheles sundaicus is considered to be the vector in the project area, even though sporozoites have not yet been detected in the mosquitoes.

Studies have also indicated that it is difficult to control malaria with residual indoor DDT spray in the project area, not because DDT is not effective against the mosquito, but simply because of the exophilic behaviour of the Anopheles Sundaicus.

Based .....

Based on those findings, efforts were focused on other control methods, which were aimed at destruction of breeding places of *Anopheles Sundaicus*.

The methods, which were taken into account are the use of larvicides, biological method, environment management and peridomicile spray.

Results of these activities have not yet been concluded because more experiments and investigations are still needed.

However, temporary findings have been identified as follows.

Laboratory tests had been carried out with larvae and with pupae by using Temephos, Fenitrothion and Fenthion. The effectiveness of the insecticides was still under investigation.

Other chemicals such as Altosid LOF and Sumithion 50%EC were also tested against *Anopheles Sundaicus* larvae.

Results of the studies indicated that 1 ppm. application of fenitrothion (50% Sumithion EC) was found effective for one week, Chlorpyrifosmethyl (5% Methyl Dursban wdp) was effective for 1-2 weeks and temephos (5% Abate wdp) was effective for at least 2 weeks. The 1 ppm application of methoprene (altosid LOF) was effective for 2 weeks in artificial ponds, but it was effective for 5 weeks in a small scale preliminary test using a natural pond.

In an effort to enhance the implementation of malaria control program, a special training course for microscopists and assistant entomologists in the project area was conducted in February 1985. The training was funded by JICA.

In the biological method activities, approximately 90 species of fishes belonging to 32 families had been identified in the project area. In relation to malaria control, these fishes had been classified as "Useful fishes", "harmful fishes" and "harmless fishes".

For future biological control of malaria vector mosquitoes, the suggested candidate fishes are Poecilia reticulata, which is easily collected in Medan and Tilapia mossambica which is abundantly found in the Lake Toba.

Studies about the possibilities of using those fishes as a malaria control method are still needed in the coming fiscal years.

#### \* Water Supply.

The water supply activities were carried out in an effort to find basic data which are needed for planning of the future water supply program.

Another .....

Another purpose of the water supply activities in the project area was to improve the knowledge and skill of the community people to maintain the water supply facilities which were available in their villages through a training course.

Surveys were also conducted to find out the condition of water supply facilities in the project area, so that repair proposal of the broken pumps could be arranged.

#### CONSTRAINTS.

Due to limitation of counterbudget in Indonesian side, the joint activities in the cooperation project were limited to malaria control and water supply activities.

However, assistance in other health programs was also provided by JICA through equipment and material supply program.

#### CONCLUSION.

In F.Y. 1984/1985 and 1985/1986 joint activities were carried out in malaria control and water supply programs. Some data had been found and some problems had been identified, and these things need further processing in the coming fiscal years.

#### SUGGESTION.

In relation to the specific objective of the technical cooperation project in the second five year period which was aimed at reduction of infant mortality rate, other health priority programs such as M.C.H, Family Planning, Nutrition, Immunization etc, need to be developed in the project area, and for the purpose of provision of educational materials, which are badly needed in health education campaign, to support the activities of the " integrated health service post " (posyandu), establishment of a media production center needs to be realized.

Medan , August 1985.

The Project Manager.

BUDGET ALLOCATION FOR ASAHAN  
HEALTH IMPROVEMENT PROJECT.

ANNEX : 1

FISCAL YEAR	I N D O N E S I A		T O T A L	J A P A N
	NATIONAL BUDGET	PROVINCIAL BUDGET NORTH SUMATRA		
1978 / 1979	Rp. 12.570.000.-	Rp. 20.000.000.-	Rp. 32.570.000.-	Y. 50.000.000.-
1979 / 1980	Rp. 44.172.000.-	Rp. 18.600.000.-	Rp. 62.772.000.-	Y. 100.000.000.-
1980 / 1981	Rp. 49.970.000.-	Rp. 36.110.000.-	Rp. 86.080.000.-	Y. 150.000.000.-
1981 / 1982	Rp. 66.473.000.-	Rp. 600.000.-	Rp. 67.073.000.-	Y. 30.000.000.-
1982 / 1983	Rp. 74.436.500.-	Rp. 23.193.000.-	Rp. 97.629.500.-	Y. 50.000.000.-
1983 / 1984	Rp. 29.415.000.-	Rp. 6.100.000.-	Rp. 35.515.000.-	Y. 30.000.000.-
1984 / 1985	Rp. 20.702.000.-	Rp. 23.500.000.-	Rp. 44.202.000.-	Y. 35.000.000.-
1985 / 1986	Rp. 19.820.000.-	Rp. 24.146.000.-	Rp. 43.966.000.-	Y. 35.000.000.-
T O T A L	Rp. 317.558.500.-	Rp. 152.249.000.-	Rp. 467.807.500.-	Y. 450.000.000.-

NOTES :

The amount mentioned above does not include budget allocated for experts and fellowship.

## LIST OF JAPANESE EXPERTS AND SURVEY TEAM MEMBERS DISPATCHED FOR THE PROJECT.

No.	Name	Field of Assignment	Duration	Position	Remarks
1.	Toshio CHISO	Leader of the team	Dec. 5-1976 - Dec.15-1976	Executive Director, Japan International Medical Association	Preliminary Survey Team.
2.	Hariyo SAIO	Public Health	"	Professor, Kyoto Univ.	"
3.	Akio UCHIDA	Medicine for Agri. Village.	"	Professor, Chiba Univ.	"
4.	Akira Matsuda	Environmental Health	"	Ministry of Health & Welfare.	"
5.	Nabuo OKUDA	Coordination	"	J I C A	"
6.	Tadashi TAKEUCHI	Leader of the Mission	Sep.29-1977 - Oct.11-1977	Professor, Nihon Univ.	R/D Mission
7.	Shuhiro SAKAWOTO	Public Health	"	Professor, Hyogo Univ.	"
8.	Akira ISHII	Parasitology	"	Associate Professor Tokyo Univ.	"
9.	Masaki NAITO	Sanitary Engineering	"	National Institute for Environmental Studies.	"
10.	Matsuyo KAMIJO	Coordination	"	J I C A	"
11.	Akira ISHII	Parasitology	Feb.25-1978 - Mar.18-1978	Associate Professor, Tokyo Univ.	Expert
12.	Masayuki YASUNO	Ecology	"	National Institute for Environmental Studies.	"
13.	Mitsumi KANEKO	Sanitary Engineering	"	Institute of Public Health	"
14.	Hitoshi TANAKA	Health Statistics	Aug. 3-1978 - Feb.28-1979	Ministry of Health and Welfare.	"
15.	Norichika KEMAZAWA	Bacteriological Epidemiology.	Nov.17-1978 - Nov.16-1980	Tokyo Univ.	"

No.	Name	Field of Assignment	Duration	Position	Remarks
16.	Kazuo TANAKA	Entomology	Jan.18-1979 - Jan.17-1981	Tokyo Univ.	Expert
17.	Akira ISHII	Parasitology	Feb. 5-1979 - Mar.15-1979	Professor, Miyazaki Medical College.	"
18.	Kiroku MATSUNO	Public Health	"	Associate Professor, Kyoto Prof. Medical College.	"
19.	Masayuki YASUNO	Ecology	"	National Institute for Environmental Studies.	"
20.	Hiroshi HASHIURA	Coordinator	May.23-1979 - Mar.31-1983	JICA	"
21.	Tsuguo YANGIHASHI	Team Leader & Public Health.	Jul.11-1979 - Jul.10-1980	Associate Professor, Kagoshima Univ.	"
22.	Michio HASHIMOTO	Leader of the Mission	Aug. 1-1979 - Aug.21-1979	Professor, Tsukuba Univ.	Contact Mission for Rural Water Supply Facilities.
23.	Kazunobu ONOGAWA	Water Supply Engineering	"	Ministry of Health and Welfare.	"
24.	Koichi MIYOSHI	Koordination	"	JICA	"
25.	Jiro YAMAMOTO	Leader of the Team	Sep.13-1979 - Sep.20-1979	Director, Medical Cooperation Dept., JICA	Advisory Team
26.	Mitsuru UEMATSU	Health Statistic & Community Health	Sep.13-1979 - Sep.20-1979	Professor, Kitasato Univ.	"
27.	Keichi MICHISHITA	Coordination	"	JICA	"
28.	Ario SAKASHITA	Indrapura Laboratory Construction	Nov.19-1979 - Dec.18-1979	Ministry of Construction	Expert
29.	Hiroyuki UESHIMA	"	"	"	"
30.	Choeichi KOBAYASHI	"	"	"	"
31.	Michio HASHIMOTO	Leader of the Team	Nov.21-1979 - Dec.20-1979	Professor, Tsukuba Univ.	Survey Team for Rural Water Supply.
32.	Kazunobu ONOGAWA	Environmental Health	"	Ministry of Health & Welfare.	"



No.	N a m e	Field of Assignment	Duration	Position	Remarks
33.	Koichi MIYOSHI	Coordination	Nov. 21-1979 - Dec. 20-1979	J I C A	Survey Team for Rural Water Supply.
34.	Hideki YAMAZAKI	Water Supply Planning	"	Japan Water Supply Consultant Co. Ltd.	"
35.	Teruji SASAKI	Facility Design	"	"	"
36.	Isao SEKINE	Water Resources Planning.	"	"	Expert
37.	Takaya IKEMOTO	Ecology	Jan. 1-1980 - Jan. 31-1981	Telkyo Univ.	"
38.	Hiroji KANEHARA	Malaria Parasitology	Jan. 31-1980 - Mar. 25-1981	Osaka Univ.	"
39.	Ryoji TAKAI	Team Leader and TB Control.	Jun. 1-1980 - Mar. 3-1983	The Research Institute of TB Japan, Anti TB Association (Former Position)	"
40.	Akio SAKASHITA	Indrapura Lab. Construction	Sep. 17-1980 - Sep. 27-1980	Ministry of Construction	"
41.	Hiroyuki USHIJIMA	"	"	"	"
42.	Syuji MURUNOKI	"	"	"	"
43.	Hideki YAMAZAKI	Water Supply Facilities.	Sep. 1-1980 - Nov. 30-1980	Japan Water Supply Consultants Co. Ltd.	"
44.	Tetsubumi TSUJIMOTO	Supervisor, Water Supply Facilities Construction.	Sep. 1-1980 - May. 15-1981	"	"
45.	Ichiro WANISAKA	Leader of the Team	Nov. 5-1980 - Nov. 21-1980	Professor, Kagoshima Univ.	Advisory Team
46.	Masayuki YASUNO	Malaria Control	"	National Institute for Environmental Studies.	"
47.	Chisad FUJIOKA	Health Education	"	Associate Professor, Osaka Educational Univ.	"
48.	Koji TANABE	Coordination	"	J I C A	"
49.	Yoshiaki KARUJI	Ecology	Jan. 1-1981 - Jan. 14-1982	Kyoto City Institute of Public Health.	Expert

No.	Name	Field of Assignment	Duration	Position	Remarks
50.	HIDEKI YAMAZAKI	Water Supply Facilities	Mar. 1-1981 - Mar. 31-1981	Japan Water Supply Consultants Co. Ltd.	Expert
51.	JUNICHI IMAI	Parasitology	Mar. 15-1981 - Mar. 14-1982	Associate Professor, Miyazaki Medical College.	"
52.	HIROYUKI AMANO	Malariaology	Mar. 15-1981 - Sep. 14-1981	Physician, Dept. of Overseas Medical Service, Tenri Hospital	"
53.	KEICHIRO JYO	Bacteriology	"	Ministry of Health and Welfare	"
54.	MICHIO HASHIMOTO	Leader of the Team	Dec. 19-1981 - Dec. 23-1981	Professor, Tsukuba Univ.	Advisory Team
55.	AKIRA ISHII	Parasitology	Dec. 14-1981 - Dec. 23-1981	Professor, Miyazaki Medical College	"
56.	RYUTARO YAMASU	Water Supply Engineering	"	Ministry of Health & Welfare	"
57.	KOJI TANABE	Coordination	"	J I C A	"
58.	Chobei IMAI	Ecology	Dec. 19-1981 - Dec. 18-1982	Osaka City Institute of Public Health and Environmental Sciences.	Expert
59.	MICHIO HASHIMOTO	(For 5th Steering Committee Meeting)	Jan. 8-1982 - Jan. 15-1982	Professor, Tsukuba Univ.	
60.	KOJI TANABE	( " )	Jan. 8-1982 - Jan. 10-1982	J I C A	
61.	HIDEKI ITOKAWA	Malariaology	Jan. 27-1982 - Sep. 23-1982	Tokyo Medical & Dental Univ	Expert
62.	Kazuhiko BABA	Bacteriology	Mar. 6-1982 - Sep. 5-1982	Ministry of Health & Welfare.	"
63.	Osemi SAKAMOTO	Parasitology	Apr. 10-1982 - Apr. 9-1983	Kanagawa Pref. Health Service Association.	"
64.	AKIKO SHIZUKUSHI	TB. Lab. Work	Jun. 13-1982 - Sep. 12-1982	The Research Institute of TB., Japan Anti TB. Association.	"
65.	MICHIO HASHIMOTO	Evaluation Team	Aug. 21-1982 - Sep. 8-1982	Professor, Tsukuba Univ., Chairman, Internal Committee on Project OIA-43	"

No.	Name	Field of Assignment	Duration	Position	Remarks
66.	Masayuki YASUFO	Evaluation Team	Aug. 21-1982 - Sep. 5-1982	National Institute of Environmental Health, Internal Committee on Project OTA-3	
67.	Taiji NAKAGAWA	"	Aug. 21-1982 - Aug. 29-1982	JICA	
68.	Katsuyuki HAKINO	Water Supply	Sep. 10-1982 - Mar. 31-1983	Water Supply Department, Municipal Government of Sapporo.	Expert
69.	Masahiro TAKAGI	Malaria Ecology	Oct. 15-1982 - Mar. 31-1983	Department of Medical Zoology, School of Medicine Univ.	"
70.	Takaakiro INOMOTO	Malaria Parasitology	Oct. 22-1982 - Mar. 31-1983	Institute of Tropical Medicine, Nagasaki Univ.	"
71.	Mitsuo HASHIMOTO	Contact Mission on the new Project.	Mar. 8-1983 - Mar. 16-1983	Mentioned above.	
72.	Osamu SAKAMOTO	Gastroenteritis Epidemiology.	Apr. 9-1983 - Oct. 5-1983	Kariyawa Prefecture Health Service Association.	Extension of the term of duty.
73.	Takaya IKEMOTO	Malaria Ecology	Apr. 15-1983 - Apr. 15-1984 Aug. 10-1984.	Department of Parasitology School of Medicine, Tokyo University.	Expert
74.	Ariko SHIZUKUISHI	TB. Lab. Works	May. 9-1983 - Jul. 16-1983	The Research Institute of Tuberculosis, Japan Anti-TB Association.	Leave from duty before the end of the Term duty because of illness.
75.	Hiroyuki MATSUOKA	Malaria Parasitology	Aug. 1-1983 - Jul. 31-1984	Institute of Medical Science Tokyo University.	Expert
76.	Sadso AHARA	Water Supply	Aug. 3-1983 - Mar. 31-1984	Water Supply Department, Municipal Government of Sapporo.	"
77.	Katsutaka SHIMOMURA	Coordination	May. 26-1984 - Apr. 26-1984		
78.	Hideki ITOGAWA	Malaria Ecology	Jul. 15-1984 - Jul. 15-1985		
79.	Chobei IMAI	Malaria Ecology	Jul. 25-1984 - Jul. 24-1985		

No.	N a m e	Field of Assignment	Duration	Position	Remarks
80.	Hisao YAMUGI	Control Operation of Malaria Mosquito	Aug.29-1984 - Oct.29-1985	Staff, Koeyakuhin Co.Ltd.	Expert
81.	Koichi NISHIYAMA	Fish Biology	Aug.29-1984 - Feb.28-1985	Teacher, Kansai Univ., First Senior High School.	"
82.	Takeshi SUZUKI	Team Leader of Health Promotion Project in North Sumatra.	Oct.16-1984 - Sep.1987.	Graduated from University of Tokyo (Faculty of Pharmaceutics)	"
83.	<sup>O</sup> Hisashi IGARASI	Water Supply Engineering	Nov.19-1984 - Nov.25-1985	Water Supply Engineering, Construction Section, Water Works Bureau, Sapporo City.	"
84.	Akira KANEKO	Malaria Parasitology	Jul. 1-1985 - Jun.30-1986	Research Associate, Dept. of Parasitology, Hiroseki Univ., School of Medicine.	"
85.	Tetsusi KIKUCHI	Larva Control Operation	Jun.30-1985 - Jul. 1-1986	Laboratory of Medical Entomology, Tokushima Medical Association.	"

FELLOWSHIP TRAINING

ANNEX : 3

No.	Name	Training Subject	Duration	Position	Remarks
1.	Dr. R. Tampubolon	Health Management	Jan. 11-1979 - Mar. 2-1979	Deputy Manager, Asahan Health Improvement Project.	
2.	Dr. R. Sudiranto	Laboratory Service	Jan. 11-1979 - Feb. 15-1979	Director, Health Laboratory in Medan.	
3.	Dr. Mangasa Siregar	Primary Health Care	Mar. 25-1979 - Apr. 12-1979	Chief of Provincial Health Service of North Sumatra, Manager of the Project.	
4.	Dr. L.A. Lolong	Health Management	Mar. 25-1979 - Apr. 12-1979	Chief, Planning and Programming Division Directorate General of Community Health.	
5.	Mr. Wesley Pohan	Health Entomology	Mar. 31-1979 - Aug. 8-1979	Staff of Communicable Diseases Control Directorate, Provincial Health Service in North Sumatra.	
6.	Dr. Remaniata P. Purba	Parasitology	Jul. 7-1979 - Oct. 31-1979	Chief of Sub-Section of Parasitology, Regional Health Laboratory in Medan.	
7.	Mr. Hari Sutikno	Sanitary Engineering	Jan. 6-1980 - May 12-1980	Staff of Regional Health Service in Asahan North Sumatra.	
8.	Mr. Mangasa Soedhon Lubis	Clinical Chemistry	Jan. 10-1980 - May 24-1980	Chief of Clinical Chemistry Sub-Section Regional Health Laboratory in Medan.	
9.	Mr. Marcus Cintiaj	Food and Drinks Examination	Nov. 28-1979 - Apr. 1-1980	Chief, Subsection of Food and Drinks Microbiology, Regional Health Laboratory in Medan.	

No.	N a m e	Training Subject	Duration	Position	Remarks
10.	Dr. Sulaiman Lubis	T.B. Control	Jun. 12-1980 - Oct. 20-1980	Chief of Communicable Diseases Control, Asahan Regency Health Service in Kisaran.	
11.	Dr. Santoso Karo-Karo	Management of Health Care Delivery Service	Mar. 21-1981 - Apr. 8-1981	Chief, Program Preparation and Reporting Div. Directorate General of Community Health Jakarta.	
12.	Dr. Darmansyah Harahap	Hospital Administration	Jul. 12-1981 - Aug. 11-1981	Chief, Kisaran Hospital.	
13.	Dr. Halomoan Nainggolan	Malaria Epidemiology	Oct. 17-1981 - Dec. 25-1981	Staff Member, CDC, Provincial Health Service of North Sumatra.	
14.	Dr. Helmi Djafer	Public Health Management	Oct. 17-1981 - Nov. 3-1981	Chief of Provincial Health Service of North Sumatra, Manager of the Project.	
15.	Dr. T.B.H.Lumbaraja	Environmental Health	Aug. 19-1982 - Sep. 22-1982	Chief of Division of Environmental Health Protection, Provincial Health Service of North Sumatra.	

No.	N a m a	Training Subject	Duration	Position	Remarks
16.	Drs. Debal Purba	Statistics	Jan.20 - '83 - May 3 - '83.	Chief of Section of Environmental Sanitation.	
17.	dr. Mara Laut Siregar SKM	Health Education	Jan.20 - '83 - May 3 - '83.	Chief of Division of Health Education Provincial Health Service of North Sumatra.	
18.	dr. W. Panjaitan DTWGH.	Communicable Disease Control		Chief of Division of Communicable Disease Control. Provincial Health Service of North Sumatra.	
19.	Mr. Sudi Simulingga	Serology on Microbial Diseases.	Oct.1 - '84 - Dec.23 - '84	Chief of Section Microbiology, Laboratory Health Medan.	
20.	dr. Husni Thaurin Nst, SKM	Community Health Service	Oct.7 - '84 - Nov.11 - '84.	Chief of Asahan Regency Health Service.	
21.	dr. M. Hariadi	Health Promotion Project in North Sumatra with Special Attention to the Asahan Area.	Jun.30 - '85 - Jul.23 - '85	Chief of Provincial Health Service of North Sumatra.	

EQUIPMENT AND MATERIALS  
DONATED BY JICA TO THE PROJECT

FISCAL YEAR	P R I C E
1978 / 1979	¥. 50.000.000.
1979 / 1980	¥. 100.000.000.
1980 / 1981	¥. 150.000.000.
1981 / 1982	¥. 30.000.000.
1982 / 1983	¥. 50.000.000.
1983 / 1984	¥. 30.000.000.
1984 / 1985	¥. 35.000.000.
1985 / 1986	¥. 35.000.000. (Under processing)
T O T A L	¥. 480.000.000.

Notes :

The amount mentioned above  
does not include budget  
allocated for experts and fellowships.



SPECIAL REPORT ON TECHNICAL PROGRESS

BY

JICA EXPERT TEAM LEADER.



## SPECIAL REPORT ON TECHNICAL PROGRESS

### 1. INTRODUCTION

The North Sumatera Health Promotion Project with special attention to the Asahan area (OTA-43) was established in 1978 under the mutual agreement between the Indonesian and Japanese Governments. The Project was conducted for five years from April 1978 to March 1983 on the basis of the Record of Discussion (R/D) signed on October 10, 1977, and was temporarily extended for one year from April 1983 to March 1984.

The new R/D was signed on March 12, 1984, in which an agreement was made between two Governments to extend the Project for further five years from April 1984 to March 1989.

During six years in the first term of the Project which include temporarily-extended period of one year, the project activities covered wide aspects of public health, as stated in Outline of the Project in the first R/D.

These are :

- (1) To promote communicable disease control activities,
- (2) To improve the health care delivery services,
- (3) To improve health laboratory services,
- (4) To promote health education activities,
- (5) To promote other related health fields mutually agreed upon as necessary.

During these six years, more than 25 Japanese Experts joined the Project to work together with the Indonesian colleagues. Altogether 18 key Indonesian staff were sent to Japan under the JICA fellowship grant. Equipment and materials indispensable to achieve the target of health promotion were donated by JICA to the Indonesian Government. It amounted almost to one million U.S. dollars.

The Project was successful in promoting health activities in the project area, particularly on tuberculosis control, on cholera control, on parasite control, on water supply, on strengthening laboratory functions and on health education.

In malaria studies, essential information was obtained which may lead a new technique of coastal malaria control in future.

In the second term of the Project covering the period April 1984 to March 1989, the project areas were expanded from the former three Kecamatan to seven Kecamatan.

During the second term, equipment and materials will be supplied to all the field of public health, with particular emphasis to the newly expanded Kecamatan for levelling up their conditions; and fellows will be selected from any field of public health, as done during the first term. The technical cooperation involving JICA experts will, however, be concentrated to some limited fields. Efforts have now been focused particularly to malaria control studies, which reflected the attached document of the R/D in 1984.

Since commencement of the second term cooperation up to July 1985, JICA experts have been working on various fields of malaria studies, i.e. parasitology, vector ecology, vector control using insecticides and vector control using fishes; and also on water supply. During the remaining period of FY 1985/1986, one expert each of malaria immunology and tuberculosis control is proposed to join the Project.

## 2. PROGRESS ON MALARIA CONTROL STUDIES

Studies were carried out as a joint programme of CDC staff and JICA Experts. In the following issues, Background Information is that clarified by previous studies in the Project; Plan of Action is that proposed at the assignment of the present Experts; and Finding are brief conclusion of their studies.

### 2.1 Epidemiology/Parasitology

#### 2.1.1 Back ground Information

- (1) Two malaria parasites, P.vivax and P.falciparum, exist in the Project Area. The former is usually predominant.
- (2) Anopheles sundaicus is considered the sole vector in the coastal area of the Asahan Regency.

- (3) High malaria incidence, as well as high density of An. sundaicus, is found in the area near the coast, particularly in the Villages Perupuk and Guntung.
- (4) High malaria incidence in the coastal area occurs, usually 1 - 1½ months after the peak of An.sundaicus density.
- (5) Scarce information is available on malaria incidence in inland area.

#### 2.1.2 Plan of Action

The Plan of Action for malaria parasitology which was issued in October 1984 is briefly summarized as follows:

- (1) Malarionetric survey in the Village Perupuk

Malarionetric surveys will be carried out in the Village Perupuk, both with school children and with the inhabitants. This village, highly endemic with malaria, is the target area for future vector control. The data of the surveys will serve as the baseline for future epidemiological evaluation of the vector control operation.

- (2) Chloroquine resistance tests

Using WHO Test Kits, ACD and PCD chloroquine resistance tests with the parasites will be carried out in the Villages Perupuk and Guntung.

- (3) Malarionetric survey in the other villages of the Asahan Regency

In order to find out new malaria endemic area other than those clarified before, malarionetric surveys will be carried out in some inland villages of the Asahan Regency. The surveys will be done in close cooperation with the survey team belonging to IKES.

#### 2.1.3 Findings

Microscopic examination of blood films is not yet completed. Final conclusion will be presented in the Assignment Report of Dr. Itokawa.

(1) Efforts have been concentrated to malarionetric surveys in inland areas belonging to the Newly-expanded Project Area. The parasite rate (PR) in inland areas is sporadic.

(2) In Desa Buntu Maraja of Kecamatan Bandar Pulau, a rather high malaria incidence was observed: the PR was 11.5% (12/104), and the spleen rate (SR) was 10.6% (11/104). This village is situated in the forestal area.

(3) The other localities with positive PR in inland area were as follows:  
Desa Padan Pulau, 5.6% (4/74); Desa Genting Marahu, 4.1% (5/121); Desa Padan Mohondang, 2.4% (12/502); and Desa Bangun, 1.0% (2/204).

(4) Malarionetric surveys were also made in the coastal area belonging to the newly-expanded Project Area. In Kecamatan Tanjung Tiram, the PR was high in the villages close to the coast and low in those far away from the coast: 15.8% (21/133) in Desa Bagung Dalam (coasta village); 12.1% (11/91) in Desa Guntung (1-2 km from the coast); 9.7% (14/144) in Desa Lima Laras (2km from the coast); and 2.3% (10/434) in Desa Ujung Kehu (3km from the coast).

(5) In conclusion, malarious areas are distributed both in the coastal and inland forestal areas of the Project Area. Low malaria incidence was also found in rice-field area close to plantations. The vector of coastal malaria is considered An.sundaicus, but that of inland malaria has not yet been known.

## 2.2 Ecology of vector mosquitoes

### 2.2.1 Background Information

(1) High density of An.sundaicus on human bait is observed (a) in the April-June period, and (b) in the October-November period in the coastal area.

(2) An.sundaicus is highly anthropophilic. Both indoor and outdoor, An.sundaicus is active for biting during the whole night with a peak around midnight.

After indoor biting, most of them fly away.

(3) Scarce information is available on outdoor resting habit of An.sundaicus.

(4) An.sundaicus prefers breeding in brackish man-made ponds directly exposed to sunshine. These ponds are distributed close to human dwellings.

(5) High density of An.sundaicus larvae occurs after the onset of high tide.

(6) After invasion of sea water to the ponds due to high tide, water body of the ponds, as well as its salinity, increase to a high extent, which may cause high larval production.

#### 2.2.2. Plan of Action

The Plan of Action on malaria vector ecology which was issued in October 1984 is briefly summarized as follows:

(1) Baseline data on vector mosquitoes in Perupuk.

Baseline data on An.sundaicus density in Perupuk will be collected by twice-a-month surveys in Perupuk, for adults at three fixed stations and for larvae in selected habitats. These will serve as the baseline data for future entomological evaluation of the vector control operation.

(2) Entomological surveys in overall Project Area

In order to find out endemic areas of malaria other than those already clarified, spot surveys on adults and larvae will be carried out in several villages in the Asahan Regency. Intensive surveys on breeding places of An.sundaicus will also be under study in the whole Perupuk and Guntung area.

(3) Basic study

In order to clarify the biology of An.sundaicus, some basic studies will be carried out, e.g. on the relationship between larval density and water salinity.

### 2.2.3 Findings

- (1) No localities with abundant Anopheline mosquitoes have been found by preliminary surveys done in inland areas, which are located in the newly-expanded Project Area. Further surveys are needed, before final conclusion be made.
- (2) A rather high density of An.sundaicus was recorded by spot surveys in the coastal area other than Perupuk. Seasonal prevalence of the mosquitoes in these localities has not yet been known.
- (3) Main habitats of An.sundaicus in Perupuk are located around fringe part of swamps which are easily invaded by high tide. It was reconfirmed that the ponds with high density of An.sundaicus are limited to well-sunlit ponds with over 0.1% salinity.
- (4) It was also confirmed that density of An.sundaicus larvae often showed a rapid increase just after invasion of sea water to ponds due to high tide.

### 2.3 Vector Control using Insecticides

#### 2.3.1 Background Information

- (1) As far as Village Perupuk is concerned, DDT residual spraying inside houses is not effective in reducing man-biting density of An.sundaicus, accordingl also in reducing malaria incidence. This is probably due to lack of indoor resting habit of the mosquitoes, and of no fugant action of DDT.
- (2) Larvicide application to An.sundaicus habitats may be feasible for vector control of the malaria, because of their limited extension and of proximity to human dwellings.
- (3) In the laboratory tests, LC-50 of tenephos (Abate) was 0.0034ppm. Preliminary field tests suggested that 1ppm application of 5% Abate wdp is promising for the control of An. sunndaicus larvae.

#### 2.3.2. Plan of Action



The Plan of Action on vector control using insecticides which was issued in October 1984 is briefly summarized as follows:

(1) Effectiveness of larvicides

Studies will be carried out both in the laboratory and in the field to know the effectiveness of candidate insecticides against An. sundaicus larvae.

(2) Laboratory rearing of An. sundaicus

Laboratory rearing of An. sundaicus will be tried, in order to supply larvae enough for laboratory insecticide tests.

2.3.3 Findings

(1) Laboratory rearing of An. sundaicus using young chickens as blood source was successful, and a mass of the larvae thus obtained were utilized for larvicide tests in the laboratory.

(2) In the laboratory tests, IC-50s of insecticides against An. sundaicus larvae were estimated as follows: temephos, 0.0032ppm; chlorpyrifos-methyl, 0.0037ppm; fenitrothion, 0.025ppm; and fenthion, 0.025ppm.

(3) A series of field tests using 5% Abate wdp were carried out in the sundaicus-inhabited ponds in Perupuk. 1ppm application of temephos was effective at least for 2 weeks.

(4) The preliminary field tests were carried out using fenitrothion (50% EC) and chlorpyrifos-methyl (5% wdp), both with the dose of 1ppm. Fenitrothion was effective for about one week; and chlorpyrifos-methyl for 1-2 weeks.

(5) After application of 1ppm methoprene (Altosid 10 F, one of the Insect Growth Regulators), practical emergence inhibition was observed for about 2 weeks in artificial ponds; while in a natural pond, it was effective for as long as 5 weeks.

2.4 Vector Control using Fish

#### 2.4.1 Background Information

- (1) In the laboratory tests, all of the three species of fishes, i.e. Poecilia reticulata, Aplocheilichthys panchax and Oryzias javanicus, were found good in consuming An. sundaicus larvae.
- (2) Preliminary laboratory tests showed that 1ppm temephos application does not cause any serious effect on the fishes mentioned above.

#### 2.4.2 Plan of Action

The Plan of Action on vector control using fish which was issued in October 1984 is briefly summarized as follows:

##### (1) Fish fauna

Surveys will be done to know fish fauna in the Project Area.

##### (2) Ecology of larvivorous fishes

Studies will be done on ecology and larvivorous nature of various species of fishes, both in the laboratory and in the field ponds.

##### (3) Maintenance of fishes at Perupuk

Cement-made ponds will be constructed in Perupuk for studies on fish biology and maintenance of candidate fishes.

#### 2.4.3 Findings

(1) In the Asahan Project Area, altogether 90 fish species belonging to 32 families were found. In the ponds and streams of the Village Perupuk, 31 species in 19 Families were confirmed, more than half of which live in brackish water.

(2) The species abundant in the sundaicus-breeding ponds in Perupuk were Chanda sp., Oryzias javanicus, Mugil sp., and Stigmogobius sp.

(3) The fishes were classified into six groups based on their habitats in ponds.

The fish species overlapping the habitat with An. sudaicus larvae are Aplocheilichthys panchax, Oryzias javanicus, Poecilia reticulata, Chanda sp., and Stigmatogobius.

(4) For future biological control of malaria vector mosquitoes, the candidate fishes are Poecilia reticulata and Tilapia mossambica. P. reticulata is easily collected in Medan, and T. mossambica is abundantly found in the Lake Toba.

(5) Mass transportation of P. reticulata from Medan to Perupuk was successful by utilizing bombed oxygen.

(6) In laboratory tests, all the fish species under tests showed no mortality in continuous dipping into 1ppm dilution of temephos for 5 days.

## 2.5 Malaria Training Course

In order to improve the knowledge and technique on malaria parasite and vectors, two training courses, one for Microscopist and another for Assistant Entomologist, were held in February 1985.

### (1) Place

Gedung Selaputda, Jl. Ngalengko No. 1, Medan

### (2) Period

Microscopist course : 5 - 23 February 1985.

Assistant Entomologist Course : 5 - 16 February 1985.

In the Joint Opening Ceremony on 5 February, Mr. Ikeda, the Japanese Consul, gave an address as a guest.

### (3) Trainee

Microscopist Course : 10 persons

Assistant Entomologist Course : 12 persons

The trainees were selected from Health Centers and related health facilities in the Project Area.

(4) Lecturers

Dr. Santlyo Kirnowaroyo, from Departemen Kesehatan, and Dr. Sumitro, from Kanwil, Dep. Kes., together with Dr. W. Panjaitan and his staffs in the Provincial Health Services, North Sumatera, executed lecturers and instructors of the courses. Japanese Experts on malaria assisted the lecturers.

(5) Free Discussion

On 11 February 1985, a chance was given for free discussion between lecturers including Japanese Experts and participants of both courses. Active and fruitful discussion was made for three hours on the present situation and future control measures of malaria in the Project Area.

(6) Budget

The budget for the courses was borne jointly by the Provincial Health Services, North Sumatera, and JICA. The contribution of JICA to the courses amounted up to Rp. 7,487,450,-

3. PROGRESS IN WATER SUPPLY

3.1 Background

In connection with the technical cooperation between Indonesian and Japanese Governments, special activities on water supply which involved JICA Experts were commenced in August 1979. Since then altogether three Experts on water supply were assigned to the Project to carry out surveys in close cooperation with Indonesian counterparts.

In 1981, five deep or semi-deep wells were constructed in the Project Area. Improvement of these wells, survey, rehabilitation and training, were also conducted by the JICA Experts.

3.2 Plan of Action

The Plan of Action on water supply which was issued in January 1985 is briefly summarized as follows:

(1) Survey

Evaluation survey:

Evaluation will be made on the present situation of water supply facilities in the Project Area, including those not provided by JICA.

Collection of basic data on water utilization:

Surveys will be made for collecting basic data on water utilization by inhabitants. Particular emphasis will be laid on the area surrounding New Town in Kuala Tanjung, in order to clarify the influence of high water consumption in the New Town area.

Survey of water condition:

Survey of water condition will be made for proper designing of future water distribution system from wells to the village center.

(2) Workshop and training

The training course on proper maintenance of hand pumps will be held, in order to level up the maintenance skill of the pumps.

(3) Rehabilitation

The planning for mechanical improvement of the artesian well in Tanjung Muda will be made, as well as the plan of water distribution system.

3.3 Current activities

- (1) In February 1985, evaluation surveys were carried out in 21 villages belonging to 3 Kecamatan, i.e. Air Putih, Lima Puluh and Medan Deras.

Only 17 of 155 wells under survey were in good condition. Most of the remaining 138 wells were being unused, due to breakdown. In addition to bad water quality, lack of spare parts for hand pumps and of repairing techniques is the main reason for this unfavourable condition.

- (2) Basic data on water utilization by village people were collected during the period March to May 1985 in randomly sample 682 houses in 10 villages belonging to three Kecamatan, with particular emphasis on the area surrounding the New Town in Kota Tanjung.

The data collected are now under arrangement, which will be presented later.

(3) Hand-pump maintenance training course

Succeeding to the former training course held in January 1984, a training course was held again in March 1985 for 5 days, in order to level up skill of hand-pump maintenance in persons in charge of water supply in the Project Area.

Altogether eight persons from eight villages were trained at the Indrapura Health Center for lecture and demonstration, and at the well-sites for field study.

Trainers involved staffs of (a) Provincial Health Services of North Sumatera, (b) Regional Health Services of North Sumatera, (c) the Asahan Regency Office, (d) Kecamatan office, (e) Health Center, and (f) JICA.

The training course was successful, which was probably due to enthusiasm of both sides, trainers and trainees.

QUARTERLY PROGRESS REPORT

NO 2/1985.





QUARTERLY PROGRESS REPORT

No. 2

April - June 1985

Medan, July 1985

NORTH SUMATRA HEALTH PROMOTION PROJECT

( ASAHAN HEALTH IMPROVEMENT PROJECT )

## FOREWORD

The objective of the Quarterly Progress Report is to facilitate quick understanding of the project activities in the related officials, through brief summarization of the works done during the ~~previous~~ quarter of the year. The reports are unofficial documents, the distribution of which is limited to the Indonesian and Japanese officials related to the Project. The reports deal with the technical progress of the project, but are supplemented with the major administrative matters.

The reports are issued four times a year, i.e. in April, July, October and January in the following year, each covering the activities in the previous three months.

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### STAFF DIRECTLY INVOLVED IN THIS ISSUE

#### JICA EXPERT

T. Suzuki ( Leader )  
H. Itokawa ( Malariologist )  
Ch. Imai ( Vector Ecologist )  
H. Yamagi ( Vector Control Specialist )  
H. Igarashi ( Water Supply Specialist )  
K. Shimomura ( Coordinator )

#### INDONESIAN STAFF

M. Hariadi ( Project Manager )  
R. Tampubolon ( Deputy Project Manager )  
S. Munthe ( Secretary, P.H.S.N.S. )  
W. Panjaitan ( Chief, Comm. Dis. Cont. Div., P.H.S.N.S. )  
T.B.H. Lumbanraja ( Chief, Env. Hlth. Div., P.H.S.N.S. )  
J. Simanjuntak ( Chief, Vector Borne Dis. Cont. Sub. P.H.S.N.S. )  
H.S. Sirait ( Chief, Water Supl. Sec., Env. Hlth Div. P.H.S.N.S. )

QUARTERLY PROGRESS REPORT

No. 2

April - June 1985

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EXECUTING BOARD MEMBER IN MEDAN

JICA EXPERTS ATTACHED TO THE PROJECT

## 1. BRIEF SUMMARY

During the quarter under review, technical activities were focussed on malaria studies and survey for water utilization. Three JICA Experts on malaria, i.e. a Malaria Parasitologist, a Vector Ecologist and a Vector Control Specialist, will complete their assignment in July/August 1985.

Their assignment reports covering one year activities are now under preparation. In this Quarterly Report, either excerpts of the report or its modified/summary conclusion are reviewed.

Extensive malarimetric surveys were carried out both in inland forestal or rice-field areas and in coastal areas. High malaria endemicity was detected in one locality in the forestal area. Malaria with low parasite rate was also found out in the rice-field area. In the coastal area, endemicity of the malaria transmitted by An. sundaicus seems not sporadic. It should be considered forming a coastal malarious belt, though the endemicity differs from one place to another.

Based on the past and present studies on An. sundaicus, in Perupuk, it was concluded that (1) An. sundaicus is not a very efficient vector; (2) its larvae breed mainly in brackish water ponds with sunny surface situated in open lands; (3) tidal action is the most important factor affecting their seasonal prevalence; (4) anti-larval measures may be only the solution for their effective control; and (5) the threshold female density for vector control may be 20/man-hour in outdoor man-biting collections.

In insecticide studies, 1 ppm application of fenitrothion (50% Sumithion EC) was found effective for one week; chlorpyrifos-methyl (5% Methyl Dursban wdp), for 1-2 weeks; and temephos, (5% - Abate wdp), for at least 2 weeks. The 1 ppm application of methoprene (Altosid 10F, one of the Insect Growth Regulators) was effective for 2 weeks in artificial ponds, but it was effective for 5 weeks in a small-scale preliminary test using a natural pond.

In the field of water supply, an extensive survey on water utilization was conducted in March-May 1985, covering 683 households, a 10% sample of houses in 10 villages. The data are still under processing.

## 2. MALARIA CONTROL

### 2.1 Parasitological studies

The Assignment Report of Hideki ITOKAWA, a JICA Expert on Malaria Parasitology, who was assigned to the Project for one year from July 1984 to July 1985, will be issued soon. The Report entitled "Parasitological studies on malaria in the Asahan Regency, North Sumatera, Indonesia " will be available on request to:

Dinas Kesehatan Propinsi Sumatera Utara  
Jl. Prof.H.M. Yamin SH No. 41-AA  
Medan, Indonesia

Briefly summarized excerpts of his report is shown here-  
under.

#### (1) Introduction

The project area was expanded from three kecamatan (Medan Deras, Air Putih, Lima Puluh) to seven kecamatan in 1984, when the Project was extended for further five years until March 1989. The four new kecamatan are Bandar Pulau, Pulau Rakyat, Buntu Pane and Tanjung Tiram.

Extensive malarimetric surveys were conducted in these new project area for the purpose of finding out unrecognized malarious area, together with the resurvey of already known area. Preliminary studies were also done on chloroquine resistance in the parasites.

#### (2) Malarimetric survey

##### (2-1) Methods

The samples for the survey were restricted to elementary school children of the first and second classes. When the number of samples was small, pupils of the third class were also examined. The pupils of the young classes usually go to the school near their houses. Therefore, the results of malarimetric survey at the school could reflect endemicity of malaria in the area around the school.

Microscopic blood examinations were done in the malaria section of IKES. Spleen examinations were done in standing positions by the authors in the field.

The schools for the malarimetric survey were selected, based on the advices of the trainees of the Microscopical Training Course held in February 1985.

## (2-2) Results

The overall parasite rate in each Kecamatan is shown in Fig.1.

### Kecamatan Bandar Pulau

The existence of mountainous or forestal malaria was clarified. The results of the survey in Desa Buntu Maraja and its neighbouring villages show many falciparum cases and splenomegaly (II-III) cases ( PR. 9,6%; SP.10,6% )

From these results it can be said that the endemicity of malaria in these areas is as high as in the coastal area in the Asahan Regency. According to the information from the villagers, many malaria cases (fever cases) often happen during rainy season; and some staffs of the Health Center in Bandar Pulau also recognized that there are many clinical cases in that area.

### Kecamatan Pulau Rakyat

Surveys were carried out in three villages ( Padang Mahondang, Bangun and Aek Bonbon). Kecamatan Pulau Rakyat lies in a large plain which consists of plantation area and paddy-field area. The three villages under survey are located in the paddy-field area. The results show the existence of paddy field malaria with low endemicity. On the contrary to Bandar Pulau, most positive cases in these villages were P. vivax, and the spleen rate was very low (0.1%, or 1/931).

### Kecamatan Buntu Pane

Surveys were carried out in four villages. A large part of the field in Buntu Pane is occupied by plantation. Even the hilly area is also farmed, and forestal area is seldom seen, being unlike to Kecamatan Bandar Pulau. Small paddy fields are scattered in valleys. The Schools examined are located near the paddy field or near the swamp area around the river.

Five positive cases were detected from 857 pupils. These cases were scattered in each village. Spleen rate was 0.1% (1/857) and no positive case was found in PCD (0/80). From these results, it can be said that malaria endemicity is low in the areas under survey.

#### Kecamatan Tanjung Tiram

Surveys were carried out in six villages ( Bogak, Tanjung-Tiram, Bagan Dalam, Guntung, Lima Laras and Ujung Kubu). Seventy positive cases were detected in this survey (5.2%, or 70/1316 ). The spleen rate was 2.3% (31/1316). High parasite rate was seen in Bagan dalam, Guntung, Lima Laras and Bogak Seberang. These areas are often flooded by high tide.

In the activity of PCD during the fasting period of 1985, 172 positive cases were found out from 548 fever patients in Bagan Dalam, Guntung, Bagan Luar and Bogak seberang.

Malaria endemicity is lower in Ujung Kubu where paddy fields are seen. It can be said that malaria endemicity is not high in paddy-field area, even though it is located in the coastal area. Lorong XII in Perupuk is the example.

It is interesting that malaria endemicity is low in Bogak, where a flood by high tide often happens like Bagan Dalam. Low endemicity in this village was also reported in the IKES malarimetric surveys in 1980. This is probably due to the fact that there exist no breeding places in and around Bogak.

#### Kecamatan Talawi

Surveys were carried out in the coastal area of kecamatan Talawi. Two elementary schools were examined. One is near Tanjung-Tiram (Mesjid lama), and the other is around the mid-point between Tanjung Tiram and Perupuk (Pasisir).

High parasite rate was obtained in the surveys in both two localities (Mesjid lama 7.9%; Pasisir, 15.2%) The spleen rate in Pasisir was 4.0% ( 4/99).

From these results, the coastal area in Talawi must also be taken into consideration as involved in the coastal malarious belt in the Asahan Regency.

### Kecamatan Lima Puluh

Surveys were carried out in three villages (Perupuk, Guntung and Pematang Panjang) in November 1984. These surveys were conducted for the purpose of clarifying the distribution of malaria cases in the study area. From the results of the surveys, it can be said that malaria endemicity in Lorong II of Guntung is as high as that in Lorong II of Perupuk. Also in the PCD in October 1984, many positive cases were found in Lorong II of Guntung. Many positive cases were also detected in Lorong VI, where parasitological and entomological surveys had seldom been carried out before. These two localities are often flooded by high tide through nearby rivers.

### (3) Passive Case Detection (PCD)

Some of the results of the PCD were already mentioned in the previous chapter, in connection with the malarimetric survey. The concentrated activities on PCD were done in June 1985, in five villages in Kecamatan Tanjung Tiram and two villages in Kecamatan Lima Puluh. Altogether 183 positive cases were detected in 610 fever patients.

Of 183 positive cases, 88 (48%) belong to P. falciparum, 92 (50%) to P. vivax, and 3 (1.6%) to the mixed infection.

	<u>No. examined</u>	<u>No. positive</u>	F.	V.	M.
<u>Tanjung Tiram</u>					
Bagan dalam*	425	124	59	63	2
Suku maju	17	6	4	2	0
Bagan luar**	66	27	13	14	0
Bogak Seberang	14	2	0	2	0
Guntung	26	13	6	7	0
Sub-total	548	172	82	88	2
<u>Lima Puluh</u>					
Perupuk	34	6	1	4	1
Guntung	30	5	5	0	0
Sub-total	64	11	6	4	1
Grand Total	610	183	88	92	3

\* The population is 3822 . . .

\*\*The population is approximately 500



(4) Preliminary chloroquine resistance studies

In the activities of PCD, many positive cases were found in Bagan Dalam and Bagan Luar.

Chloroquine treatment was made to the positive cases of high parasite density ( more than 500 proflirative forms/8000 WBC) for three days (10 mg/kg/first day; 10 mg/kg/second day; and 5 mg/kg/third day). Two kinds of chloroquine difasfate tablets (chloroquine base 60 mg and 150 mg Kimia fama) were used for these treatments. The treatments were always done in front of the authors. The second blood examinations were done one week after the first one, in the cases of successful treatment.

It was found that six of the 44 cases of falciparum infection were still positive; and one of the 22 cases of P.vivax was still positive. The parasite density decreased in all of these cases.

The existance of chloroquine resistance could not be concluded from these results, but it is strongly suspected. The results of chloroquine resistance in invivo test will be reported later.

(5) Conclusion

1. It was made clear from these studies that malaria is still a big problem in the Asahan Regency.
2. Forestal malaria was found out in the mountainous area of Kecamatan Bandar Pulau. The endemicity of malaria in some localities was as high as that of coastal malaria.
3. The existence of paddy-field malaria was clarified in Kecamatan Pulau Rakyat, but the endemicity is not so high ( PR = 2% ).
4. The coastal malaria with high endemicity like Perupuk was detected also in the coastal area of Kecamatan Tanjung Tiram and Talawi. In the past, it was considered that the coastal malaria in the Asahan Regency is restricted to small areas near the beach, such as in Perupuk. But, from the results of the present surveys, this is not always correct.

5. The author is of opinion that the coastal areas from Perupuk to Tanjung Tiram should be considered as one continuous malarious belt, though the endemicity of malaria differs from one place to another.
6. Existence of chloroquine resistance ( R I - II) was strongly suspected through preliminary tests, but further studies are needed before final conclusion be obtained.

## 2.2 Vector Ecology Studies

The Assignment Report of Chobei Imai, a JICA Expert on Malaria Vector Ecology, who was assigned to the Project for one year from July 1984 to July 1985, was issued in July 1985.

The Report entitled "Ecological aspects and control strategy of An. sudaicus, a coastal malaria vector in the Asahan Regency, North Sumatera" ( 25pp + 71pp.of Annexes) is available on request to:

Dinas Kesehatan Propinsi Sumatera Utara  
Jl. Prof.H.M.Yamin SH no. 41-AA  
Medan, Indonesia

The Discussion (a part) and Conclusion of his report are mentioned hereunder.

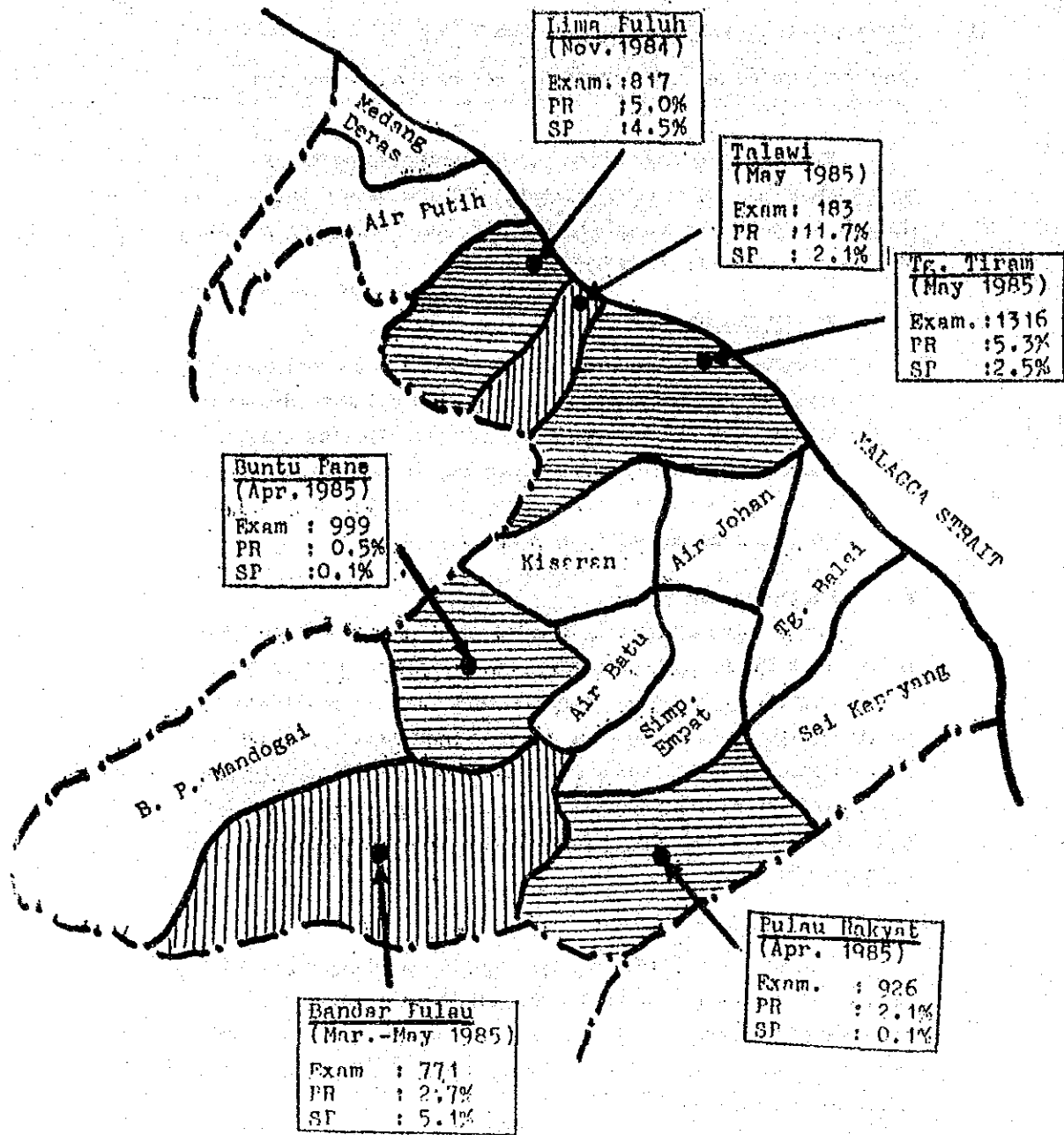


Fig. 1 Overall parasite rate and spleen rate in malarionetric surveys in 6 Kecamatan in the Asahan Regency.

Surveys in Lima Puluh, Talawi and Tg. Tiram were done in the coastal belt and its adjacent area.

(1) Discussion on biology of An.sundaicus

(For the purpose of simplification, references are omitted  
See original text.)

The following discussions on biological aspects of An.sundaicus are made, upon reviewing all the data obtained through the past studies of the Project, also referring the other information on the subject.

(1-1) Vector status

There are some characteristics affecting the efficiency of a certain mosquito species as a malaria vector. Tables 1 and 2 summarize the characteristics of the North Sumatera population of An.sundaicus in comparison with two other vector species (Table 1), and three other geographical populations (Table 2).

a). Host preference

The results of outdoor simultaneous biting collections showed that the Perupuk population of An.sundaicus prefers human bait to buffalos, goats and monkeys. The similar result was also obtained with trap hut method. Two other Indonesian populations of this species also prefer human blood very much. But An.acornitus and the Malaya population of An.sundaicus prefer cattle blood to human blood. An.balab.censis likes human blood as well as monkey blood.

b). Man biting rate

Man biting rate of An.sundaicus is very high in Perupuk though it fluctuates markedly. The other populations also show high man biting rates. But the rates of two other species are much lower than those of An.sundaicus even in malarious places or malarious seasons.

c) Survival rate

The rate of parous female fluctuated between the minimum 0.20 and the maximum 0.58 with an average value of 0.415 in 23 times dissection during 1980-1982. Following Davidson (1954) we can estimate survival rates from the above parous rates if we know a real value of gonotrophic cycle. Sundararaman et al.(1957) described that the gonotrophic cycle of An.sundaicus takes 2 days.

Now putting this value into the Davidson's formula, we calculate the survival rate to be 0.64 per day. Thus expectation of infective life is calculated as 0.011 days assuming extrinsic incubation period to be 12 days.

On the other hand, the daily survival rate and the expectation of infective life of An.balabacensis were estimated 0.82 and 0.466 days, respectively in Thailand.

d) Sporozoite rate

Sporozoite detection has not been conducted in Perupuk because of shortage of man power. However it is presumed from the result in three other populations of the same species that sporozoite rate of the Perupuk population may be very low. This assumption is supported by low survival rate and short expectation of infective life in the population.

An.balabacensis has much higher sporozoite rates compared to An.sundaicus. This corresponds to the fact that An.balabacensis has higher survival rate and longer expectation of infective life.

e) Vector status

From the above comparison, we can conclude that An.sundaicus, although anthropophilic, is not an effective vector, if compared with An.balabacensis. The malaria transmission by An.balabacensis can occur even when its man-biting rate is considerably low, because of its high sporozoite rates. While the transmission by An.sundaicus is realized only when its man-biting rate is very high, because of its very low sporozoite rates.

(1-2) Adult Behavior

a) Man biting activity

All night biting activity of An.sundaicus was examined by human bait collections three times in Perupuk in 1980. The results show that this species bites man both outdoors and indoors throughout the whole night with a small peak activity in midnight. Similar results were also reported in South Sulawesi.

b) Daytime resting habit

A trial of early morning collection of An.sundaicus was carried out in Perupuk in March 1980 to clarify its resting habit. But no mosquitoes were collected from the inside of 8 houses in spite of much effort by 6 collections.

Indoor daytime resting adult collection was tried in February 1983 by using smoking insecticides. In a total of 8 houses under survey, only one fed female of An.sundaicus was collected; while in the other species, 6 females of Mansonia spp. and 35 females of Culex spp. were collected. These results suggest exophilic nature of the North Sumatera population of An.sundaicus. On the other hand, the same species was reported as endophilic in Central Java and South Sulawesi.

c) Outdoor resting place

The intensive survey on outdoor resting places in Central Java revealed that An.sundaicus rests in rock crevices (54.4% of 1482 mosquitoes collected), hollows in sand banks (22.4%) and plant bushes (2.7%) and other places. At this time scarce information is available on the Perupuk population.

d) Night time resting habit after entering house

Indoor night time resting adults were collected three times in Perupuk by using total 5 houses. As for An.sundaicus, 548 females were confirmed engorging on humans in the houses, but only 18 (3%) were collected resting on walls of the same houses. While as for Mansonia spp. and Culex spp., 76 (35%) fed females of a total of 219 were collected. At the same time only one unfed female of An.sundaicus was collected while 29 unfed females of Mansonia spp. and Culex spp. were collected. These results clearly show that the Perupuk population of An.sundaicus seldom rests on house walls before and after indoor biting.

On the contrary, three other populations of An.sundaicus, as well as An.aconitus and An.balabacensis were reported as resting on walls after indoor blood feeding.

(1-3) Susceptibility of Adults to DDT

a) In 1954 DDT resistance of An.sundaicus was first reported in Central Java. It was also detected in the other places in Java by 1955. However the Perupuk population showed high susceptibility against DDT in 1981.

(1-4) Ecological Aspects

a) Breeding place

Breeding of An.sundaicus larvae in brackish water ponds was reported in North Sumatera, as well as in North Coast of Central Java, South Sulawesi and Malaya/Singapore.

In Bali and South Coast of Central Java, however, they breed mainly in lagoons.

In Perupuk Village, the breeding places are distributed mainly along the edges of tidal swamps.

b) Environmental factors affecting larval breeding

Table 3 summarizes favorable and unfavorable conditions for the breeding of An.sundaicus larvae. As for surrounding vegetation, this species prefers ponds with sunny surface in open lands to those with shaded surface covered with vegetation. The larval density is much higher in the water body with high salinity of more than 0.5‰ compared to those with low salinity of less than 0.1‰. The density is also higher in the ponds where the water depth is less than 40 cm.

The larval density is somewhat low when fish are abundant.

c) Seasonal prevalence of adult

The seasonal peaks of the adult density of An.sundaicus are observed in general after onset of high tides. However the density may not increase even after high tides if heavy rain fall occurs. On the other hand, the density may increase without preceding onset of high tides if water salinity is kept at a high level due to small or moderate rainfall (Fig.2).

Therefore, it is considered that the tidal action is the most important factor affecting the seasonal prevalence of An.sundaicus, followed by the rainfall, which may be the secondly important factor.

(2) Conclusion

(2-1) Conclusion of Present Survey

- 1) In Blocks I, II, III and V of Perupuk Village, favorable breeding places of An.sundaicus were distributed mainly along the edges of tidal swamps which were situated near the mouths of two rivers, and several breeding places were also found in coconut fields; while no breeding places were found in rice fields.
- 2) According to the distribution of water salinity before and after onset of high tides, the extension of each breeding place and the number of breeding places were considered to increase by invasion of high tides.

- 3) It was also confirmed, however, that even after onset of high tides, the favorable breeding places were limited mainly to the areas within 100m distant from the edges of tidal swamps.
- 4) The average larval density of An.sundaicus per 20 dips in the registered ponds fluctuated between the minimum 0.1 and the maximum 197.9 during the period March 1982 to June 1985.
- 5) High average larval density of more than 10 was usually observed under the following conditions; (1) small average depth of pond water less than 20 cm and high average salinity of more than 0.5%, or (2) moderate average depth between 20 cm and 40 cm accompanied with high average salinity of more than 0.5% and with low fish-present pond rate of less than 50%.
- 6) Aquatic vegetation such as algae, duckweeds and water plants was sometimes found coexisting with a large number of An.sundaicus larvae.
- 7) Man-biting density of An.sundaicus females showed a similar fluctuation manner at three fixed stations in Perupuk.
- 8) Outdoor man-hour density of the females at station 1 fluctuated between the minimum 3.6 and maximum 249.4 since March 1980 up to March 1985.
- 9) High peak densities over 50/man-hour were observed mainly after onset of high tides of more than 300cm.
- 10) Heavy rainfalls may sometimes cause rapid decrease of salinity even after the invasion of brackish water into ponds due to high tides. In such case, increase of the mosquito density was not observed. Moderate rainfalls may cause favorable conditions for increase of the density even when high tides are not recorded.
- 11) Anopheline mosquito-abundant places were not found out by spot surveys in four inland villages in the Asahan Regency.
- 12) The larvae and adults of An.sundaicus were collected abundantly in two other coastal villages than Perupuk;



Pangkalan Dodek and Guntung/Tg.Tiram. In these two villages, favorable conditions for larval breeding were same as those in Perupuk.

(2-2) Conclusion of Biology of An.sundaicus

- 1) An.sundaicus, although anthropophilic, is not a very effective vector because of its low survival rates and low sporozoite rates. Malaria transmission by this mosquito might be realized only when its man-biting rate is very high.
- 2) The Perupuk population of this species bites man both outdoors and indoors throughout whole night, and seldom rests on house walls before and after indoor biting. Only few of them are collected resting indoors in day times.
- 3) The Perupuk population of this mosquito is susceptible to DDT.
- 4) An.sundaicus larvae breed mainly in brackish water ponds in North Sumatera as well as in North Coast of Central Java, South Sulawesi and Malaya/Singapore. While in Bali and South Coast of Central Java, they breed mainly in lagoons.
- 5) In Perupuk Village, An.sundaicus prefers ponds with sunny surfaces in open lands for its breeding places. High larval density is usually observed in the water body with high salinity of over 0.5% and with small water depth of less than 40cm.
- 6) Tidal action is the most important factor affecting the seasonal prevalence of An.sundaicus followed by rainfalls, which may be secondly important.

(2-3) Conclusive Suggestion on Control Strategy

- 1) An integrated control method against An.sundaicus larvae should be established for successful malaria control in Perupuk Village, because DDT residual spraying is not expected to be effective, taking the limited distribution of favorable breeding places of the vector into consideration.

- 2) To establish such control method, promising larvicides and effective predatory fish should be found. Efficacy of improvement of environment such as source reduction and removal of aquatic vegetation should also be examined.
- 3) Effective larvicides should be used mainly in the periods of high density of An.sundaicus, while in the periods of lower density, effective predatory fish should be introduced into the breeding places.
- 4) In Perupuk, a critical vector density of malaria transmission or a threshold density for vector control was estimated to be 20/man-hour in outdoor man biting collection at station 1, based on monthly data of the mosquito densities and the parasite rates. ( Fig. 3.)
- 5) The area of the target water body for larval control operation was estimated approximately 30.000m<sup>2</sup> - 33.000m<sup>2</sup> in Blocks I,II,III and V,Perupuk. The amount of water was calculated to be 10.500 - 10.750 m<sup>3</sup>.
- 6) To evaluate the effect of control operation, larval and adult densities of An.sundaicus should be examined twice a month in registered ponds and at four or five fixed stations in Perupuk, respectively.

### 2.3 Insecticide Studies

The Assignment report of Hisao YAMUGI, a JICA Expert on Malaria Vector Control using Insecticides, who was assigned to the Project for one year from August 1984 to August 1985, will be issued soon. The Report entitled "Insecticide studies for control of Anopheles sundaicus, a vector of coastal malaria in the Asahan Regency, North Sumatera" will be available on request to:

Dinas Kesehatan Propinsi Sumatera Utara  
 Jl. Prof.H.M.Yamin SH no. 41-AA  
 Medan, Indonesia

The Introduction (a part), Summary and Recommendations of his report are mentioned hereunder.

Table 1. Comparison of characteristic among three Anopheline species

Item	<i>An. sudaious</i> N. Sumatra	<i>An. adonitus</i> Java	<i>An. b.</i> <i>balabacensis</i> Thailand
Distribution	Coastal belt	Inland plain	Forested hill
Breeding place	Brackish pond	Ricefield	Small pool
Factor affecting abundance	Tidal action? Rainfall ?	Cultivation	Rainfall
Daytime resting	Indoor Outdoor	Very rare ?	Wall Stream bank
Host preference	Human	Cattle >> Human	Human, Monkey
Feeding time	All night	All night	23:00h ~
Outdoor—Indoor biting ratio	3 : 1	3 : 1	1 : 1
Night time indoor resting	Very rare	Wall	Wall
Daytime resting after indoor biting	Exophilic	Exophilic	Exophilic
Parous rate	0.20 — 0.58	0.33 — 0.75	0.54
Gonotrophic cycle	?	2 days	3 days
Sporozoite rate	Very low ?	0.09 %	0.45 % (~8.7 %)
Man biting rate	Indoor Outdoor	97.5 288.8	5.4 17.1
Susceptibility to DDT	Susceptible	Resistant	Susceptible

Table 2 Comparison among four geographical populations of *Anopheles sundanensis*.

Item	N. Sumatra 1979—1983	Mid Java South coast 1952—1956	S. Sulawesi 1974—1975	Malaya Singapore
Breeding place	Pond	Lagoon (N. coast: Pond)	Pond	Pond
Daytime resting Indoor Outdoor	Very rare ?	Wall Crevice	Wall ?	Wall ? Crevice
Time of peak density	May—June (Sep—Jan)	Sep—Dec Mar—May	?	Jul—Oct Apr—May
Host preference	Man	Man	Man	Calf > Man
Out—Indoor biting ratio	3 : 1	?	?	2.5 : 1
Night time Indoor resting	Very rare	Wall	Wall	Wall
Daytime resting after indoor biting	Exophilic	Endophilic	Endophilic	?
Parous rate	0.20 —0.58	?	?	0.64
Gonotrophic cycle	?	2 days	?	2 - 3 days
Sporozoite rate	Very low ?	0.04 -0.30 %	0.07 %	0.04 %
Man biting rate	97.5	50	9 , 22	?
Susceptibility to DDT	Susceptible	Susceptible	Susceptible	Susceptible
Repellency of DDT	Observed but weak	Observed (Avoidance)	?	?

Table 3

ENVIRONMENTAL FACTORS AFFECTING LARVAL BREEDING.

Factor	Favourable Habitat Condition	Unfavourable Habitat Condition
Vegetation	Open, sunny surface	Covered, shade surface
Salinity	≈ 0.5 ‰	≈ 0.1 ‰
Water depth	≈ 40 cm	> 40 cm
Tidal action	After high tide (Brackish water enters ponds )	-
Fish	-	Abundant

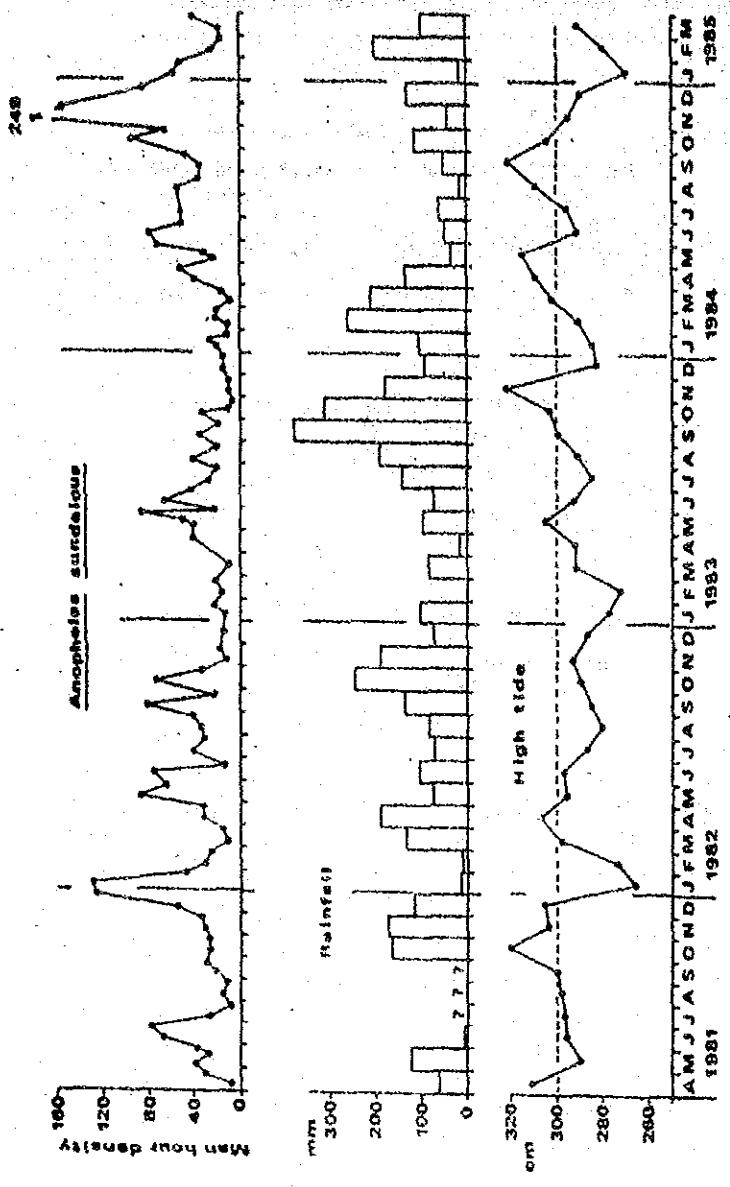


Fig. 2 Prevalence of Man-Hour Density of *An. surdalensis* at Station I, Monthly Rainfall and Monthly Highest Tide Since April 1981

\*The monthly rainfall data in Kuala Tanjung are used for, before rainfall observation was started at station 1, Perupuk in October 1983. The tidal level data were obtained in Kuala Tanjung Port.

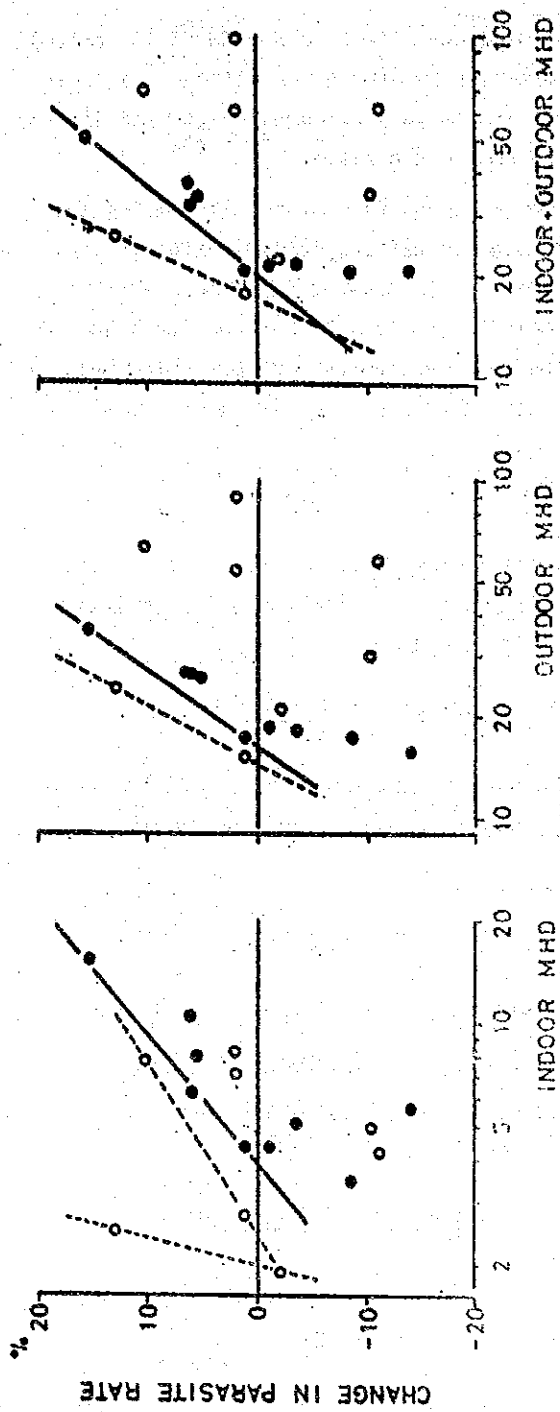


Fig. 3 Relation between Monthly Average Man-Hour Density of An. sudaicus and Monthly Change of Malaria Parasite Rate in Perupuk, June 1980 - May 1982.

● : Data obtained before 1st DDT spraying in June 1981

○ : Data obtained after 1st DDT spraying

\* Differences of parasit rate between month  $i$  and  $i + 1$  are plotted against average mosquito densities in month  $i$ .

(1) Introduction

For the purpose of finding out effective and feasible control measures of An.sundaicus, preliminary studies on efficacy of insecticides against An.sundaicus larvae were already carried out in the past, both in the laboratory and in the field.

The main objective for the assignment of the present writer is to obtain further information on efficacy of insecticides including Insect Growth Regulators (IGRs), towards the future establishment of practical control methods of the vector mosquitoes. The activities done during his one year assignment are presented herewith

(2) Summary

(Laboratory rearing)

- 1) Laboratory rearing of An.sundaicus was done without any particular difficulties. One generation cycle completed in about two weeks in the laboratory.

(Laboratory tests of insecticides and IGR)

- 2) The LC-50s (50% Lethal Concentration) of organophosphorus insecticides to An.sundaicus larvae were as follows:

Temephos (Abate)	0.0032 ppm
Chlorpyrifos-methyl (Methyl Dursban)	0.0037 ppm
Fenitrothion (Sumithion)	0.015 ppm
Fenthion (Baytex)	0.025 ppm

- 3) The IC-50 (50% Inhibition Concentration) of methoprene (one of the Insect Growth Regulators) was estimated as in the range of 0.00004 - 0.00008 ppm.

(Field tests of organophosphorus insecticides)

- 4) The 1 ppm application of temephos (5% Abate wdp) was effective at least for 2 weeks.(Fig.4)
- 5) In a preliminary field test, 1ppm application of fenitrothion (50% Sumithion EC) was effective for about one week. ( Table 4)



- 6) In the preliminary field tests, 1 ppm application of chlorpyrifos-methyl (5% Methyl Dursban) was effective for 1-2 weeks. (Table 4)

(Field tests of IGR)

- 7) After application of 1 ppm methoprene (Altosid 10F), practical emergence inhibition was observed for about 2 weeks in artificial ponds; while in a natural pond, it was effective for as long as 5 weeks. (Fig.5)

(3) Recommendations for future studies

- 1) Further laboratory tests of candidate insecticides, including IGRs and B.t.i., if available, should be carried out using An.sundaicus larvae.
- 2) A standard method for semi-laboratory efficacy tests using buckets should be established, which could simulate natural environment of sundaicus-breeding ponds. The tests should be carried out using candidate insecticides and IGRs. These may give basic information on the practical effect of the chemicals under natural conditions.
- 3) The methods evaluating effect of IGRs to be used in the field tests should be improved.
- 4) In the sundaicus-breeding ponds, close observations should be made on the relation between effect of chemicals, particularly residual effectiveness, and environmental conditions, such as movement of pond water, or change of salinity due to invasion of high tides.
- 5) Comparison should be made in the effect of candidate chemicals between various types of the breeding places; e.g. natural and artificial ponds, shallow and deep ponds, grassy and non-grassy ponds, etc.
- 6) At later stage, applications of selected chemical(s) to all the breeding places in an area should be done to know whether the operation could suppress man-biting density of An.sundaicus, and subsequently incidence of malaria cases.

Table 4. Preliminary field tests with 1 ppm application of fenitrothion (50% Sumithion EC) or chlorpyrifos-methyl (5% Methyl Dursban wdp) against An.sundaicus larvae in ponds of Perupuk ( May - June 1985 )

Days post-application	No. of <u>An. sundaicus</u> larvae per 20 dips		
	Young*	Old*	Total
<u>Fenitrothion</u>			
(Before)	173	125	298
1	0	0	0
5	163	0	163
14	867	499	1366
<u>Chlorpyrifos-methyl**</u>			
(Before)	112.8	78.8	191.7
1	0	0	0
7	2.0	0	2.0
12	17.5	4.5	22.0
21	529.5	135.5	665.0

Note: \* Young: 1st - 2nd instar larvae; Old, 3rd - 4th instar larvae.

\*\* In pre-application, average number of 4 repetitions; in post-applications, average number of 2 repetitions.

Fig.4. Effect of 1ppm application of temephos (5% Abate wdp )  
on the density of An. surdatus larvae in ponds of Perupuk.

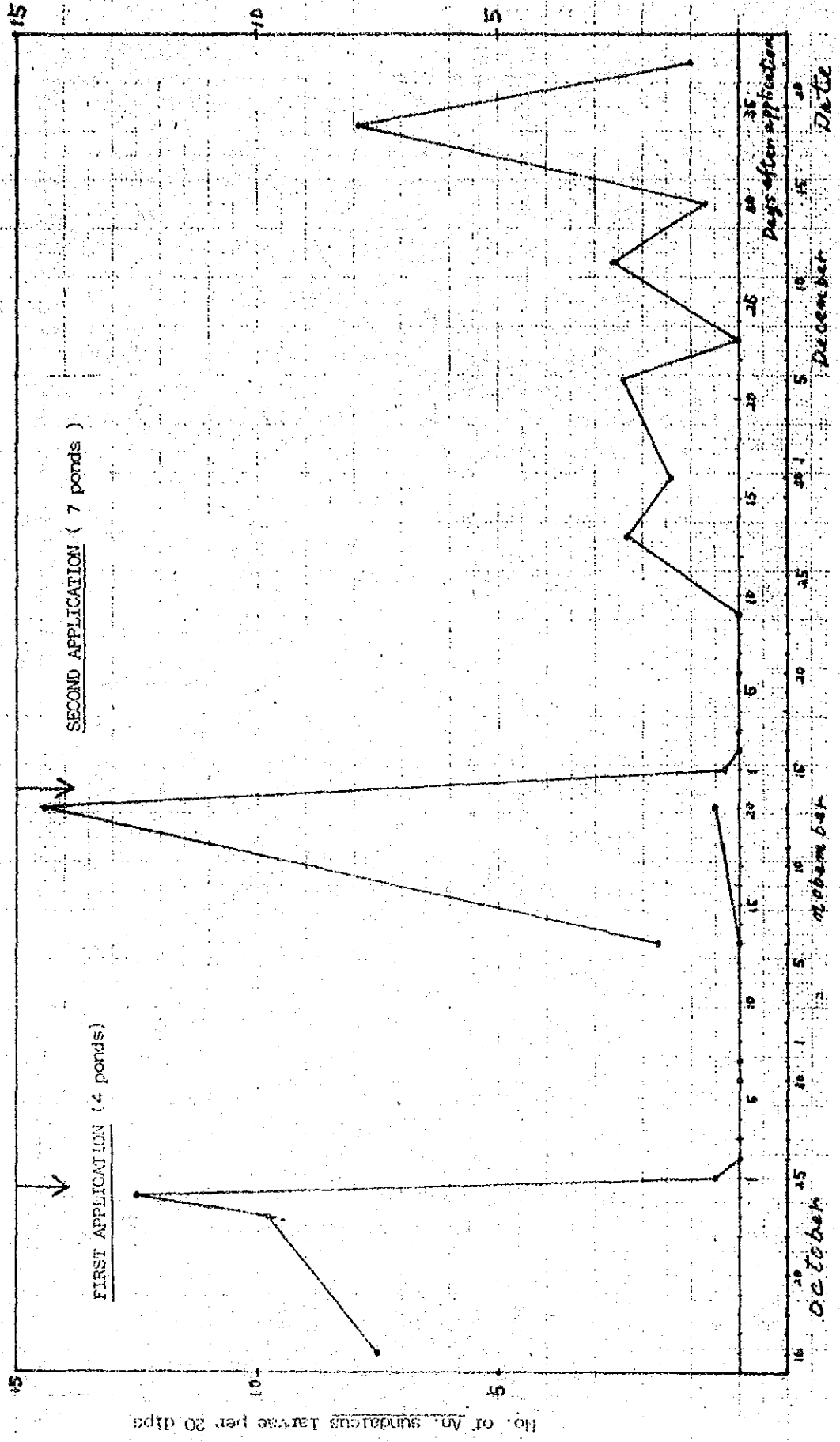
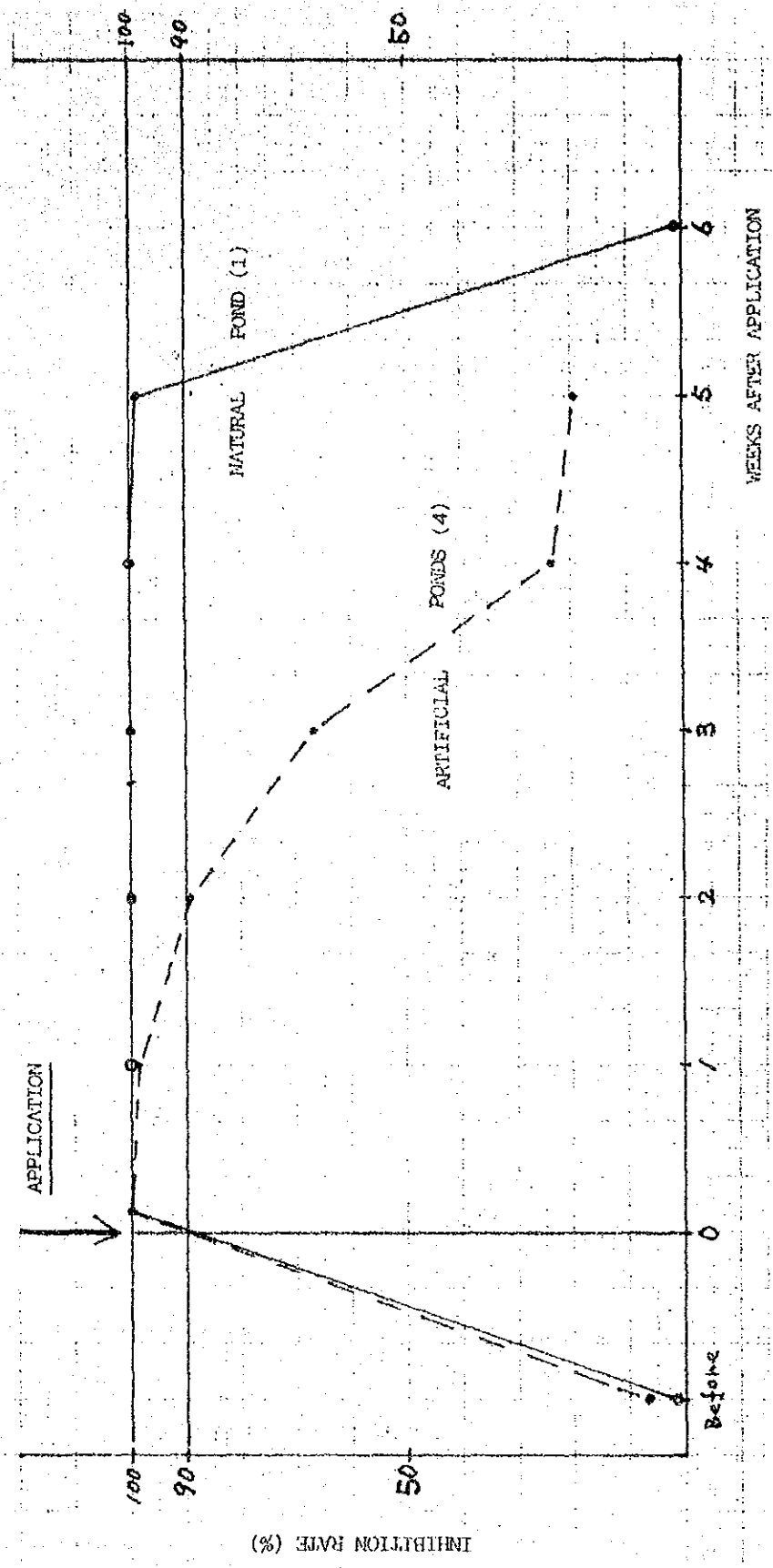


Fig. 5. Emergence inhibition rate of *An. surdanicus* after ppm application of methoprene ( Altosid IOF ) onto artificial and natural ponds in Ferupuk.



### 3. WATER SUPPLY

#### 3.1 Data collection on water utilization in villages

Extensive surveys were carried out to collect basic data on water utilization of village people during the period March to May 1985 by staff members of the Provincial Health Services, Regency of Asahan, together with a JICA Expert.

This kind of survey was done in 1982 in some villages. Our survey adopted similar method, but covered the areas which have never been surveyed before. Particular emphasis was laid on the area surrounding the New Town in Kuala Tanjung, in order to clarify the influence of high water consumption in the New Town area. The data are now under arrangement, which will be presented later. Only its outline is mentioned hereunder.

##### (1) Period

During the period 27th of March to 13th of May 1985.

##### (2) Objectives

###### General Objective:

To identify development of the rural water facilities in the area, whether big water consumption in the New Town area affects water volume to be available in the surrounding area.

###### Specific Objectives:

- a. To obtain data on the population using water facilities, on type of facilities, on lavatories and on sewage.
- b. To understand to what extent the community gets involved in building the water supply facilities and lavatories, especially their participation in the maintenance of these facilities.
- c. To know what types of water supply and sewage facilities are being utilized by the rural community. This information will be useful for future programme.
- d. To identify the quality and quantity of the drinking water consumed by the rural people.