

JAPAN INTERNATIONAL
COOPERATION AGENCY (JICA)

MINISTRY OF HEALTH
THE UNITED REPUBLIC OF TANZANIA

**BASIC DESIGN STUDY REPORT
ON
THE MALARIA CONTROL PROJECT (PHASE IV)
IN
THE UNITED REPUBLIC OF TANZANIA**

MAY 1992

INTERNATIONAL TOTAL ENGINEERING CORPORATION

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JICA

BASIC DESIGN STUDY REPORT ON THE MALARIA CONTROL PROJECT
(PHASE IV) IN THE UNITED REPUBLIC OF TANZANIA

MAY 1992

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国際協力事業団

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PREFACE

In response to a request from the Government of the United Republic of Tanzania, the Government of Japan decided to conduct a basic design study on the Malaria Control Project (Phase IV) and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Tanzania a study team headed by Dr. Yoichi Yamagata, Development Specialist (JICA), and constituted by members of International Total Engineering Corporation from January 31 to February 15, 1992.

The team held discussions with the officials concerned of the Government of Tanzania and conducted a field study at the study area. After the team returned to Japan, further studies were made and the present report was prepared.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the United Republic of Tanzania for their close cooperation extended to the team.

May 29, 1992



Kensuke Yanagiya

President

Japan International Cooperation Agency

May 1992

Mr. Kensuke Yanagiya
President
Japan International Cooperation Agency
Tokyo, Japan

Letter of Transmittal

We are pleased to submit to you the basic design study report on the Malaria Control Project (Phase 4) in The United Republic of Tanzania.

This study has been made by International Total Engineering Corporation with JICA, from Jan. 20 1992 to May 29 1992. Throughout the study, we have taken into full consideration of the present situation in The United Republic of Tanzania and have planned the most appropriate project in the scheme of Japan's grant aid.

We wish to take this opportunity to express our sincere gratitude to the officials concerned of JICA, the Ministry of Foreign Affairs, Ministry of Health and Welfare and Embassy of Tanzania in Japan. We also wish to express our deep gratitude to the officials concerned of Ministry of Health, JICA Tanzania office, Embassy of Japan for their close cooperation and assistance during our study.

At last, we hope that this report will be effectively used for the promotion of the project.

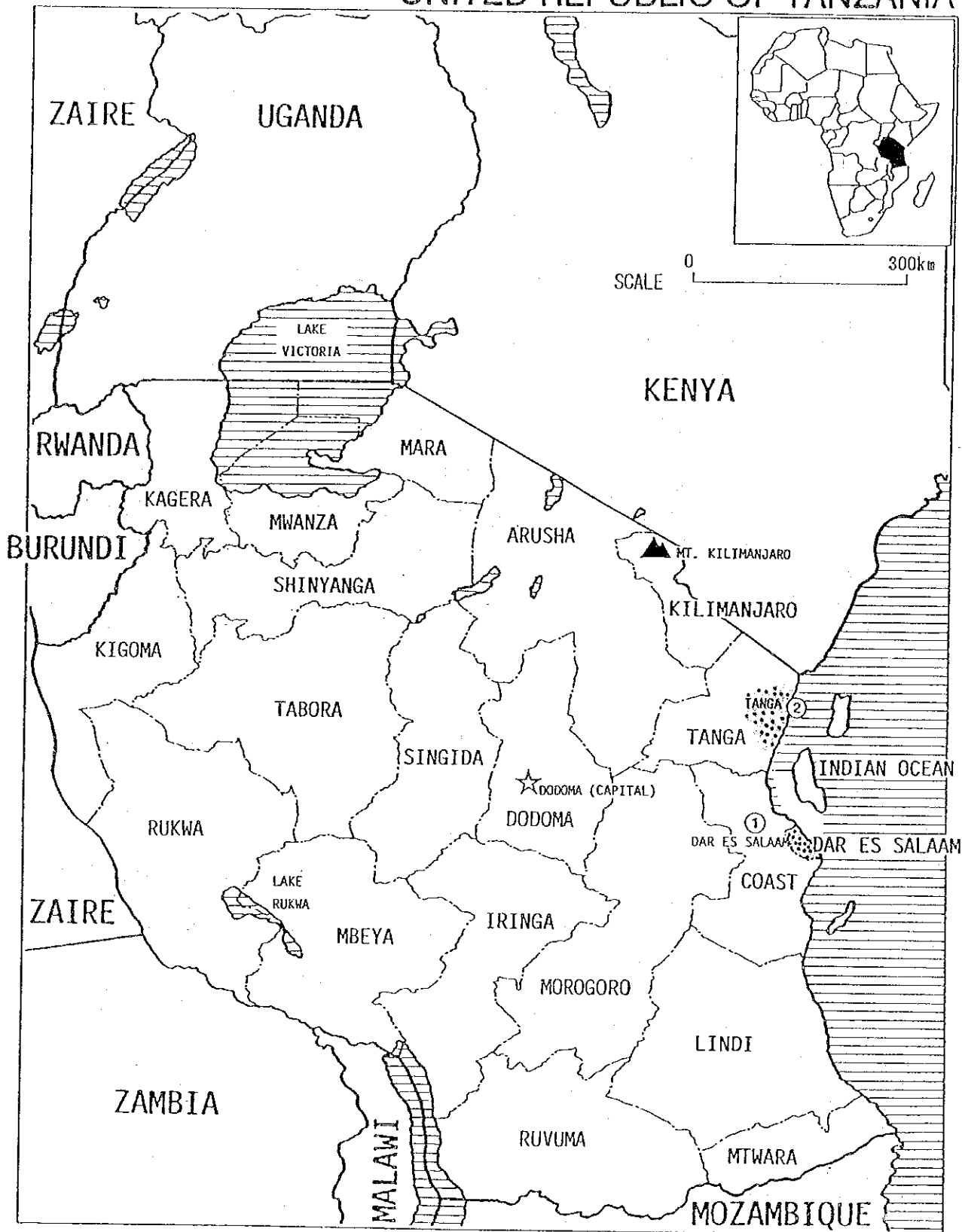
Very truly yours,



Project Manager, Kaoru GOTO

Basic design study team on
The Malaria Control Project (Phase 4)
International Total Engineering Corporation

UNITED REPUBLIC OF TANZANIA



SUMMARY

SUMMARY

The United Republic of Tanzania is located in Middle Eastern Africa, facing the Indian Ocean. It has a land area of 945,234 square kilometers and a population of 23.1 million (according to the statistics carried out in 1988) with the rate of population growth being 2.8%. The economy of the country relies heavily on the export of agricultural products such as cotton, coffee, cashew nut and tea, so the country has many factors that makes its economy unstable. For example, the lowering prices of those products on the international market have been worsening the country's trade figures, and the country's unlimited money supply has been accelerating the inflation. Moreover, the government has been operating in deficit finance for a long period. Also, the country currently has a high degree of economic difficulty, e.g., its GDP per capita is US\$87 (in 1990). The country placed priority in improving the agricultural production, improving out necessary infrastructure, promoting export, and improving the financial balance and the international balance of payments in the First Economic Recovery Programme (executed from 1986 to 1989). In addition to that, the country is now trying seriously to improve such social services as health and medical care, education, water supplies, and employment opportunities in the Second Economic Recovery Programme (executed from 1989 to 1992).

The level of health and medical care in Tanzania is very low, being similar to other African nations, and the country is burdened with infectious and endemic diseases. According to the statistics of WHO compiled in 1988, the infant mortality is 115/1,000, the mortality among the children under 5 is 192/1,000, and the average life expectancy is 49 years in Tanzania. The number of the patients affected from malaria accounts for 10 - 15% of the patients visiting the country's major medical facilities, and malaria ranks at the top in the morbidity of the country, surpassing upper-tracheal infections and diarrhea.

When malaria was in an holoendemic proportion in Dar es Salaam City and the urban area of Tanga Municipality, the Government of the United Republic of Tanzania conceived of the Five-Year Project for Malaria Control in Urban Areas. The main goal of the project was to eliminate the malaria-causing mosquitoes in both cities, which are centers of social and economic activities. The Government of Tanzania, after experiencing difficulty in acquiring insecticides and other materials and equipment, requested the Govern-

ment of Japan for assistance. In response to the request, the Government of Japan has been providing technical assistance by sending some experts and members of the Japan Overseas Cooperation Volunteers (JOCV) since 1986 and offering grant aid in three phases of the project since 1987.

Further to the above mentioned cooperation, the Government of Tanzania has recently requested the Government of Japan for another grant for acquiring the materials necessary for "phase 4" of the project, which would reduce the morbidity caused from malaria and maintain the suppressed state of malaria infection in both project areas. After receiving this request, the Japan International Cooperation Agency (JICA) sent to the United Republic of Tanzania a study team for carrying out a basic design study from January 31 to February 15, 1992. Through the field survey and the analysis made after returning home, the members of the study team ascertained and evaluated the assistance of "phases 1 - 3" of the project and examined the contents requested, the activities, and the administrative plan for "phase 4" of the project. The results of the work are compiled in this report.

At the initial stage of "phase 1", there were various impediments in the processes of organizing the executing bodies, developing and maintaining the personnel, and budgeting for activity expenses. However, through "phase 2" and "phase 3", the Malaria Unit of the Ministry of Health of the Government of Tanzania and the executing bodies of both Dar es Salaam City and Tanga Municipality have accepted an operating plan made by the Japanese experts giving technical assistance, have learned strategies and tactics for vector control as well as monitoring and evaluation methods. They have carried out periodically operations of indoor residual house spraying (IRHS), larviciding(LC), ultra low volume spraying(ULV), and source reduction. As a result, a considerable decrease was observed in the parasite infection rate among the primary school children, from 50 - 70% at the start of the project to 15 - 20% in some areas.

The aim of "phase 4" of the project is to reduce further the malaria prevalence and to maintain the incidence so reduced. The project is currently considered to be entering into the transition period from the "attack" stage (i.e., a period of reducing the incidence of malaria) to the "maintenance" stage(i.e., a period of keeping the incidence so reduced). Therefore, new measures should be applied in addition to the current, conventional operations.

The following are the principal materials needed for the project:

- 1) Materials for vector control (insecticides, impregnated bed nets, polystyrene beads, etc.),
- 2) Equipment and materials for vector control operations (insecticide sprayers, protection suits for spraying workers, etc.),
- 3) Equipment and materials for source reduction operations (surveying devices, shovels, etc.),
- 4) Equipment and materials for community health education (overhead projectors, generators, etc.),
- 5) Equipment and materials for parasitological, entomological, and sociological evaluation activities (microscopes, distillers, pH meters, etc.),
- 6) Vehicles for transporting personnel, and their spare parts for maintenance.

Among the above listed materials for vector control, the following three items are to be newly introduced into this project as devices utilized for the maintenance stage and also can be distributed and sprayed by residents participation

1) Impregnated Bed Nets

The effectiveness of bed nets impregnated with a quickly acting insecticide has been acknowledged by WHO and UNICEF. Such nets were distributed in some villages for a trial use in "phase 3", and they gave satisfactory results, with gratitude being expressed by the local people.

Such nets seem more cost effective and last longer in preventing mosquitoes than the conventional indoor residual house spraying.

2) Polystyrene Beads

Polystyrene beads are effective in preventing mosquito propagation if

they are dispersed in sewage tanks, for they intervene the respiration of mosquito larvae as well as access of mosquitoes to sewage to lay eggs. They are relatively cheap and durable. Their use should be promoted in urban and peri-urban zones.

3) Insect Growth Regulator (IGR)

This insect growth regulator has a high and durable effectiveness per weight when compared to conventional insecticides. It is also available in the form of granule for easy application. It is effective against mosquitoes (anopheles and culex), does not allow the mosquitoes to acquire resistance, and does not affect non-targeted fauna.

The current stock and past consumption of the conventional insecticides were carefully studied for designing "Phase 4". For deciding the number of vehicles, priority was given to the vehicles which would meet the current needs of the project. The delivery of the materials was scheduled to make them available for the activities starting in 1993.

There will be no increase in the amount of insecticide sprayed in this project after the introduction of new measures using those new materials mentioned above. So, from among the current members of the project staff without any increase in the personnel, so as not to increase activity expenses, chosen are a manager who will study and compile a ledger to keep track of the families, the members of those families, houses in each area where those nets are distributed and receive payments for the nets and an instructor who will disseminate health knowledge concerning the use of the nets, and organized is a maintenance team that will carry out the distribution of those nets and then perform the maintenance work of impregnating the nets with an insecticide every six months.

To implement this project, a period of 11 months will be required after the Exchange of Notes. The necessary budget for management of the activities of "phase 4" which should be provided by the Tanzanian side is estimated at 101.57 million Tanzanian shillings for Dar es Salaam City and 19.94 million Tanzanian shillings for Tanga Municipality.

If this phase of the project is executed and administrated properly by the Tanzanian side, the expected effects will be as follows:

Through this project, parasite infection rates among primary school children has decreased to 15 - 20% in some areas, and this rate is expected to be maintained or even reduced further.

The Tanzanian staff will experience a series of strategies of malaria control, methods of data collection and evaluation through the activities carried out in the project. These experiences will, as expected, make them be the human foundation of future malaria control activities that are to be implemented by the Tanzanian side alone.

This project is a model case which promotes not only malaria control but also health education and basic environmental improvement in Tanzania. Those activities can be continued even after the completion of the project, by the efforts of the Tanzanian side alone, and the effect coming out of those activities is expected to propagate throughout the country.

The following are suggestions to make, more effective than before, the Five-Year Urban Malaria Control Project, which includes this phase.

1) Adjustment of the Strategies

After resulting effects of the new materials introduced in this phase (impregnated bed nets, polystyrene beads, insect growth regulator) are studied, the total strategy should be adjusted. A special consideration should be given to a possible reduction of the operational cost including personnel. The final goal of this adjustment is to make the Malaria Control sustainable by the Tanzanian side alone even after the Japanese assistance has ended.

2) Administration of Bed Nets Distribution

The introduction of impregnated bed nets in "phase 4" of the project and afterward should require appropriate maintenance carried out by the users with owner's attitude. The introduction of the nets should also promote the improvement of conscious community cooperation and introduce a part-of-the-cost recovery scheme to assist the cities' funds for acquiring future nets and insecticide for impregnating the nets. (See Appendix 5: Proposal for Managing Bed Nets Distribution.)

3) Establishment of Appropriate Malaria Control Technology and Its Transfer to Tanzania

3-1 Manuals

Manuals should be prepared to show operators and local residents how to use the impregnated bed nets, the polystyrene beads, and the insect growth regulator (IGR).

3-2 Maps

Maps of both Dar es Salaam City and Tanga District should be made in a scale of approx. 1/10,000 to show the geography, location of bodies of water, sewage system, distribution of mosquito breeding sites, the distribution of houses of different types, the districts, etc.

3-3 Cost Table

Costs for operation should be listed on a table in terms of material and activity expenses for each method of malaria control.

3-4 Strategic Option

Appropriate strategies should be presented by means of combining the above mentioned maps and the cost table according to various levels of financial assumption.

4) Technical and Academic Exchange with Other Countries and International Institutions

The use of polystyrene beads was developed by the University of London. Scientists of the university have been carrying out a field survey in Tanzania, and they are interested in the execution of this phase of the project. Therefore, further technical and academic communication with the university's scientists will surely benefit the project.

5) Dispatch of Experts

Several long-term experts are expected to be dispatched to Tanzania to prepare the above mentioned documents and to train the personnel of the project.

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CHAPTER 1 INTRODUCTION

CHAPTER 1 INTRODUCTION

The Government of the United Republic of Tanzania has requested the Government of Japan for a grant aid to carry out "phase 4" of the 5 Year Urban Malaria Control Project that targets Dar es Salaam City(DSM) and Tanga District of Tanga Municipality(TNG). This request was made on the basis of "phases 1 - 3" of the project, through which the materials and equipment necessary for the execution of those phases of the project have been procured by receiving grant aid from the Government of Japan. The procurement of the materials and equipment for "phase 3" has been recently completed, and the activities of the project are being continued. In response to the above mentioned request, the Government of Japan decided to execute a basic design study, and the Japan International Cooperation Agency (JICA) sent to Tanzania a study team for the basic design from January 31 to February 15, 1992, Dr. Yoichi Yamagata, International Cooperation Specialist of the JICA being chief of the team. The team, after studying the activities of "phases 1-3" of the project, has carried out investigation on the following, in order to determine the appropriateness of offering a grant aid and to set the scale of this grant for this "phase 4" of the project.

- (1) To ascertain and evaluate the activities and the achievements of "phases 1-3".
- (2) To investigate the inventory and condition of the materials procured in "phases 1-3".
- (3) To study the needs of the materials requested.
- (4) To ascertain the executing body, the personnel planning, and the administrative budget of the project.
- (5) To determine future malaria control strategies.

This report is the summary of analyses done on the results of the field survey.

At the end of this report, attached are a description of the study team, the schedule of the field survey, a list of the officials interviewed, and the minutes of the discussions held with those officials.

CHAPTER 2 BACKGROUND OF THE PROJECT

CHAPTER 2 BACKGROUND OF THE PROJECT

2-1 Present State of the United Republic of Tanzania

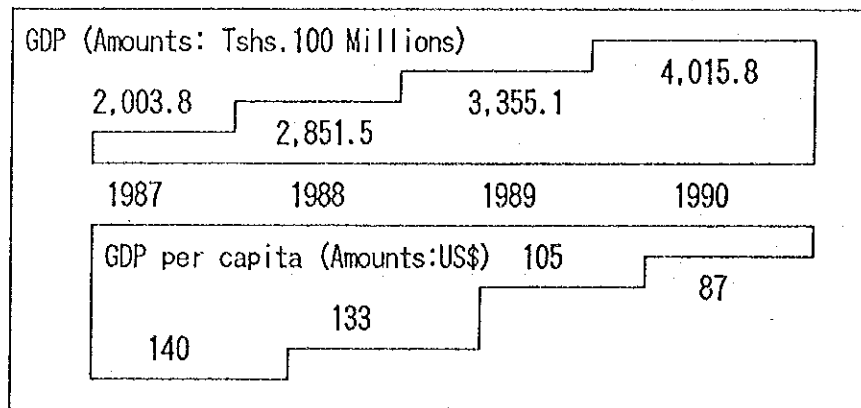
2-1-1 General Situation

(1) Economy

General Trend

The economy of the United Republic of Tanzania was in a great depression during the 1980's due to the oil shocks experienced twice in 1973 and 1979, Ugandan War from 1978 through 1979, a recession which started in the early 1980's, a terrible drought which had affected all of Africa, etc. Under such difficulties, in an attempt to revitalize the economy, the Government of Tanzania has started to introduce some liberal economic policies such as the liberalization of part of the country's import and the gradual abolition of price control since 1984. In 1985, president Nyerere retired admitting the failure of his economic policies, and the presidency was succeeded by president Mwinyi. In June, 1986, the devaluation of the national currency was executed, and in July, "the Economic Recovery Programme" was brought forward with a support from the World Bank and IMF. To support such positive economic policies of Tanzania, developed countries and international organizations, which had been offering aid in small amounts since the beginning of the 1980's, have started offering more aid in large amounts. As a result, the economy is now recovering from the destitution. The growth rate of GDP, was 3.9% in 1987, 3.9% in 1988, 3.3% in 1989, and 3.6% in 1990, each rate being over 3%. The GDP growth rate has been above the rate of population increase, but because of the repeated devaluation of the national currency, the nominal GDP per capita fell to US\$ 87.00 in 1990. Thus, the real economic growth remains at a low level.

Fig.2-1 GDP RECORD IN TANZANIA



(Source : President's office, Bureau of statistics 1991/Sep.)

Financial Trend

The public sector of the country consists of the central government, the regional governments, the public enterprises, and the public corporations. The financial balance of the central government including the expenditure for development has been in the deep red every year, and the expenditure reaches twice the amount of the revenue. Most of the deficit is balanced by foreign aid received. In the past, nationalization was facilitated in each main industry, breeding low productivity and inefficiency. Those are the factors which led the country to the brink of economic disaster. Now, however, economic liberalization is in progress, and the private sector is getting revitalized.

The domestic debit loans of commercial banks have been increasing in response to such liberal policies. A rapid increase was observed in the financial shares of each of the agriculture, mining industry, manufacturing industry, and transportation in 1987, when "Economic Recovery Programme" showed its effect.

Table 2-1 TANZANIA : CENTRAL GOVERNMENT FINANCIAL BALANCE

(Amounts: Tshs.100 Millions)

Fiscal Year	1987	1988	1989	1990
Revenue	464.8	620.5	875.4	1,133.9
Expenditure	554.8	768.6	1,083.1	1,428.4
Balance	△ 90.0	△ 148.1	△ 207.7	△ 294.5

(Source : Research Bureau of The University of DSM. 1991/Jul.)

Trend in Each Industry

<Agriculture, Forestry and Fishery>

The most important industry in Tanzania is agriculture, which occupies 50% of the GDP, 60% of the export, and 90% of the labor force. A third of the country's land area is cultivatable. However, about a sixth of the land area is really cultivated, and irrigation is applied only over less than 3% of the cultivated land. Main agricultural products are maize, rice, cas-

sava, wheat and bean. After the passing of the drought experienced in the early 1980's, all agricultural productions have been increasing. Major internationally-marketable products are coffee, cotton, sisal fiber, tobacco, tea and cashew nut; a small amount of pyrethrum, cardamom and cocoa can be added to those export items. Among those exportable products, coffee accounts for more than a quarter of the country's export in value. However, since the productions of coffee and others are not increasing, the export is not prospering.

The forestry industry seems to have a potential for future development since nearly a half of the nation's land is covered with woods. However, the reality is that most of those woods are savanna type, and only about 2% are tropical forests with tall trees. Moreover, people there are dependent on firewood and charcoal for their energy needs, which leads to the reduction of the wooded area. As a result, the central part of the country is becoming desertlike, and the country's environment is getting worse.

Tanzania has 800 kilometers of coastline, but the fishery industry relies not much on marine fish but mostly on fresh-water fish, which is caught at Lake Victoria, Lake Tanganyika, Lake Nyasa, etc. The catch of fresh-water fish accounts for 80 - 90% of all the fish caught or of the total monetary value of the industry. Also, 80 - 90% of all the fishermen are working for fresh-water fish. However, marine fishery seems to have recently started to develop for shrimps, sardines, tuna, etc.

<Mining>

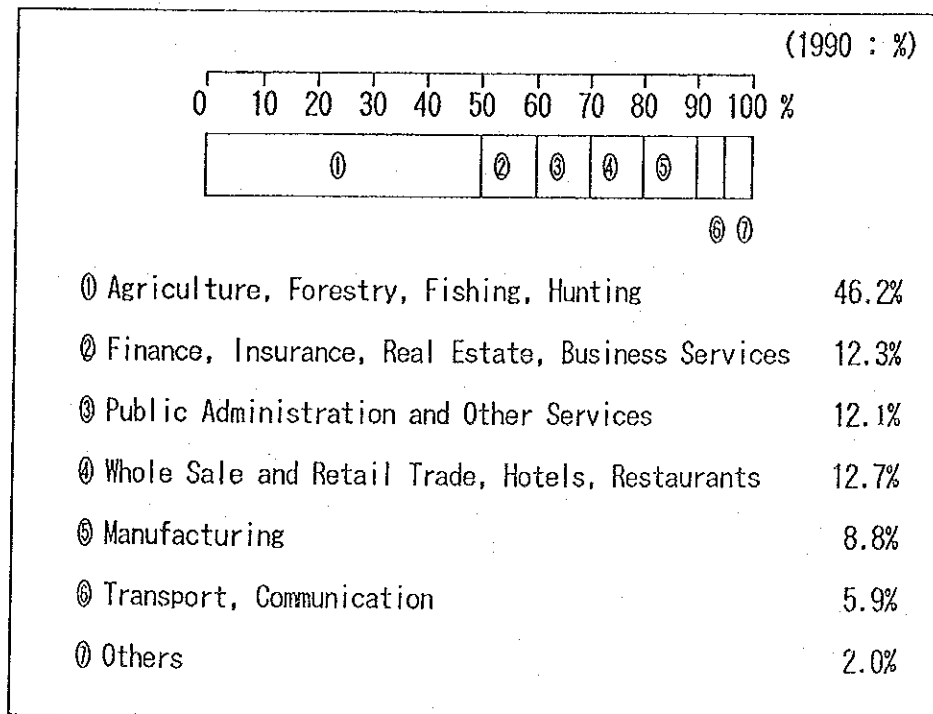
There are various mineral sources in Tanzania, but the mining yield of each mineral is small. The mining industry accounts for less than 1% of the nation's GDP. The reasons for this poor showing of the mining industry is due to the dilapidation of the existing mining facilities, a lack of fund and equipment, a lack of administrative and technical knowhow, etc., yet it seems that no specific measures have been taken to revive the industry. Oil exploration has been being carried out at seven locations without any discovery yet. However, natural gas has been discovered in the vicinity of Songosongo Island, and its uses are being discussed currently.

<Manufacturing>

The manufacturing industry consists mainly of sections of processing agricultural products for export; processing food for the domestic market;

producing zinc-plated iron sheet, cement, and fertilizer; making shoes; manufacturing battery cells, etc. During the depression of 1983 through 1985, most of the factories' operations went down to 20 - 30% of their operational capacities. The government, trying to bring the economy out of the depression, came up with "the Economic Recovery Programme", which took effect in 1986. The program promoted the revitalization of production activities by improving infrastructure and also facilitated the import of raw materials and spare parts by allocating foreign currency reserves to particular sectors of the manufacturing industry, with high priority. Liberal economic policies are still coming out. As a result, the recovery of production is now seen in some part of the manufacturing industry.

Fig.2-2 TANZANIA : Economic Activity Profile



(Source : President's office, Bureau of statistics 1991/Sep.)

Trade profile and balance of payments

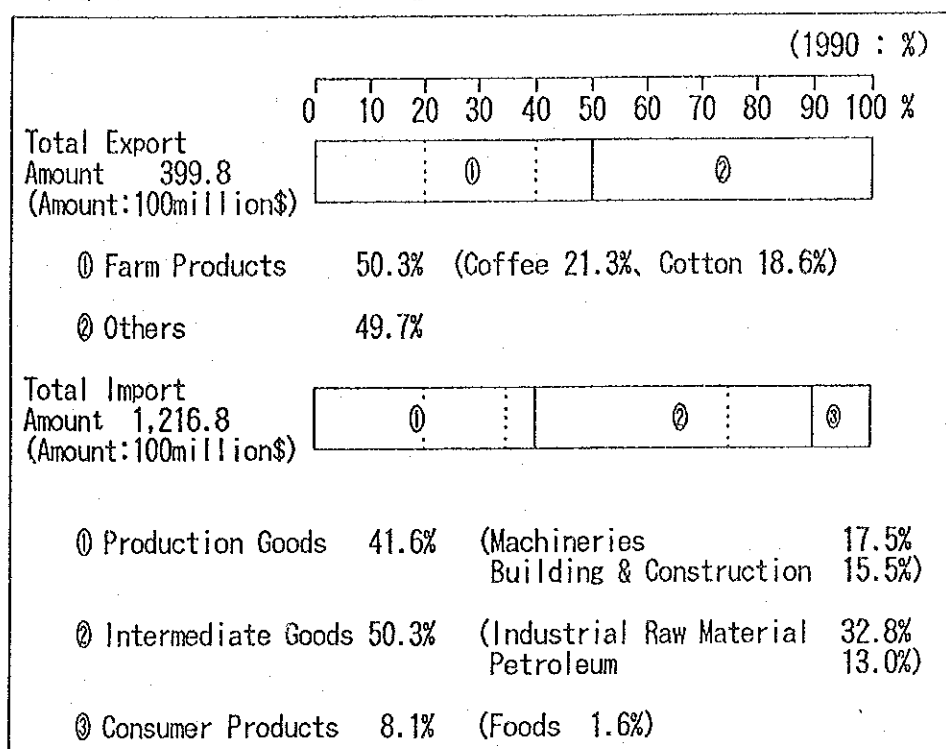
<Trade>

The trade profile of Tanzania is primary-industry-dependent. Agricultural products, mainly coffee and cotton, account for more than 60% of the country's export. In addition to those export products, crude oil and petroleum products are exported, as well as minerals and some manufactured products. On the other hand, main import items are materials necessary for production, which account for nearly a half of all the import. Examples of such items are transportation vehicles, construction machinery, production machinery, raw materials for manufacturing such as oil, and consumable materials such as apparel and food. In 1989, the total value of export was US\$ 395.2 million, and that of import US\$ 1.23 billion, resulting in US\$ 835 million of deficit. Trading partners for both export and import are Great Britain, which reigned over Tanzania in the colonial time, Germany and other European countries.

<International Balance of Payments>

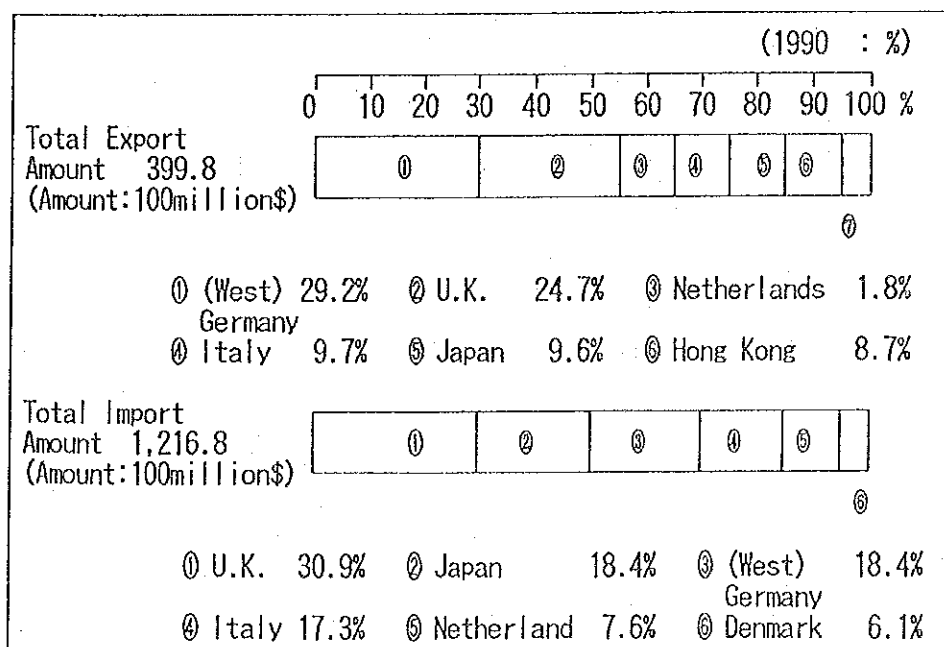
As far as the balance of payments in 1989 is concerned, there were a deficit of about US\$ 400 million in the ordinary balance and a deficit of about US\$ 250 million in the total balance. Those conditions were resulted from a large deficit in the trade balance and a deficit in the service balance, both of which were not sufficed with a transferable balance. This trend of persistent deficit started in the early 1980's, and have been dealt with by means of delay of settling debts or of rescheduling, and debts have accumulated to about US\$ 5.0 billion, reaching 95% of the national budget. Under such circumstances, debt-salvation measures were agreed twice at conferences held in Paris in 1986 and 1988. In compliance with those agreements, the Government of Japan has dealt to eliminate the official debts encountered by the Government of Tanzania for the period of October, 1987 through September, 1989.

Fig.2-3 TANZANIA : Foreign Trade by Description of Goods



(Source : Research Bureau of The University of DSM. 1991/Jul.)

Fig.2-4 TANZANIA : Foreign Trade by Description of Countries



(Source : Research Bureau of The University of DSM. 1991/Jul.)

(2) Programmes for Economic Development

Transition of Programmes for Economic Development

After achieving independence in 1961, the Government of the United Republic of Tanzania implemented several plans for economic development: the first three-year programme (1962 - 1964), the first five-year programme for economic and social development (1965 - 1969), the second five-year programme for economic and social development (1970 -1974), and the third five-year programme for economic and social development (1977 -1981).

After those programmes, other programmes have been also implemented. "The National Economic Survival Programme" (1981) was to bring the economy out of recessionary difficulties. "The Structural Adjustment Programme" (1983 - 1985) was tried by the Government of Tanzania without any help from IMF, because of the country's severed relation with IMF. However, neither of those programmes could turn the economy to recovery, and they ended without any achievement. After the inauguration of a new president, Mwinyi, reconciliation was made with the World Bank and IMF. Thereby, getting a support from the World Bank and IMF, "the Economic-Recovery Programme" (1987 -1989) was carried out by the new government, adopting liberalization policies. As a result, economic growth has been seen, though it has been small.

Second Economic Recovery Programme (Economic and Social Action Programme) (1989 - 1992)

"The Second Economic Recovery Programme" was started to promote further economic growth over what had been brought about by the first programme. This programme is also called "Economic and Social Action Programme", for the programme is meant not only to adjust the country's structure for economic growth but also to improve the social service sector that has been left without any government action in the past. The numerical targets of the programme are: a yearly GDP growth rate of 5%, a yearly growth rate in the agricultural sector of 5.5%, an inflation rate of less than 10%, etc. during the period of the programme's implementation.

The following are the principal strategies:

- 1) Agricultural production increase;
- 2) Efficient use of the nation's natural resources;
- 3) Rehabilitation of the infrastructure for economic activities especially in the transportation and communications sector;
- 4) Improvement of the balance of payments through appropriate policies concerning budget, finance, production and trade;
- 5) Control of inflation;
- 6) Vitalization of the manufacturing sector by improving the factories' operations to their maximum; and
- 7) Recovery of the quality of social services through public involvement and maintenance of the services so recovered.

2-1-2 Population Structure

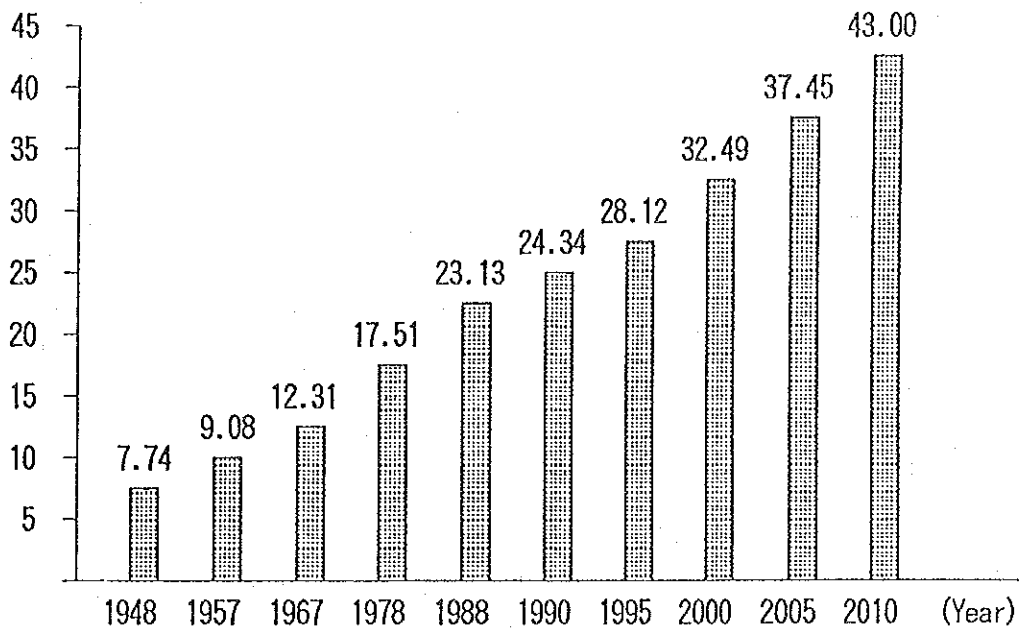
The population of Tanzania is 23.1 million according to the statistics carried out in 1988. Estimated future population increases by the year 2010 are shown in the figure below. The rate of population increase has been about 3%. However, it was 2.8% from 1978 to 1988, so it is showing a little decrease.

The total population consists of: 45.8% in the younger generation of 14 years old or under, 50% in the middle generation of 15 to 64 years old, and 4.2% in the older generation of 65 or older according to the statistics of 1988. Even if the rate of population growth were decreased, the growth rate in the work force would not be hampered in the future.

When the estimated population of 1990 is subgrouped by the age, the distribution of those subgrouped populations takes the shape of a pyramid, which is typical of developing countries.

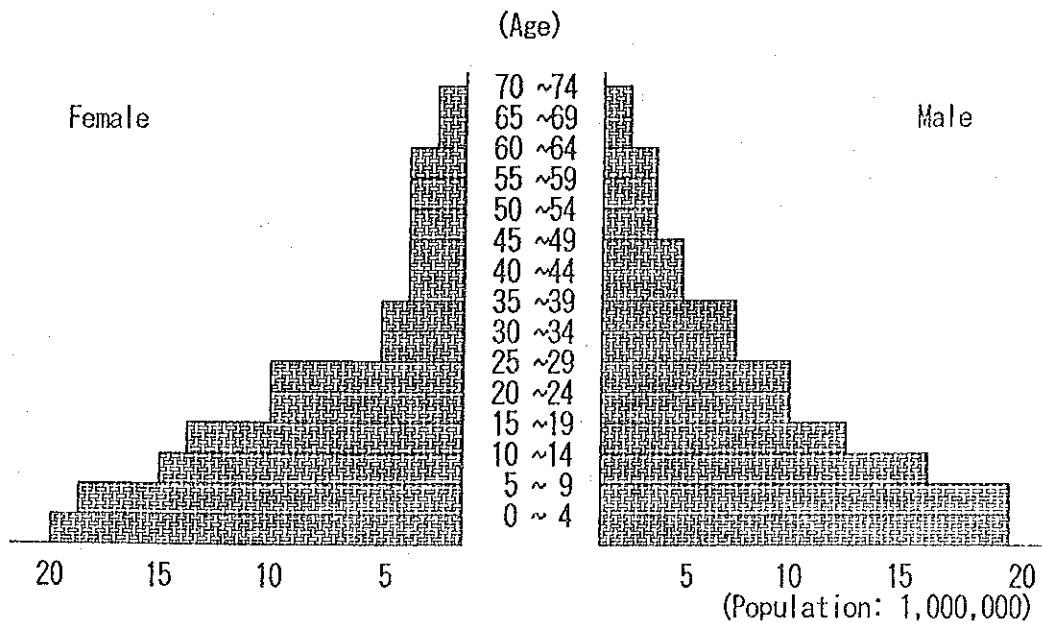
Fig.2-5 Transition and Projection of Population

(Population : 1,000,000)



(Source : President's office, Bureau of statistics 1991/Dec.)

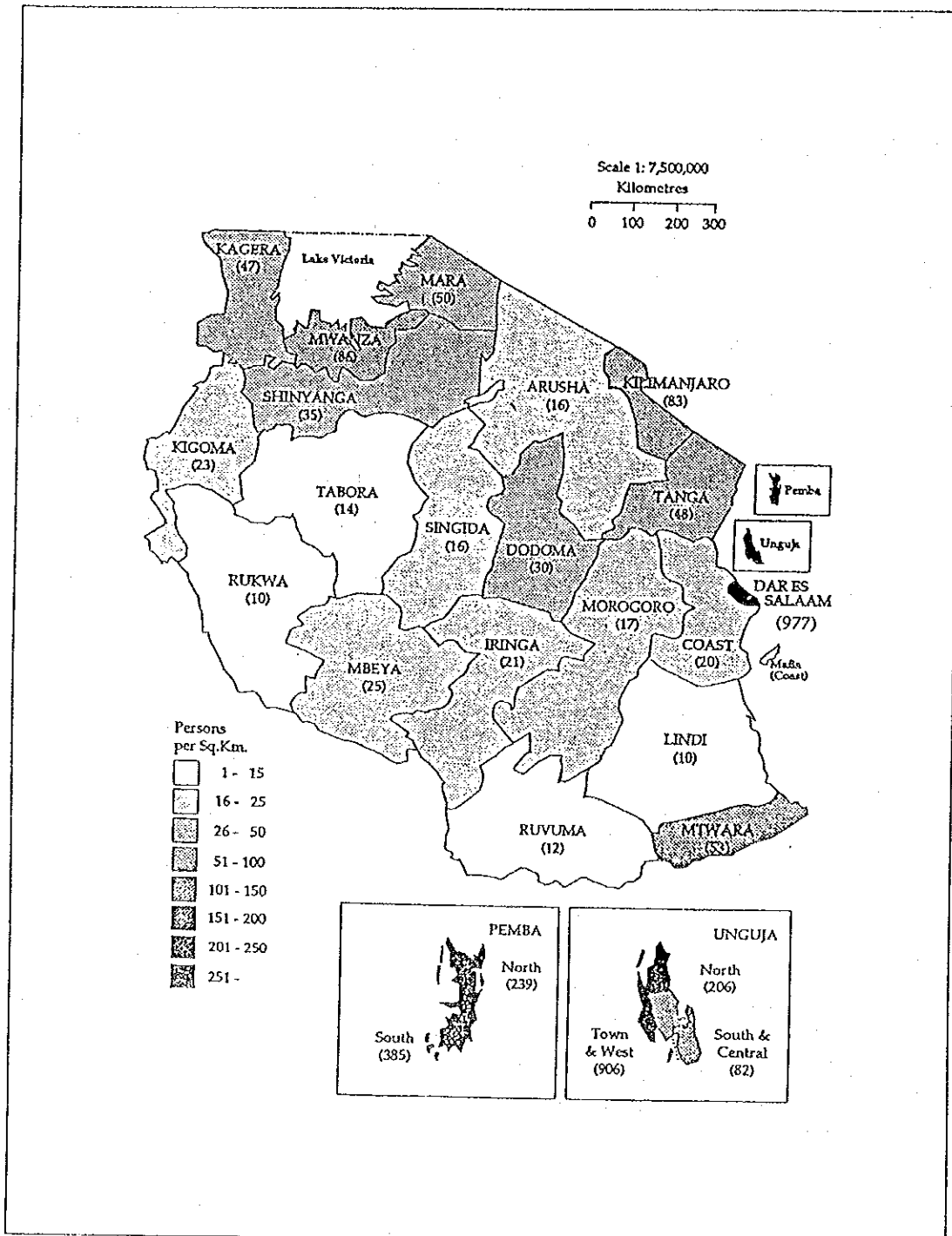
Fig.2-6 Population Structure by Sex and Broad Age Groups



(Source : President's office, Bureau of statistics 1991/Dec.)

The United Republic of Tanzania consists of 20 Regions and the Islands of Zanzibar. The population is dispersed evenly over the whole land area except in Dar es Salaam Region, which is an urban area.

Fig.2-7 TANZANIA : Regional Population Density in 1988



(Source : President's office, Bureau of Statistics, 1990)

Table 2-2 TANZANIA : Population by Region in 1988

Region	Area (Km ²)	Population		Population Density (Km ²)		Families No. 1988	per- sons / family
		1978	1988	1978	1988		
Dodoma	41,311	972,005	1,237,819	24	30	244,684	5.0
Arusha	82,306	926,223	1,351,675	11	16	249,434	5.4
Kilimanjaro	13,309	902,437	1,108,699	68	83	205,302	5.4
Tanga	26,808	1,037,767	1,283,636	39	48	249,147	5.1
Morogoro	70,799	939,264	1,222,737	13	17	227,705	5.3
Coast	32,407	516,586	638,015	16	20	128,218	4.9
D'Salaam	1,393	843,090	1,360,850	605	977	314,304	4.3
Lindi	66,046	527,624	646,550	8	10	138,070	4.6
Mtwara	16,707	771,818	889,494	46	53	198,726	4.4
Ruvuma	63,498	561,575	783,327	9	12	146,874	5.3
Iringa	56,864	925,044	1,208,914	16	21	248,479	4.8
Mbeya	60,350	1,079,864	1,476,199	18	25	297,636	4.9
Singida	49,341	613,949	791,814	12	16	148,937	5.3
Tabora	76,151	817,907	1,036,293	11	14	180,129	5.7
Rukwa	68,635	451,897	694,974	7	10	130,759	5.3
Kigoma	37,037	648,941	854,817	18	23	146,961	5.8
Sinyanga	50,781	1,323,535	1,772,549	26	35	279,690	6.3
Kagera	28,388	1,009,767	1,326,183	36	47	269,626	4.9
Mwanza	19,592	1,443,379	1,878,271	74	96	292,962	6.4
Mara	19,566	723,827	970,942	37	50	143,246	6.7
Mainland	881,289	17,036,499	22,533,758	19	26	4,240,891	5.3
Kaskazini unguja	470	77,017	97,028	169	206	23,347	4.1
Kusini Unguja	854	51,749	70,184	62	82	15,284	4.5
Mjini magharibi	230	142,041	208,327	460	906	42,142	4.9
Kaskazini Pemba	574	106,290	137,399	232	239	29,324	4.6
Kusini Pemba	332	99,014	127,640	242	385	26,300	4.8
Zanzibar	2,460	476,111	640,578	201	260	136,397	4.7
TANZANIA	883,749	17,512,610	23,174,336	220	286	4,377,288	5.2

(Source : President's office, Bureau of Statistics 1991/Sep.)

2-1-3 Level of Health and Medical Care

The infant mortality is very sensitive to the nutritional condition of the inhabitant, the level of medical care, and the supply of medicines. As can be expected, in the case of Tanzania, the infant mortality is very high according to the statistics of 1988. (Yearly changes of the infant mortality are not known.) It is 115/1000 for the whole country (115/1000 for the main land and 120/1000 for the Island of Zanzibar). The mortality of children under 5 is 192/1000 for the whole country (191/1000 for the main land and 202/1000 for the Islands of Zanzibar), which is even higher than the infant mortality. It is evident from those data that the mortality of infants and children is very high. Concerning mortality, it is hard to make a conclusion from those data in observing the yearly transition of data and the comparison with International data, since mortality is very different among those different age-groups. However, those statistics can be after all an indication of the level of health and medical care of a country. The mortality as a whole was 19.1/1000 in 1978, and 15.1/1000 in 1988. Though it has been decreasing, it is still high.

Fig.2-8 Age Specific Mortality Rate (per 1,000)

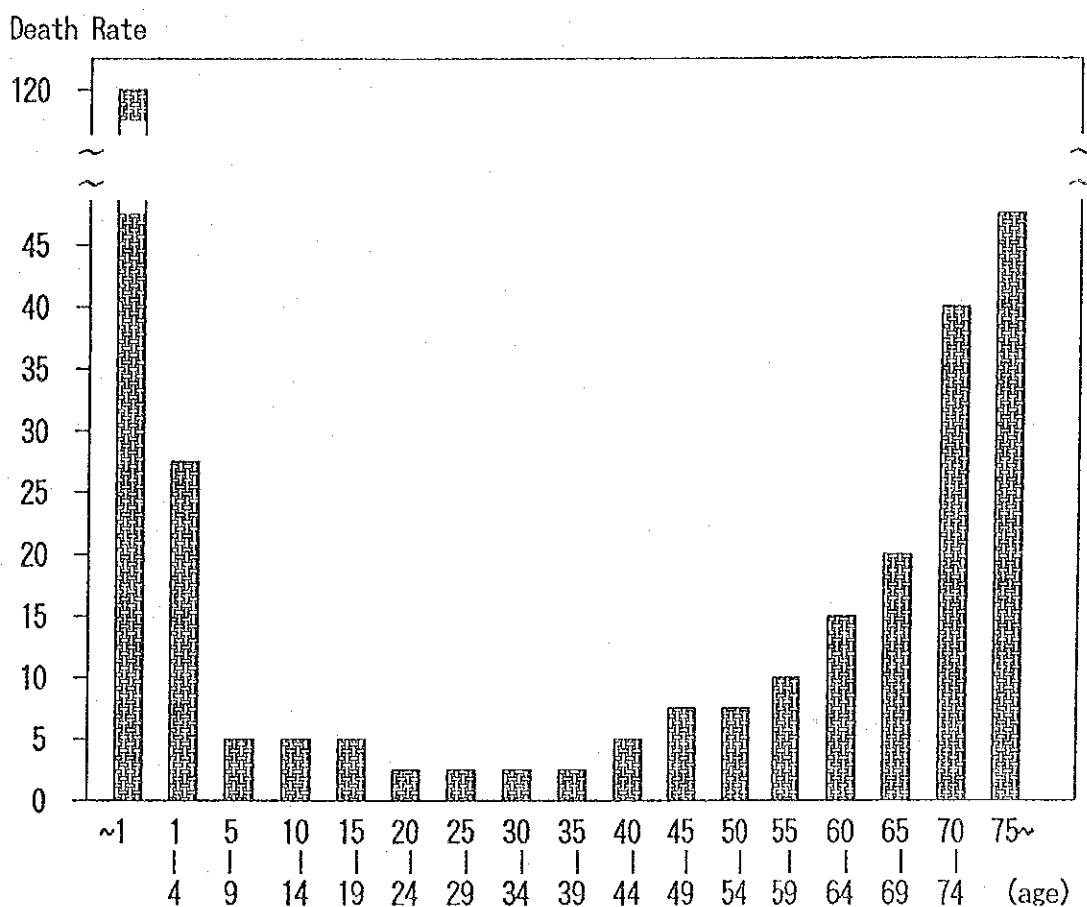


Table 2-3 International Comparison of Infant Mortality and Crude Death Rate (per 100)

Country	Infant Mortality Rate	Crude Death Rate
Tanzania	115.0	15.1
Indonesia	84.0	11.2
Malaysia	24.1	5.6
Thailand	39.0	7.0
Nepal	128.2	14.8
Bangladesh	119.2	15.5
U.K.	8.8	11.1
U.S.A.	9.9	8.8
Japan	5.0	6.2

(Source : World Health Statistics 1987, WHO/Demographic Year Book 1988, UN)

2-1-4 Disease Pattern

It is difficult to ascertain the morbidity profile of Tanzania because institutions that deal with statistics are not functioning well in Tanzania. However, after seeing the reports submitted by the hospitals, rural health centers, and dispensaries of Tanzania, it is noticed that most patients are afflicted with malnutrition, malaria, and other infectious diseases. Patients infected with malaria are apparently increasing according to the reports submitted by the rural health centers and dispensaries, which are peripheral facilities of the hospitals. Most infectious diseases are curable if they are treated at their early stages. They can be prevented by improving public health and sanitation and also by promoting vaccination. However, the reality is that infectious diseases are still the main causes of death among the people in Tanzania.

The morbidity and mortality caused by malaria and other infectious diseases are very high among the people living in the slums of big cities and of the suburbs. So are they in the national level, as well. Therefore, it is very urgent to cope with such archaic infectious diseases to improve the level of health and medical care of the whole nation of Tanzania.

Table 2-4 Major Causes of Outpatients Attendance (records in main hospitals)

Disease	1976		1977		1978	
	Number of persons	(%)	Number of persons	(%)	Number of persons	(%)
Malaria	603	11.1	630	13.0	470	13.0
Malnutrition	260	4.8	255	5.0	320	7.2
Accidents, injuries & poison	248	4.6	236	4.9	222	5.2
Pneumonia & other respiratory diseases	230	4.2	278	5.7	191	4.5
Diarrhoea & diseases of digestive system	241	4.4	122	2.5	106	2.5
Hookworm & other helminths	209	3.9	146	3.0	153	3.6
Venereal diseases	118	2.2	167	3.4	84	2.0
Eye diseases	111	2.0	75	1.5	67	1.6
Measles	77	1.4	71	1.5	66	1.5
Dental	53	0.9	52	1.0	62	1.4
Schistosomiasis	17	0.3	65	1.3	53	1.2

(Source : Ministry of Health; Guidelines for the Implementation of the Primary Health Care Programme in Tanzania 1983)

Table 2-5 Major Causes of Inpatients (records in main hospitals)

Disease	1976		1977		1978	
	Number of persons	(%)	Number of persons	(%)	Number of persons	(%)
Complication of Pregnancy	88	19.2	78	16.2	70	20.0
Malaria	35	7.6	43	8.9	37	10.4
Pneumonia & other respiratory diseases	36	8.2	40	8.4	29	8.3
Diarrhoea & diseases of digestive system	99	2.1	34	7.1	22	6.2
Measles	22	4.8	23	4.8	14	3.9
Anaemias	18	3.9	17	3.5	18	5.1
Hookworm	24	5.2	7	1.5	12	3.4
Malnutrition	13	2.8	13	2.7	8	2.8
Skin diseases	5	1.1	7	1.5	9	2.6
Tuberculosis	8	1.9	7	1.4	6	1.8
Accidents	8	1.7	7	1.4	7	2.0

(Source : Ministry of Health; Guidelines for the Implementation of the Primary Health Care Programme in Tanzania 1983)

Table 2-6 Major Causes of Deaths (records in main hospitals)

Disease	1976		1977		1978	
	Number of persons	(%)	Number of persons	(%)	Number of persons	(%)
Diarrhoea	1.0	18.0	1.0	6.4	1.0	12.1
Pnenmonia	1.0	11.0	1.0	11.6	1.0	10.1
Measles	0.6	8.6	1.0	14.7	0.7	10.4
Malnutrition	0.5	7.4	0.8	7.6	0.3	4.1
Malaria	0.2	2.8	0.5	4.9	0.4	5.8
Neonatal diseases	0.4	6.6	0.5	5.3	0.1	1.5
Tuberculosis	0.4	6.3	0.4	3.8	0.3	4.8
Anaemia	0.4	6.1	0.5	4.7	0.3	4.9
Heart diseases	0.3	4.6	0.4	3.8	0.4	5.7
Tetanus	0.1	2.0	0.2	2.1	0.2	3.6

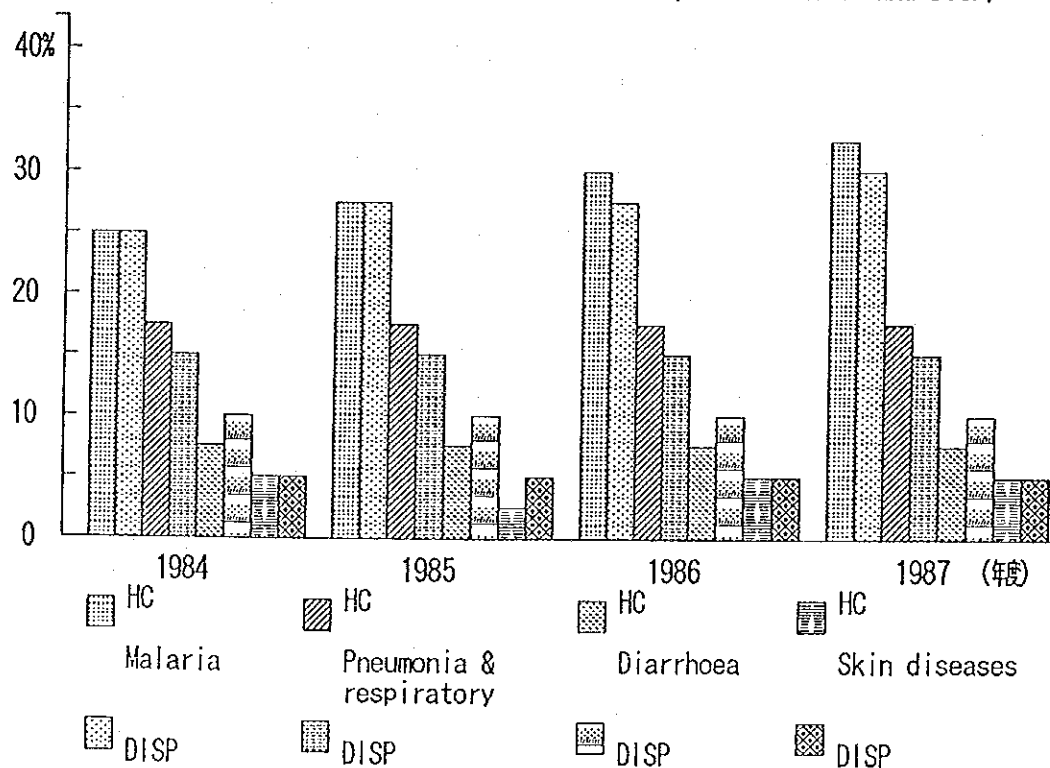
(Source : Ministry of Health; Guidelines for the Implementation of the Primary Health Care Programme in Tanzania 1983)

Table 2-7 Major Causes of Out Patient Attendance (Records in HC and DISP)

Diseases	1986			1987				
	Total Reports	No. of Patients	%	Total Reports	No. of Patients	%		
Malaria	HC	674	385,187	30.7	HC	665	460,905	33.2
	DISP	1544	426,246	28.0	DISP	1463	442,763	30.4
Pneumonia & respiratory diseases	HC	674	205,840	16.4	HC	665	211,336	15.2
	DISP	1544	222,814	14.6	DISP	1463	209,559	14.4
Diarrhoea	HC	674	94,604	7.5	HC	665	110,426	7.9
	DISP	1544	139,474	9.1	DISP	1465	130,584	9.0
Skin diseases	HC	674	43,557	3.5	HC	665	45,425	3.3
	DISP	1644	58,005	3.8	DISP	1463	55,977	3.8

(Source : Ministry of Health, Tanzania, 1989)

Fig. 2-9 Major Causes of Out Patient Attendance (Records in HC and DISP)



(Source : Ministry of Health, Tanzania, 1989)

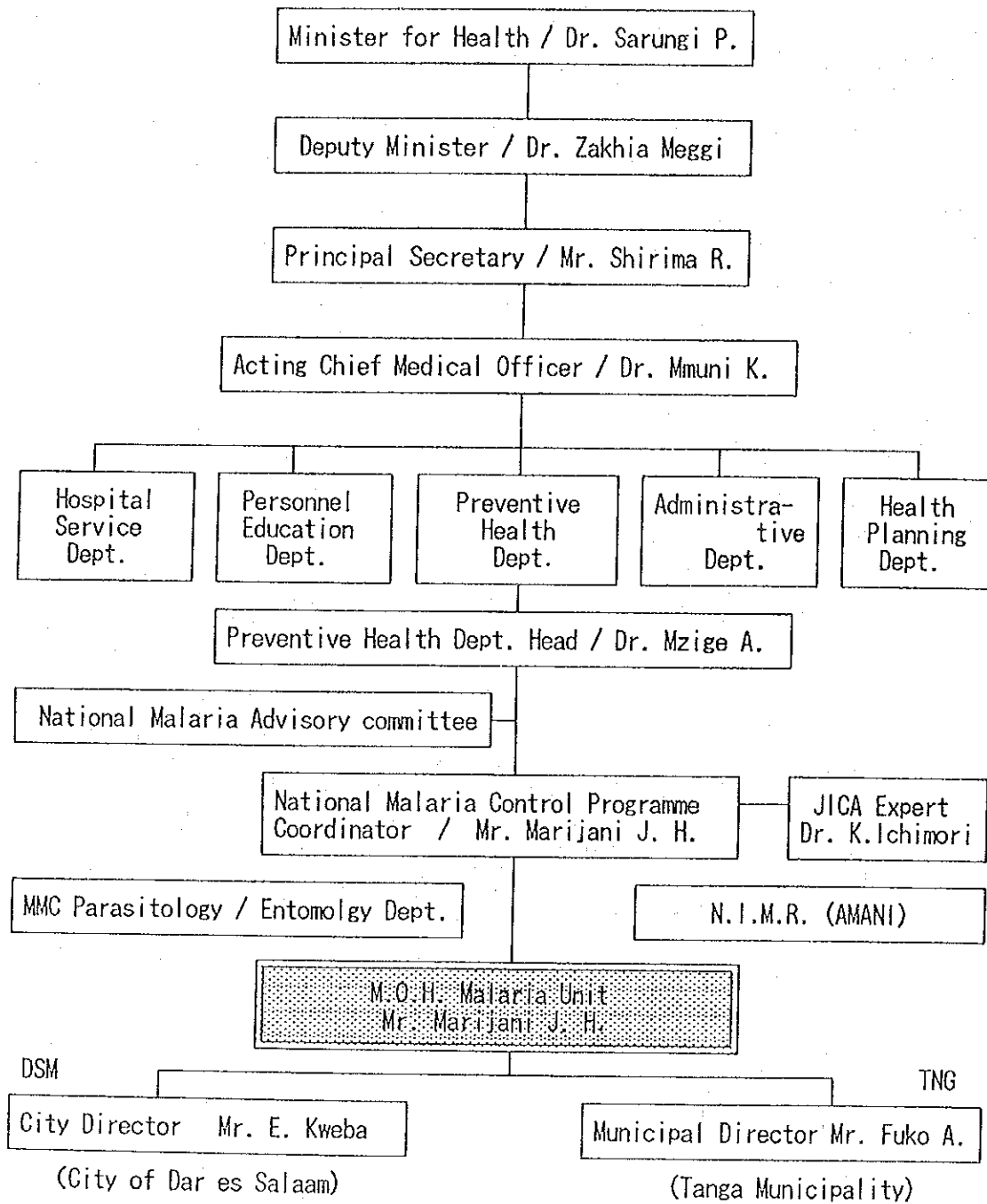
2-2 National Health Care Administration

2-2-1 Organization of the Ministry of Health

The Ministry of Health exists as central administrative organization in charge of the nation's health and medical care. Under the ministry, there are five departments (The Preventive Health Department, the Hospital Service Department, the Personnel Education Department, the Administration Department and the Health Planning Department) and facilities supporting those departments. The Preventive Health department, the organization that manages the Malaria Control Project, works mainly for the prevention, treatment, education and study of infectious diseases as well as for the improvement of public health. Upon starting the Malaria Control Project, the Ministry of Health organized a head quarters named "the Malaria Unit". Since then it has been managing the project.

Regional Administration for health care work is carried out by institutions centering around the rural health centers and dispensaries. These two institutions are instituted in accordance with the levels of the regional governing bodies organized under the system of regional administration. Those regional governing bodies are composed of 20 Regions and the Islands of Zanzibar and Pemba, their districts under those Regions, and the wards and branches of those Districts.

Fig.2-10 Organization of the Ministry of Health



(Source : M.O.H. Malaria Unit)

2-2-2 Budget of the Ministry of Health

The following shows the transition of the annual budget of the Ministry of Health as a whole.

Table 2-7 Budget of the Ministry of Health
(Amount: Tsh.)

Fiscal Year	1987/88	1888/89	1989/90
Routine Budget	1,837,797,800	2,603,504,400	3,949,292,200
Annual Increase / Decrease (%)	-	+70.5%	+65.9%
Administration Dept	35,344,300	53,840,600	58,333,400
Hospital Service Dept	1,267,501,000	1,992,454,300	3,095,796,600
Preventive Health Dept	84,522,800	168,255,700	247,980,700
Personnel Education Dept	194,417,100	300,571,900	414,748,400
Health Planning Dept	2,422,400	3,489,300	5,515,200
Medical Supply Dept	23,985,700	36,505,700	53,288,200
Clinical Examination Dept	30,648,500	42,276,000	66,571,800
Social Welfare Dept	194,271,500	(Transfer to the Ministry of Social Welfare)	
Foods Control Committee	4,684,500	6,110,900	7,057,900
Development Budget	71,608,000		215,100,000
Increase or Decrease	-	-	-
Prev. Health Dept	24,200,000		48,700,000
Health Center	600,000		3,000,000
Hospital Service Dept	24,197,000	Unknown	130,000,000
Personnel Education Dept	9,263,000		33,400,000
Social Welfare Dept	13,348,000	(Transfer to the Ministry of Social Welfare)	
T o t a l	1,909,405,800	2,603,504,400	4,164,392,200

(Source : Ministry of Health, Tanzania, 1992)

The total budget of the ministry has been increasing for the past three years in tandem with the nation's general budget, and the budget of the ministry accounts for about 6.0% of the national budget.

The budget of the Malaria Control Project is allocated from the ministry through the above mentioned Malaria Unit, which is under the ministry, out of the budget allocated for the Preventive Health Department, as seen in the above table. The following table shows the transition of the budget of Malaria Unit and budgets of the cities (DSM and TNG) that are the executing bodies of the Malaria Control Project.

Table 2-8 Budgetary Allocation for the Programme
(Amount: Tsh)

Fiscal Year	Agency	Budget Amounts			
Phase 1 (1988/89)	M.O.H.	10,000,000			
	Municipal	DSM	12,000,000	TNG	8,000,000
Phase 2 (1989/90)	M.O.H.	10,000,000			
	Municipal	DSM	58,000,000	TNG	8,000,000
Phase 3 (1990/91)	M.O.H.	11,000,000			
	Municipal	DSM	40,000,000	TNG	5,000,000
Phase 4 (1991/92)	M.O.H.	9,000,000			
	Municipal	DSM	90,000,000	TNG	6,000,000
* Phase 5 (1992/93)	M.O.H.	32,400,000			
	Municipal	DSM	120,000,000	TNG	40,000,000

* Figure on "Phase 5" is estimate amounts

(Source : M.O.H. Malaria Unit)

At first, the budget for the Malaria Control Project was allocated as a development budget for the Preventive Health Department of the Ministry of Health in the fiscal year of 1988/1989. It came to be allocated in the ordinary budget in the following year. As seen in the above table, however, there has been little increase in the budget allocated for the project, which is still not enough to function in a reasonable way. The budget allocated to the Malaria Unit is spent for general management of the project activities such as research and field monitoring carried out by other groups rather than the executing bodies of the project, e.g., research projects and field monitoring operations executed by Amani Research Institute or joint meetings. Also, the

project budgets for executing bodies, DSM and TNG, are allocated from the budgets of the regional governments that governs both cities.

Since the fiscal year of 1990/1991, 3.0 million shillings have been subsidized from the Malaria Unit to both the cities. As a result, for the fiscal year of 1990/1991, the real budget for DSM was 43.0 million shillings, which was the sum of 40.0 million shillings allocated from the regional government and additional 3.0 million shillings allocated from the Malaria Unit. Also, the real budget for TNG was 8.0 million shillings, 5.0 million shillings from the provincial government and additional 3.0 million shillings from the Malaria Unit. The table below shows the account of main items of the budget requested by TNG for the fiscal year of 1990/1991. It is clear that there is a great difference between the account of budget requested and the real budget allocated. The fiscal year of Tanzania runs from July through June, and budgetary requests are currently, at the time of this study being made for the year 1992/1993. The account of main budgetary items requested by TNG for the year 1992/1993 is shown below for reference.

90/91 Breakdown of estimates		92/93 Breakdown of estimates	
<u>Expenses</u>	<u>Amounts</u>	<u>Expenses</u>	<u>Amounts</u>
Personnel	7,896,000	Personnel	7,896,000
Fuel for vehicles	11,118,600	Fuel for vehicles	13,506,668
Health education	405,000	Health education	2,706,500
Operator training	311,600	Operator training	523,000
Maintenance of vehicles	3,850,000	Maintenance of vehicles	10,700,000
Environmental improvement	8,382,325	Environmental improvement	10,178,025
T o t a l	31,963,525	Maintenance of facilities	5,043,750
		Seminar	57,000,000
		T o t a l	107,553,943

(Source : TNG ; Executing Body 1992)

As far as the budgetary figures for TNG are concerned, the project budget is all spent for personnel. This budgetary condition really tells what has been said since the start of the project. It has been said that most of the budget for the project would be eaten up by the expenses for the personnel and the fuel for vehicles used. Securing the sufficient budget for the project is a fundamental problem facing the Ministry of Health as well as both the cities executing the project. The Department of International Economic Relation of the Ministry of Finance says that as long as Japanese grant aid assistance continues, they will try to secure a budget to run the project. However, whether a budget is secured or not it will affect future activities of the project, most.

2-2-3 Level of Medical Services

In Tanzania, medical services are provided to the public through the hospitals, rural health centers, and dispensaries. There are 152 hospitals both private and public throughout the country (according to the statistics of 1985). However, it is impossible to find out the number of beds equipped in those hospitals. The national hospitals and public hospitals are evenly distributed throughout the country. On the other hand, the private hospitals, which are funded by religious foundation or various corporations, are located mostly in big cities. This distribution of the hospitals seems to correspond relatively well with the distribution of the population.

The rural health centers and dispensaries are instituted under those hospitals in organizational hierarchy and are at the front line in health care operation, offering the public primary health care services. Most of those centers and dispensaries are easy-access medical facilities, which are established mainly for the purpose of offering medical services directly to low-income families living in farm areas or urban areas. Those facilities are currently being expanded and improved by the government. The number of those rural health centers and dispensaries existing in each Region, as of 1985, is listed on the table below. There are at least 10 health centers in each Region. Also, the number of rural health centers instituted in each Region is about 30% the number of the villages existing in each Region. With those facilities distributed throughout the country, a network of primary health care service is organized in Tanzania.

Table 2-9 Medical Facilities by Region, 1985

Region	Area (Km ²)	No. of Pregnant women	No. of District	No. of Villa -ge	No. of Hospi -tal	H.C.	Dispensary
Dodoma	41,311	59,362	4	423	7	14	132
Arusha	82,306	60,681	6	462	9	11	142
Kilimanjaro	13,309	55,491	5	333	13	11	145
Tanga	26,808	62,576	6	556	13	12	220
Morogoro	70,799	57,363	5	470	10	10	184
Coast	32,407	29,085	4	333	6	6	100
D'Salaam	1,393	73,919	3	73	5	8	106
Lindi	66,046	30,528	5	309	7	7	98
Mtwara	16,707	44,324	4	481	6	7	96
Ruvuma	63,498	35,403	4	302	7	9	94
Iringa	56,864	55,600	4	578	11	12	161
Mbeya	60,350	69,794	7	581	11	12	136
Singida	49,341	27,591	4	318	5	8	84
Tabora	76,151	55,663	5	392	7	8	106
Rukwa	68,635	30,955	3	241	3	6	72
Kigoma	37,037	39,636	4	-	5	7	88
Shinyanga	50,781	84,769	5	620	6	14	153
Kagera	28,388	66,414	6	350	7	10	124
Mwanza	19,592	88,160	6	687	9	19	188
Mara	19,566	43,280	4	379	5	11	108
Mainland	881,289	1,068,588	94	7,888	152	202	2,537

(Source : Ministry of Health, Tanzania, 1992)

2-3 Situation of Activities on the Malaria Control Project (phases 1 - 3)

2-3-1 Present Situation of Malaria

The table below shows yearly changes in the number of patients infected with malaria and in the number of deaths caused of malaria in each Region. The figures showing each Region's morbidity and mortality causes of malaria do not correspond to the classification of the Regions ranked by the degree of the disease's seriousness. For example, in the classification of the Regions, Mtwara Region is listed as "Holoendemic", but no deaths had been reported there for three years, from 1987 to 1989. This classification of the Regions by the degree of seriousness in malarial infection must have been made by considering the geographies and climates of the Regions instead of considering the reality.

Table 2-10 Demographic Malaria Disease Cases and Deaths

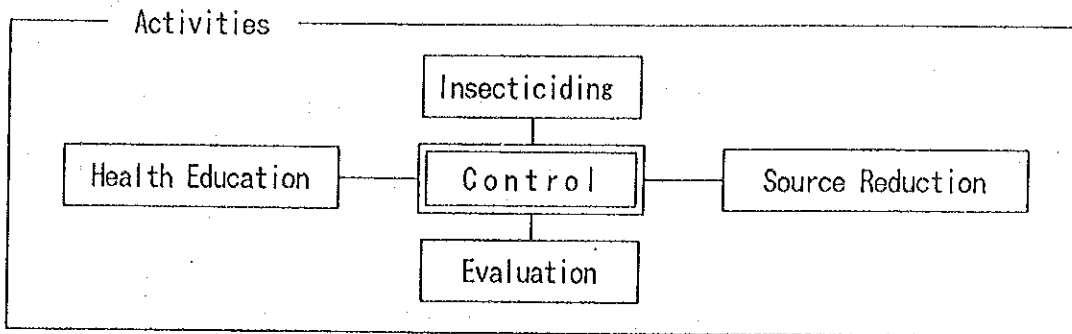
Region	1987		1988		1989		1990	
	No. of Patients	*	No. of Patients	*	No. of Patients	*	No. of Patients	*
(Holo-endemic)								
Tanga	155,892	391	411,164	501	364,349	871	325,490	915
Morogoro	318,605	216	246,419	194	320,728	266	498,612	284
Mtwara	134,418	-	185,522	-	199,125	-	315,238	14
(Hyper-endemic)								
Dodoma	353,807	122	473,916	146	606,785	109	581,282	112
Shingida	5,720	22	9,978	24	8,059	35	5,009	36
Rukwa	44,074	-	199,094	-	309,982	28	144,975	-
Mbeya	578,985	148	671,426	380	718,025	508	774,475	136
Mwanza	425,689	273	661,894	414	538,640	373	760,168	31
Shinyanga	236,338	322	384,108	1039	504,541	248	612,299	71
Tabora	371,692	149	510,560	269	529,726	269	505,375	143
(Meso & Hypo-endemic)								
Arusha	665,193	268	423,127	336	293,530	201	298,534	165
Kilimanjaro	348,596	94	267,387	190	230,533	165	219,004	100
Iringa	23,561	405	40,731	321	16,219	127	14,631	176

* No. of Deaths

(Source : TNG ; Execting Body 1992)

2-3-2 Activities

Strategies for the Five-Year Urban Malaria Control Project were developed in 1988 with the assistance of the experts dispatched from the Government of Japan. With an activity plan created in accordance with the strategies, the project was started in the same year and currently "phase 3" of the project is being carried out. The table below shows the activities carried out during "phases 1-3". After the start of the project, the project had consisted mainly of four activities including the evaluation work of the project, in compliance with the activity plan throughout "phases 1-2". In "phase 3", two new measures were tried in a small area to prevent mosquitoes from coming into houses. They are the applications of impregnated bed nets and polystyrene beads. Also, health education was being disseminated to the public at the same time. As a result, people are now actively participating in the project. For "phase 4", more extensive introduction of those impregnated bed nets and polystyrene beads is considered as part of a new strategy for malaria prevention.



- | | |
|------------------|---|
| Insecticiding | (1) Indoor Residual House Spraying (IRHS)
(2) Ultra Low Volume (ULV) Spraying
(3) Larviciding |
| Source Reduction | (1) Land reclamation
(2) Maintenance & Construction of anti-malaria drains
(3) Afforestation of water pumping trees (eucalyptus) |
| Health Education | (1) Seminar
(2) Distribution of Posters
(3) Audio-visual Education (8m/m, Video etc.) |
| Evaluation | (1) Epidemiological Evaluation
(Blood collection of Primary School Students)
(2) Entomological Evaluation
(Mosquitoes collection and Identification) |

Trial on "Phase 3"

- * Introduction of impregnated bed nets
- * Introduction of Polystyrene beads for the control of CULEX

2-3-3 Project Target Areas

The areas where the project is implemented are Dar es Salaam City and urban area of Tanga Municipality. The table below clearly shows a great difference between the populations of the two project areas.

Dar es Salaam Region, in its three districts all together, has a total population of 1,360,000 inhabitants. On the other hand, Tanga project area has a population of only 187,000. Though it is difficult to ascertain the number of the houses involved in the project, the difference between those two areas in the sizes that are to be dealt with in the project can be estimated from the numbers of families living in both project areas. The number of families living in DSM is 314,000, and TNG 40,000.

(1) Dar es Salaam Region

Kinondoni District

Population : 621,389 (Male 328,417 Female 292,972)

Ilala District

Population : 333,708 (Male 175,142 Female 158,566)

Temeke District

Population : 405,753 (Male 212,366 Female 193,387)

*Total Population 1,360,850 (Male 715,925 Female 644,925)

*Yearly average increase rates of population

1978 - 1988 : 4.8% (2.8% Tanzania Total)

Table 2-11 Kinondoni District

Town and Village		Population			Families	
Name	Form	Total	Male	Female	No. of Families	Persons No per family
Magomeni	Urban	16,944	9,087	7,857	4,361	3.8
Makurumfa	Urban	53,991	28,493	25,498	12,987	4.1
Ndugumbi	Urban	32,736	17,341	15,395	7,933	4.1
Tandale	Urban	58,413	30,738	27,675	13,380	4.3
Mwananyamala	Urban	72,508	37,611	34,897	16,943	4.2
Msasani	Urban	51,293	27,164	24,129	10,839	4.7
Kinondoni	Urban	42,387	22,088	20,299	9,526	4.4
Mzimuni	Urban	23,985	12,606	11,379	5,807	4.1
Kigogo	Urban	21,222	11,530	9,692	4,693	4.5
Mabibo	Urban	45,963	24,389	21,574	10,761	4.2
Manzese	Urban	54,499	28,639	25,860	12,834	4.2
Ubungo	Urban	46,980	25,030	21,950	9,521	4.9
Kibamba	Rural	16,751	8,823	7,928	3,875	4.3
Goba	Rural	4,753	2,479	2,274	1,186	4.0
Kawe	Urban	44,085	23,398	20,687	10,527	4.1
Kunduchi	Rural	22,743	12,632	10,111	5,452	4.1
Mbweni	Rural	2,159	1,217	942	551	3.9
Bunju	Rural	9,977	5,152	4,825	2,493	4.0
Total		621,389	328,417	292,972	143,669	4.3

(Source : Bureau of Statistics 1988)

Table 2-12 Ilala District

Town and Village		Population			Families	
Name	Form	Total	Male	Female	No. of Families	Persons No per family
Pugu	Rural	6,226	3,427	2,799	1,178	5.2
Msongola	Rural	13,351	6,607	6,744	3,058	4.3
Tabata	Urban	18,465	9,721	8,744	3,058	4.8
Kinyerezi	Rural	3,048	1,556	1,492	730	4.1
Ilala	Urban	35,048	17,787	17,261	8,241	4.2
Mchikichini	Urban	15,040	7,835	7,205	3,372	4.4
Vingunguti	Urban	33,690	17,643	16,047	8,731	3.8
Kipawa	Urban	36,910	19,589	17,321	9,282	3.9
Buguruni	Urban	48,247	25,514	22,733	13,198	3.6
Kariakoo	Urban	12,569	6,668	5,901	2,499	5.0
Jangwani	Urban	15,320	8,219	7,101	2,908	5.2
Gerezani	Urban	7,487	3,730	3,757	1,557	4.8
Kisutu	Urban	8,358	4,328	4,030	1,699	4.9
Mchafukoge	Urban	8,547	4,463	4,084	1,604	5.3
Upanga East	Urban	9,807	5,107	4,700	752	13.0
Upanga West	Urban	11,020	5,354	5,666	1,633	6.7
Kivukoni	Urban	5,372	2,887	2,485	781	6.8
Total		333,708	175,142	158,566	75,130	4.4

(Source : Bureau of Statistics 1988)

Table 2-13 Temeke District

Town and Village		Population			Families	
Name	Form	Total	Male	Female	No. of Families	Persons No per family
Vijibweni	Rural	2,557	1,314	1,243	520	4.9
Kibada	Rural	3,003	1,442	1,561	752	3.9
Kisarawe II	Rural	2,821	1,494	1,327	697	4.0
Somangira	Rural	6,730	3,443	3,287	1,596	4.2
Kimbiji	rural	6,465	3,192	3,273	1,457	4.4
Mbagala	Mixed	40,866	21,009	19,857	9,539	4.2
Chamazi	Rural	5,452	2,602	2,850	1,261	4.3
Yombo Vituka	Rural	13,408	7,012	6,396	2,876	4.6
Charambe	Mixed	18,624	9,290	9,334	3,974	4.6
Toangoma	Rural	6,652	3,292	3,360	1,553	4.2
Miburani	Urban	72,892	38,403	34,489	16,793	4.3
Temeke 14	Urban	91,144	47,754	43,390	22,271	4.0
Mtoni	Urban	39,417	20,562	18,855	9,745	4.0
Keko	Urban	42,868	23,261	19,607	10,493	4.0
Kurasini	Urban	26,776	14,510	12,266	5,781	4.6
Total		405,753	212,366	193,387	95,505	4.2
Dal es Salaam		1,360,850	715,925	644,925	314,304	4.3

(Source : Bureau of Statistics 1988)

(2) Tanga Region

Lushoto District

Population : 357,255 (Male 163,610 Female 193,645)

Korogwe District

Population : 217,810 (Male 107,656 Female 110,154)

Muheza District

Population : 231,394 (Male 116,175 Female 115,219)

Tanga District (Municipal)

Population : 187,155 (Male 96,259 Female 91,196)

Pangani District

Population : 37,867 (Male 19,165 Female 18,702)

Handeni District

Population : 251,855 (Male 123,680 Female 128,175)

*Total Population 1,283,636 (Male 626,545 Female 657,091)

*Yearly average increase rates of population

1978 - 1988 : 2.1% (2.8% Tanzania Total)

Table 2-14 Tanga District

Town and Village		Population			Families	
Name	Form	Total	Male	Female	No. of Families	Persons No per family
Majengo	Urban	8,920	4,314	4,606	1,844	4.8
Nguvumali	Urban	13,689	7,222	6,467	2,810	4.8
Chumbageni	Urban	14,154	7,043	7,111	3,110	4.5
Ngamiani Kask.	Urban	5,149	2,614	2,535	1,044	4.9
Ngamiani Kati	Urban	7,040	3,594	3,446	1,310	5.3
Ngamiani Kusini	Urban	8,651	4,369	4,282	1,936	4.4
Usagara	Urban	14,663	7,578	7,085	3,082	4.7
Makorora	Urban	14,626	7,544	7,082	3,222	4.5
Mzingani	Mixed	8,323	4,485	3,838	1,661	5.0
Msambweni	Urban	3,698	1,899	1,799	800	4.6
Mwanzange	Urban	11,733	6,037	5,696	2,911	4.0
Tangasisi	Rural	8,557	4,203	4,354	1,970	4.3
Mabawa	Urban	13,234	6,761	6,473	2,781	4.7
Tongoni	Rural	3,720	1,930	1,790	965	3.8
Marungu	Rural	1,923	959	964	537	3.5
Pongwe	Rural	8,224	4,081	4,143	1,821	4.5
Maweni	Rural	7,874	4,602	3,272	1,653	4.7
Duga	Rural	3,800	1,996	1,804	975	3.8
Mzizima	Urban	7,010	3,655	3,355	1,684	4.1
Mabokweni	Rural	7,036	3,431	3,605	1,596	4.4
Kirare	Rural	3,101	1,527	1,574	751	4.1
Kiomoni	Rural	4,946	2,432	2,514	1,173	4.2
Total		187,155	96,259	91,196	40,722	4.6

(Source : Bureau of Statistics 1988)

2-3-4 Scope of the Activities

(1) Scope of the Activities

The activities carried out as insecticide spraying until "phase 3" include three types of spraying: indoor residual house spraying (IRHS) that remains effective for a long period, ultra low volume space spraying (ULV), and larviciding (LC). IRHS is normally carried out twice a year in DSM: once during the months of February through May, i.e., before the rainy season, and the other during the months of September through December, i.e., before the drizzling season. On the other hand, it is carried out three times a year in TNG. From 50 to 55 thousand houses are sprayed in DSM, and 5 thousand houses are sprayed in TNG. By estimating the number of houses existing in each project area to be a half the number of the families living in each area, the number of the houses sprayed may be estimated to account about a third of all the houses in each project area. ULV is also carried out twice a year, in January and July, the months after each rainy season. LC is carried out weekly throughout the year. The figures below show the areas sprayed in DSM and the TNG.

The evaluation activities of the project are categorized mainly in epidemiological evaluation and in entomological evaluation. For epidemiological monitoring, from six to eight primary schools are selected in each project area, and the blood samples of pupils in the first and second year of those schools are screened every other month, six times a year as ideal screening interval (the number of pupils screened is from 100 to 200 in each school, and their ages are from seven to ten).

For entomological evaluation, changes are studied in the number of mosquitoes collected by the Light Trap method or the Spray Catch method in the houses chosen for the evaluation in each project area.

Health education is offered to primary school children regularly by showing videos and also to adults by giving seminars.

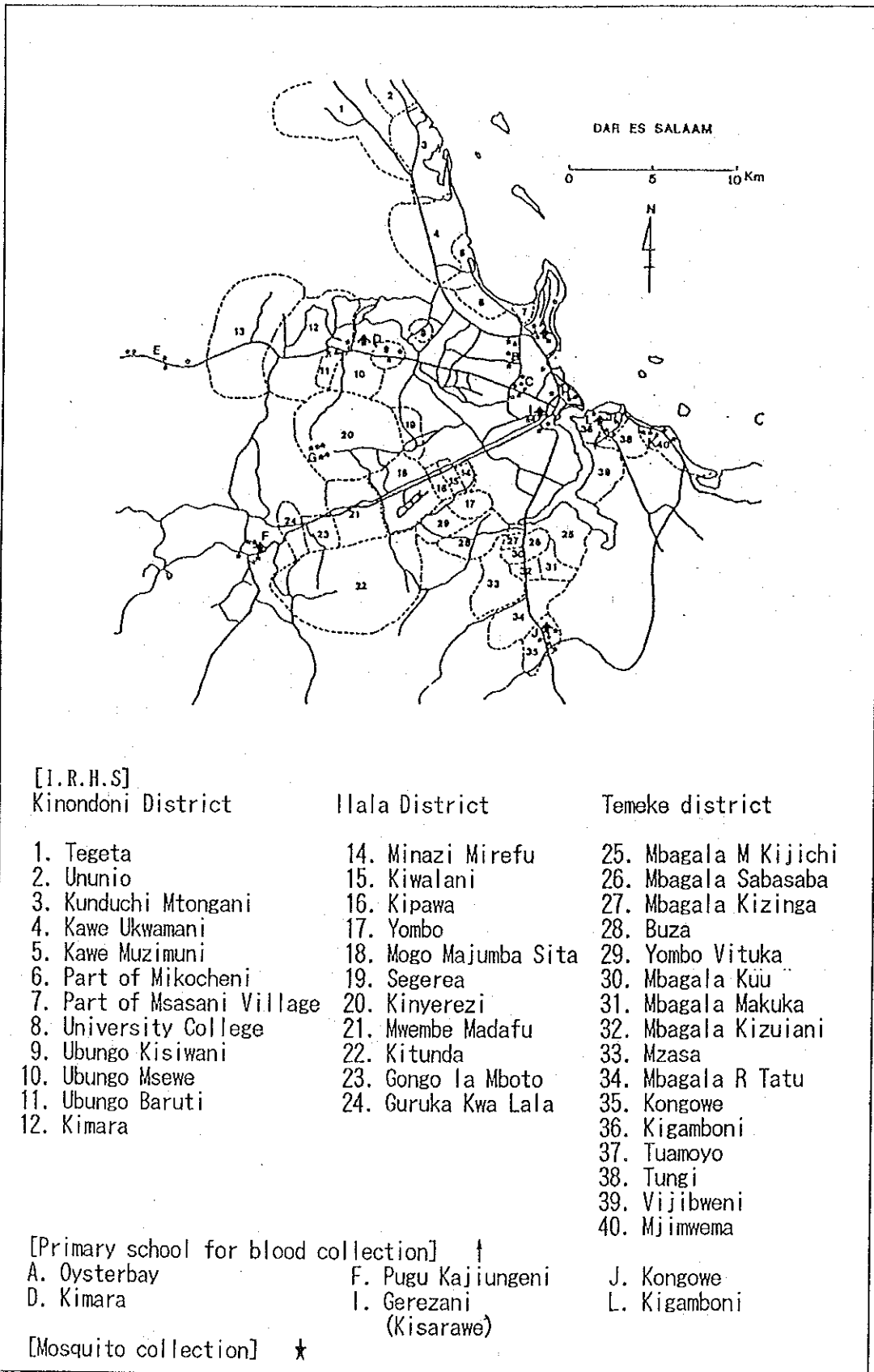


Fig.2-11 DSM: Location of I.R.H.S., Blood collection, Mosquito collection

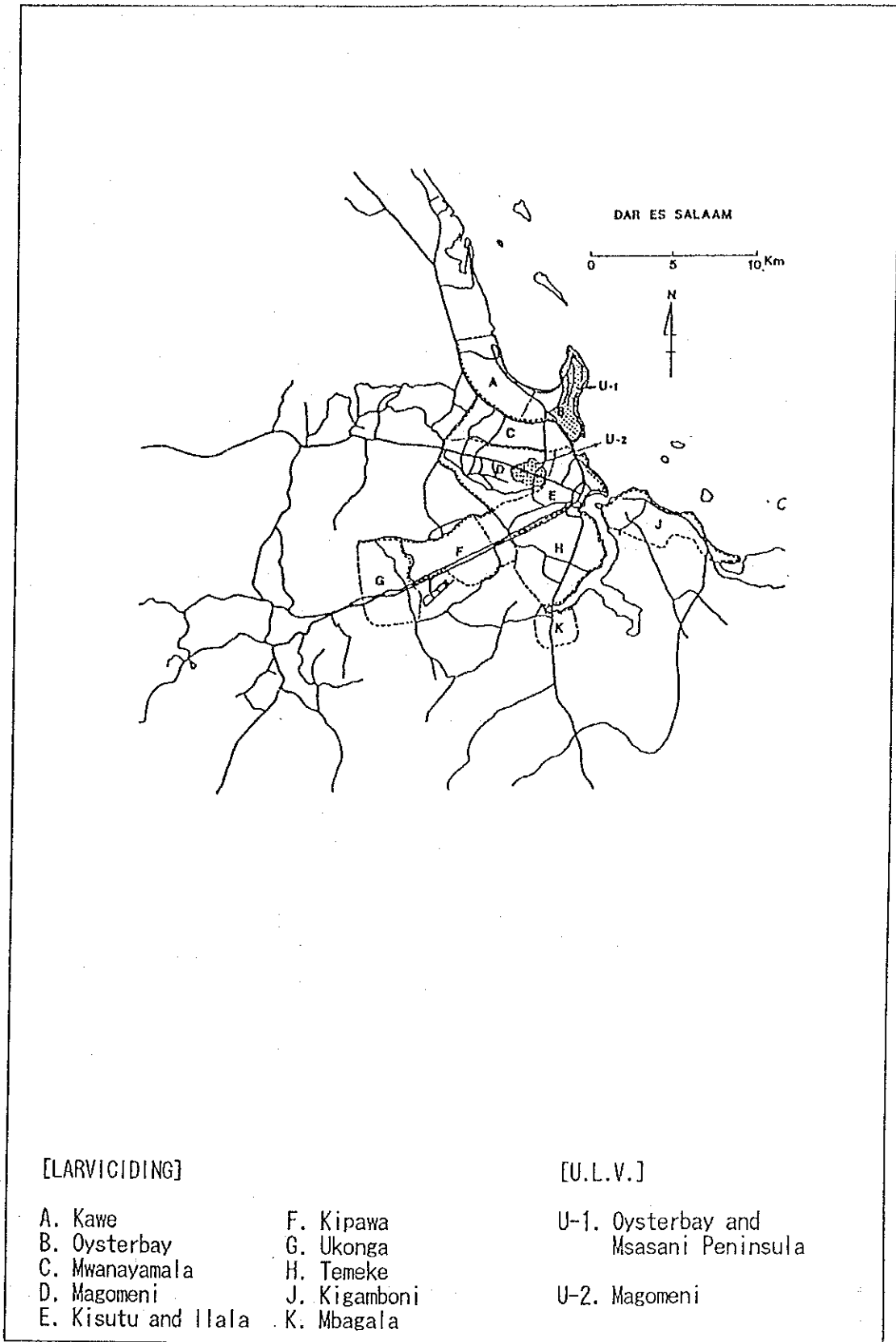


Fig.2-12 DSM : Location of LARVICIDING AND ULV

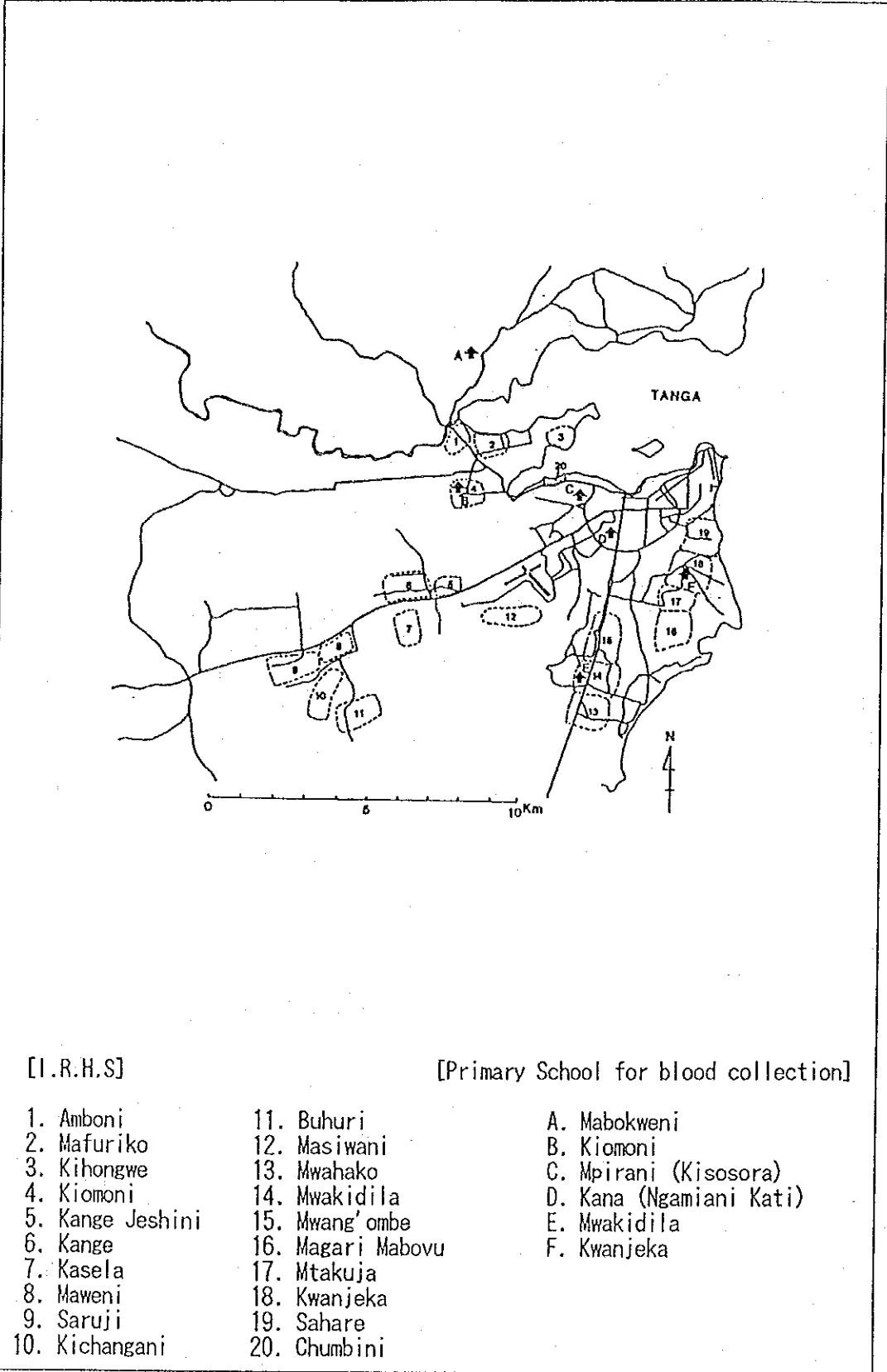


Fig.2-13 TNG : Location of I.R.H.S. and Blood collection

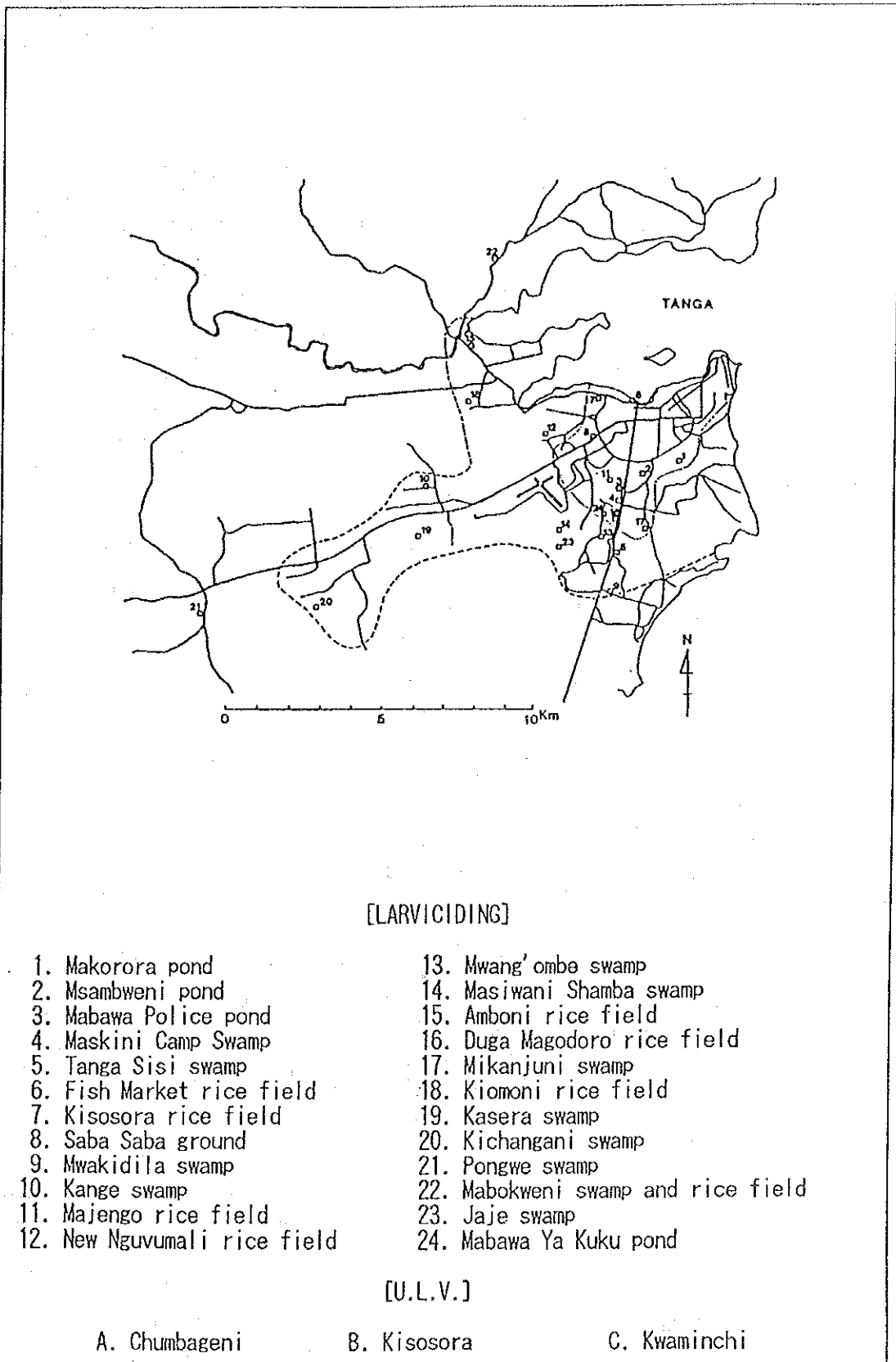


Fig.2-14 TNG : Location of LARVICIDING and ULV

(2) Activity records

1) I.R.H.S

-- DAL ES SALAAM --

(1st. Round) : 1988/ 9~12

(M.W)-MUD WALL (P.W)-PAINTED WALL

Zone	Sprayed Houses	Unsprayed Houses	Coverage (%)	Insecticides Fenitorthion	
				40WP (M.W)	80EC (P.W)
Ilala	11,627	227	97.7	5,300 kg	845.0 l
Kinondoni	10,596	234	97.8	4,142 kg	300.3 l
Temeke	9,125	7,222	55.8	4,140 kg	123.4 l
Total	31,348	7,733	80.2	13,582 kg	1,268.7 l

(2nd. Round) : 1989/ 2~3

Zone	Sprayed Houses	Unsprayed Houses	Coverage (%)	Insecticides Fenitorthion	
				40WP (M.W)	80EC (P.W)
Ilala	5,412	4,195	56.3	2,511 kg	150.5 l
Kinondoni	11,287	1,568	87.8	5,555 kg	719.4 l
Temeke	8,633	381	95.8	5,056 kg	406.4 l
Total	25,332	6,144	80.5	13,122 kg	1,276.3 l

(3rd. Round) : 1990/ 10~12

Zone	Sprayed Houses	Unsprayed Houses	Coverage (%)	Insecticides Fenitorthion	
				40WP (M.W)	80EC (P.W)
Ilala	6,171	234	96.0	3,262 kg	496.9 l
Kinondoni	4,208	278	93.0	8,417 kg	1,574.7 l
Temeke	4,304	675	86.0	2,162 kg	683.4 l
Total	14,683	1,187	92.0	13,841 kg	2,755.0 l

(4th. Round) : 1991/ 2~3

Zone	Sprayed Houses	Unsprayed Houses	Coverage (%)	Insecticides Fenitorthion	
				40WP (M.W)	80EC (P.W)
Ilala	5,081	434	92.0	3,000 kg	760.0 l
Kinondoni	4,313	3,541	54.9	4,680 kg	830.0 l
Temeke	16,653	661	96.0	6,490 kg	246.3 l
Total	26,047	4,636	85.0	14,170 kg	1,836.3 l

(5th. Round) : 1991/9~10

Zone	Sprayed	Unsprayed	Coverage (%)	Insectidices Fenitorthion	
	Houses	Houses		40WP (M. W)	80EC (P. W)
Ilala	28,860	864	96.9	15,000 kg	1,235.0 l
Kinondoni	6,480	424	94.0	5,311 kg	212.0 l
Temeke	25,683	120	99.5	10,082 kg	518.8 l
Total	59,023	1,408	97.7	30,393 kg	1,965.8 l

(Source: DSM Executing Body)

It can be pointed out that it took a lot of time for the spraying activities to get under way in DSM. This impedance or delay was caused from the population concentration of the city and from difficulty in getting workers for the spraying activities. In the latter half of 1990 (i.e., the third operation of spraying activities), the spraying activities really got under way.

The following shows the activities carried out in TNG. In contrast with the operation in DSM the achievement in TNG, i.e., the ratio of the number of the houses really sprayed to the number of the houses planned to be sprayed is reportedly from 70 to 80%. Spraying activities are carried out twice or three times a year continually, and now (as of February, 1992) the tenth spraying activities have been carried out.

- T N G -

Round		I	II	III	IV	V
Spraying Period		9 - 12 1988	2 - 3 1989	9 - 12 1989	2 - 3 1990	7 - 8 1990
Number of Sprayed Houses		4,168	5,075	4,352	3,654	2,569
Insecti-cides	40WP	1,908 kg	3,175 kg	3,024 kg	1,870 kg	2,357 kg
	80EC	57.5 l	68.3 l	88.4 l	77.4 l	66.0 l

Round		VI	VII	VIII	IX	X
Spraying Period		10 - 12 1990	2 - 3 1991	7 - 8 1991	10 - 12 1991	2 - 3 1992
Number of Sprayed Houses		3,062	2,254	3,477	1,994	
Insecti-cides	40WP	4,038 kg	2,928 kg	3,446 kg	2,900 kg	kg
	80EC	83.0 l	73.5 l	78.0 l	72.0 l	l

(Source : TNG Executing Body)

2) ULV

- DSM -

Year	Round	Month	Region	m ²	Insecticides (Pesguard)	Popula- -tion
1988	1st. round	unknown	Oysterbay Wailes Chang'ombe	un- -known	820 l	unknown
	2nd. round	unknown	Oysterbay Wailes Chang'ombe	un- -known	520 l	unknown
1989	1st. round	2 ~ 3	Oysterbay Magomeni	5.8	135 l	76,232
	2nd. round	8 ~ 9	Oysterbay Magomeni	5.8	382 l	56,993
1990	1st. round	1 ~ 2	Oysterbay Magomeni	30.0	500 l	56,993
	2nd. round	6 ~ 7	Oysterbay Magomeni	30.0	520 l	56,993
1991	1st. round	1 ~ 2	Oysterbay Magomeni Kariakoo	40.0	760 l	84,882
	2nd. round	8 ~ 9	Oysterbay Magomeni Kariakoo	40.0	800 l	84,882
1992	1st. round	1 ~ 2	Oysterbay Magomeni Kariakoo Gerezani	44.0	880 l	84,882

(Source : DSM Executing Body)

From now on, if successive activities of the Malaria Control Project should be determined in consideration of activity expenses, the strategies of the project must be adjusted so that the IRHS currently carried out will be replaced with the application of impregnated bed nets. Desirably, consideration should be given in combining strategies and in deciding the houses to be included in the project.

2-3-5 Personnel and Employment

Workers are essential part of the project in carrying out the strategies of the Malaria Control Project. As far as DSM is concerned, 800 people are currently engaging themselves in this Five Year Project as municipal employees. At the start of the project, only about 240 municipal employees were available for the project activities, so the city hired nearly 200 people especially for the project. Since then, about 600 people have been added to the project staff, making the total number of the staffers 800. This increase in the personnel can be seen as a factor that have caused the project to take a long time to get under way. The increased employment may have caused the managing of personnel expenses difficult.

The table below shows the account of the personnel employed for the project in both project areas, at the start of the project and at present.

In TNG, personnel necessary for the project was almost secured at the start of the project. There were a total of 173 people, including 75 for spraying insecticide, 42 for source reduction, and 13 as drivers. However, the number of the personnel has been reduced a little since the start of the project. There is concern that there may exist some difficulty for securing enough budget for the project to keep the sufficient number of personnel.

Table 2-15 DSM Staff Allocation and Scale

Occupation (tsh.)	Salary/Month	1988/89	Current Number
PROJECT MANAGER	10,500	1	1
SENIOR HEALTH OFFICER	-	1	-
PUBLIC HEALTH ENGINEER	7,000	1	2
MEDICAL ASSISTANT	6,000	1	2
HEALTH OFFICER	6,000	5	8
LABORATORY TECHNICIAN	5,500	3	2
SUPPLY OFFICER (STORE)	6,000	5	2
HEALTH ASSISTANT (SUB-DEPOTS)	5,000	16	18
PLANT OPERATOR	4,500	2	3
DRIVER	4,000	30	24
MASON	3,500	1	5
REGISTRY ASSISTANT	4,500	2	4
TYPIST	5,000	3	3
MESSENGER	3,500	1	1
MALARIA ORDERLIES (SPRAYMEN)	3,500	326	625
OTHER WORKERS (SOURCE REDUCTION AND EVALUATION)	3,500	18	100
T o t a l (per month)	2,897,500	416	800

(Source : DSM Executing Body 1992)

Table 2-16 TNG Staff Allocation and Scale

Occupation (tsh.)	Salary/Month	1988/89	Current Number
PROJECT MANAGER	8,000	1	1
ENTOMOLOGIST & SOCIOLOGIST	-	1	-
VECTOR CONTROL HEALTH OFFICER	8,000	2	1
HEALTH EDUCATIONIST	-	1	-
HEALTH OFFICER	8,000	2	2
PUBLIC HEALTH ENGINEER	8,000	1	1
HEADMAN	5,000	2	2
SUPERVISORS	4,000	3	16
SUPPLY OFFICER (STORE KEEPER)	4,000	2	2
TYPIST	5,000	1	1
COMPUTER OPERATOR	4,000	2	2
PHOTOCOPY/DUPLICATING	4,000	1	1
OFFICE ATTENDANT	5,000	1	1
DRIVER	4,000	13	18
TURNBOYS	4,000	3	5
LABORATORY TECHNICIAN	5,000	1	1
LABORATORY ASSISTANT	5,000	1	1
LABORATORY ATTENDANT	4,000	6	12
SPRAYMAN (IHRS & DOMESTIC CONTROL)	4,000	75	45
SPRAYMAN (LARVICIDING ANOPHELENES CONTROL)	4,000	5	8
SOURCE REDUCTION (DRAINERS)	4,000	42	21
HEALTH ASSISTANT	4,000	1	3
VEHICLE MECHANICS	4,000	3	7
ENTOMOLOGIST	4,000	3	7
T o t a l (per month)	658,000	173	158

(Source : DSM Executing Body 1992)

2-3-6 Present Condition of Materials and Equipment

The following describes the conditions of the materials and equipment procured for "phase 1-3".

(1) Inventory of Insecticides

The amounts of the insecticides listed in the table below can be calculated from the data of the activities described in Section 2-3-4. As for the IRHS, the sixth spraying operation is carried out in DSM, and the tenth spraying operation in TNG this year (the months of February and March, 1992). Fenitrothion 40% WP was not procured for "phase 3", so it will be used up this year. On the other hand, Fenitrothion 80% EC, which is used for the IRHS, remains in inventory in a large amount. Since there are not many painted walled houses, which are to be sprayed with this insecticide, the amount planned in the beginning of the project is considered to have been too much. Much inventory is also seen for Pyrethroid EC, which is used for the ULV, and for Fenitrothion 50% EC, which is used for the LC. The amounts planned for those insecticides in the beginning have not been consumed in the project yet. Permethrin 10% EC is the one used for the impregnated bed nets, so it will be consumed in correspondence with the planned distribution of impregnated bed nets.

Insecticides	Procurement			Balance
	Phase 1	Phase 2	Phase 3	
Fenitrothion 40WP (kg)	D 80,000 T 10,000	90,000 17,000	- -	15,420 kg (514 Carton) 3,879 kg (125 Carton)
Fenitrothion 50EC (l)	D 14,400 T 5,400	18,900 7,200	9,000 3,500	10,080 l (504 Drum) 7,280 l (373 Drum)

Insecticides	Procurement			Balance
	Phase 1	Phase 2	Phase 3	
Fenitrothion 80EC (1)	D 22,000 T 2,500	22,800 3,700	11,000 1,500	16,740 ↓ (837 Drum) 7,000 ↓ (350 Drum)
Pyrethroid EC (1)	D 2,900 T 1,000	2,500 1,000	3,000 1,000	2,560 ↓ (128 Drum) 500 ↓ (25 Drum)
Permethrin 10%EC (1)	D - T -	- -	1,000 500	880 ↓ (44 Drum) 500 ↓ (25 Drum)

(2) Condition of the Insecticide Spraying Equipment

Spraying equipment, which is used for spraying insecticide, includes sprayers and atomizers, and they are considered as semi-consumables. Operational and maintenance instructions of the equipment are given to the workers. However, if the frequency of its use is considered, the equipment should be renewed at every two years. For the activities carried out currently, the sprayers procured for "phase 3" are mainly being used.

Equipment	Procured Quantity			Number of operable Balance
	Phase 1	Phase 2	Phase 3	
Hand Compression sprayer	D 580	70	408	530 Set
	T 60	30	50	60 Set
ULV Applicator (truck mounted)	D 3	-	1	2 Set
	T 1	-	1	1 Set
Hand Atomizer	D 220	20	-	193 Set
	T 15	10	-	15 Set

(3) Vehicles and Construction Machinery

A study has been carried out to find out the functioning of the vehicles and construction machines allocated for the project. A check-up has been conducted to find out whether those vehicles and machines are functioning or repairable. Since the maintenance system of the vehicles and machines has come to be operational recently, those vehicles and machines are expected to be efficiently used from now on. Concerning the distribution of impregnated bed nets and polystyrene beads, which are to be introduced for "phase 4", it is necessary to determine vehicles for transporting those materials are available.

Model	Procured Quantity			Total	Operating vehicles (units)
	Phase 1	Phase 2	Phase 3		
TOYOTA DYNA 2-TON TRUCK	D 5	-	-	5	5
	T 2	-	-	2	2
TOYOTA HILUX DIESEL ENGINE DOUBLE CABIN PICK UP	D 9	2	4	15	13
	T 3	1	2	6	6
TOYOTA HILUX GASOLINE ENGINE DOUBLE CABIN PICK UP	D 9	-	-	9	9
	T 2	-	-	2	2
TOYOTA HILUX SINGLE CABIN PICK UP	D 3	-	2	5	5
	T 1	-	1	2	2
TOYOTA LUND CRUSER 4X4	D 2	1	1	4	4
	T 1	-	1	2	2
TOYOTA COASTER MINI BUS 20 SEATER	D 2	-	1	3	2
	T 1	-	1	2	2
NISSAN DIESEL MOVIE BUN	D 1	-	-	1	1
	T 1	-	-	1	1
NISSAN 6-TON TRUCK	D -	3	-	3	2
	T -	1	-	1	1
NISSAN 7-TON DUMP TRUCK	D -	-	3	3	3
	T -	-	1	1	1
YAMAHA MOTOR CYCLES 125 cc	D 15	30	-	45	42
	T 5	5	2	12	11
KOMATSU WHEEL ROADER (SMALL) WA-120-1	D 2	-	1	3	3
	T 1	-	-	1	1
KOMATSU WHEEL ROADER (LARGE) WA-380-1	D 2	-	1	3	3
	T 1	-	-	1	1

(4) Others

Polystyrene beads and impregnated bed nets are the materials introduced for a trial use in "phase 3". Those materials are applied for the preparation of the implementation of new strategies for the "maintenance" stage of the project. The use of those materials has been already started in a small scale to see their effectiveness. However, at the time of the field study executed by the basic design study team, the work of introducing those materials was still at a stage of selecting areas for their distribution.

Equipment Name	Procured Quantity			Balance
	Phase 1	Phase 2	Phase 3	
Polystyrene beads	D -	-	10	9.75 ton
	T -	-	5	5.00 ton
Bed net single size	D -	-	2,000	790 pcs
	T -	-	1,000	1,000 pcs
Bed net double size	D -	-	2,000	1,530 pcs
	T -	-	1,000	1,000 pcs
Bed net family size	D -	-	1,000	503 pcs
	T -	-	500	500 pcs

(1) Insecticide Spraying Operation

a. Indoor Residual House Spraying (IRHS)

IRHS has been a central strategy for malaria control not only in this project but also in other projects since the implementation of the Malaria-Eradication Programme, which had been carried out in the past with assistance of WHO. Insecticide spraying is a good strategy for the "attack" stage in the fight against malaria. It seems that the staff has gradually improved their skills of spraying insecticide through this project, and the spraying carried out by them is now really effective in lowering the morbidity of malaria. However, for "phase 4" the areas to receive IRHS should be redetermined in combination with the distribution plan of impregnated bed nets in order to carry out the IRHS operation more effectively.

b. Larviciding (Larviciding)

Currently, very large areas are receiving larviciding, and the selection of those areas to receive the spraying changes with the changes of the climate, e.g., from a rainy season to a dry season. The LC spraying operation is carried out systematically throughout the year even though it is difficult to carry out this spraying operation with thoroughness because of this very transitory nature of the areas to be sprayed. The effectiveness of this spraying operation is seen not only in the areas where it is executed in combination with the IRHS but also in the areas where only LC spraying is carried out. For the "phase 4", the use of conventional insecticides should be reduced gradually in consideration of possible incidence of water pollution from those insecticides. Instead, an insect growth regulator (IGR), a chemical agent to interfere with the development of larvae without affecting non-target fauna, should be introduced for application in drinking water reservoirs, rice fields, etc.

c. Ultra Low Volume Space Spraying (ULV)

It is surprising that the staffs of both DSM and TNG have learnt ULV spraying technique that requires systematic mobility and intuition, though its effectiveness against malaria is doubtful. However, ULV spraying operation appeals very much to the people because it is effective for suppressing "culex", which are not vectors of the parasite causing malaria. Therefore, the operation should be valued for promoting public relations. Besides, ULV spraying is effective as an emergency measure for preventing the spread of yellow fever, so the operation can be appraised meaningful as an exercise for that purpose.

(2) New Measures Tried in "phase 3" of the Project

a. Polystyrene Beads

Polystyrene beads were applied as one of the measures to replace the use of insecticides. The use of the beads is very easy. When the beads are boiled in hot water, they swell to acquire a volume thirty-fold of their original. After those swollen beads are taken out of the hot water, they are thrown into pits of sewage to cover the surface of the sewage and thereby to choke the larvae living in the pits. The result is the suppression of "culex". The use of the beads appealed to the people when they were used as trial. The extensive application of the beads planned in "phase 4" and the analysis of results coming out therefrom are indispensable for the strategy against the emergence of "culex" because suppressing the emergence of "culex" will help achieve the people's cooperation when the project enters into the "maintenance" stage. The effectiveness of the beads has been proven in the data collected in TNG (refer to Table 2-17), in which a rapid decrease is seen in the development of imagoes in 12 hours, and no larva generation is seen after the application of those beads. However, the effectiveness of the beads may differ if they are applied at different sewage treatment facilities. There is still a need for an experiment to be conducted in different conditions.

Table 2-17 Comparing Number of Larvae and Adult Mosquito Catch before and after Application of Polystyrene Beads

Pit NO.	Total Larvae per Pit		Total Adult Mosquito	
	Before application	After application	Before application	After application
1	151	0	24	7
2	179	0	25	4
3	169	0	42	0
4	185	0	31	1
5	197	0	31	2
6	160	0	42	0
7	150	0	48	2
8	178	0	41	0
9	184	0	37	1
10	159	0	39	0
11	158	0	47	0
12	164	0	35	0
13	190	0	49	1
14	239	0	38	0
15	144	0	43	0
16	145	0	47	0
17	161	0	42	0
18	169	0	21	0
19	194	0	40	0
20	129	0	37	0
21	162	0	31	0
22	164	0	45	0
23	156	0	31	0
24	156	0	26	1

(1991/DEC. DSM/TNG MALARIA CONTROL PROJECT - TECHNICAL MEETING)

b. Impregnated Bed Nets

The trial use of impregnated bed nets conducted in "phase 3" of the project was done very efficiently through the Chama Cha Mapinduzi (CCM), which is a nationwide political organization. A study of the people's interest in impregnated bed nets and explanations of their effectiveness were conducted before the distribution of the nets, so the trial was implemented very successfully. Good results were seen not only against mosquitoes but also against bedbugs, which excited or pleased the people in having those impregnated bed nets. Permethrin, which is used to soak those nets every six months, does not have much adverse effect for the human body in contrast with conventional insecticides. Starting from this phase of the project, IRHS should be gradually reduced by introducing impregnated bed nets in replacement. In "phase 3", impregnated bed nets were distributed to the people free of charge. However, part of the cost of the impregnated bed nets that are distributed from now on should be collected from the people receiving those nets so that the maintenance of the nets distributed may be easily carried out or new nets can be purchased with the collected funds (refer to the annex titled "Proposals for Managing Bed Net Distribution").

(3) Environmental Improvement

(Measures to Reduce the Mosquito-breeding Sites)

Activities for environmental improvement are mainly targeted at repairing drainage canals, filling up ponds and planting eucalyptus at marshes. People are actively participating in those activities. The activities seem to have progressed to a stage of being executed independently by the Tanzanian side alone from the technical aspect. Therefore, it is essential to secure funds enough to cover the personnel salaries and the cost for repairing vehicles used for those activities. Also, cooperation should be further promoted among the departments of the municipalities involved in the project in order to prevent puddles from forming in the areas where gravels have been taken out as well as in salt fields. Cooperation should be promoted also to construct the drainage connection of each houses to a network of sewage treatment as well as to provide the municipalities with scavenger vehicles.

(4) Health Education

The anti-malarial health education that has been offered through showing posters and video tape at local meetings is gradually coming to show its effect. This health education has been mostly offered to the public through a specialized staff or an "education" group. However, it is necessary that opinions or suggestions are taken in from among those who have acquired a high level of health consciousness. Then, in response to those suggestions, information should be fed back or reflected to the people in a suitable way. For this purpose, training should be offered to promote health education not only to the "education" group but also to the leaders of the groups that carry out spraying operations or distribute impregnated bed nets so that smooth communication will be kept with the people, informing them of the effect or results of the project.

(5) Epidemiological and Entomological Evaluation

a. Epidemiological Evaluation

Figs.2-15 and 2-16 show the transition of the incidence of malaria in six areas of DSM from September, 1988 to October, 1990. The incidence of malaria in Kimara, which area has been receiving IRHS, has recently reached 15% or less, after having stayed at a little below 30% for half a year following the start of the IRHS operation.

As for Kongowe, an area which has been receiving IRHS and is located farthest from the city center, the incidence of malaria was above 30% from 1990 through 1991 though it had decreased substantially from the original rate of 70% (refer to the bottom portion of Fig.2-15). Possible reasons may be the location of the area, which is located next to areas that are not receiving IRHS and is surrounded by larva-breeding sites.

On the other hand, the decrease, from 70% to 40%, seen in the incidence in Pugu, which is not receiving insecticide spraying at all, may be due to a positive influence gained from its location. Pugu is located close to areas that receive insecticide spraying (refer to the upper portion of Fig.2-15).

In Kiganboni, where insecticide spraying has been carried out in combination of IRHS and LC, the incidence of malaria decreased from above

40% to near 20% immediately after the start of the spraying operations. Since then, it has been further reduced to around 10% (refer to the middle portion of Fig.2-16). Also, in Kisarawe, where only LC spraying has been carried out, the incidence has decreased from 30% to around 10% (refer to the upper portion of Fig.2-16).

Kiganboni and Kisarawe are both located around the bay of Dar es Salaam, facing each other with a distance of 3 kilometers apart, so there is a similarity in their transition patterns of malarial morbidity.

In Oysterbay, where spraying has been carried out in combination of IRHS and LC, the incidence of malaria has stayed at 2 to 3%. It had been very low, 5%, since the start of the spraying operations (refer to the bottom portion of Fig.2-16).

As seen here, a reduced incidence can be observed in any area evaluated in DSM. Even from those limited data, it can be estimated that the incidence of malaria is currently less than 15% in the area surrounded by the areas which receive IRHS, including the exact areas receiving IRHS. The total land area encompassing those areas is 100 square kilometers. For this area of DSM, the Malaria Control Project can be evaluated as successful.

As for TNG, no epidemiological study had been conducted during the initial half year immediately after the start of the spraying operations, so the transition in the incidence of malaria for that period cannot be known. However, since the start of the epidemiological study, a gradual decrease has been observed in the incidence in any area monitored. Particularly, in the following three areas, Kiomoni, Kwanjeka, and Mwakidila, where IRHS has been conducted, the incidence has decreased from 60 - 70% to 20 - 30% (refer to Figs.2-17 and 2-18). There are still many areas whose incidence of malaria is still above 20%. Therefore, epidemiological study results seen in TNG are not so satisfactory as in DSM. This is probably because TNG has not developed so much as DSM as an urban city. The amount of data that have been collected in both DSM and TNG so far is not enough to make a really effective improvement in the strategies against malaria. Desirably, the epidemiological study should be conducted more widely, involving as many primary schools as possible, and an analysis should be made to see the distribution of malarial infection geographically. If this study has to be conducted without any increase in the size of the staff, then it is necessary that the study be conducted to cover more areas with a less frequency than at present.

b. Entomological Evaluation

Mosquito imagoes are periodically collected by the Spray Catch method and Light Trap method. Changes in mosquito concentration observed are very different among the areas where the mosquito collection activity is conducted and are also different between the methods used for the collection. Fig.2-19 shows changes in the numbers of three types of mosquitoes that are collected in six areas of DSM. Some of the results show very small concentrations of malaria vector mosquitoes in some areas, which may be an indication of an ineffective study or mosquito collection. It may not be accurate to make an evaluation from those results, on the effect of the measures that have been conducted for malaria control against those mosquitoes. However, the concentration of anopheles, vectors of the parasite causing malaria, is high in both Pugu (refer to the parts indicated with letter "F" in Fig.2-19), which is located close to some of the areas receiving IRHS, and Kongowe (refer to the parts indicated with letter "J" in Fig.2-19), which is located next to some of those areas that do not receive any spraying. Those data help indicate an interrelationship between the concentration of malaria vector mosquitoes and the morbidity caused by malaria.

On the other hand, the concentration of "culex" is high in the areas where a sewage system has been developed, and it is low in the surrounding of the areas that receive insecticide spraying. It seems that those mosquitoes have, each, its distinct habitat. This difference in their habitats can be a key factor in planning strategies for malaria control. The area covered by the entomological study should be expanded as in the case of the epidemiological study, and the distribution or location of larva-breeding sites should be searched and ascertained in detail.

Since this project has been achieving good results in reducing mosquitoes, it is becoming difficult to collect malaria vector mosquitoes for evaluation purpose. From "phase 4", the study of mosquito larvae can be better conducted than the study of mosquito imagoes because IGR, a chemical to interfere with larva development, is planned to be introduced. IGR is going to reduce the population of adult mosquitoes still further.

When the use of IGR becomes routine, water collected from each mosquito-breeding site should be biologically examined at a laboratory to see the effectiveness of the IGR application.

Fig. 2-15 DSM : Village Malaria Infection Rates of Primary School students

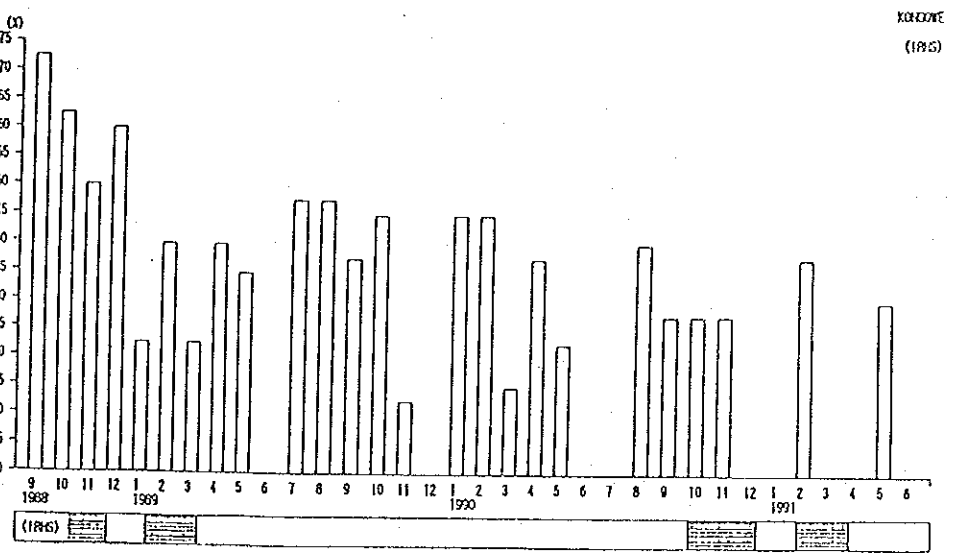
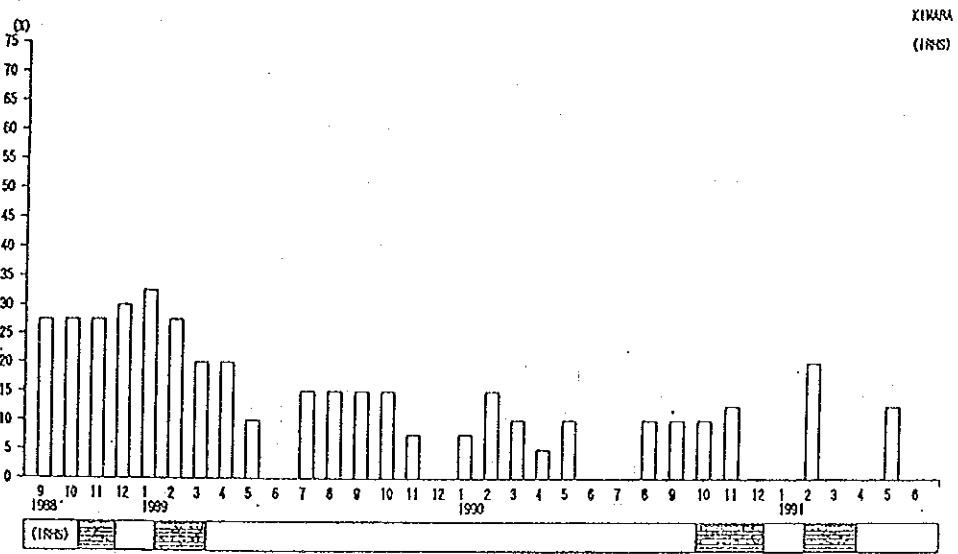
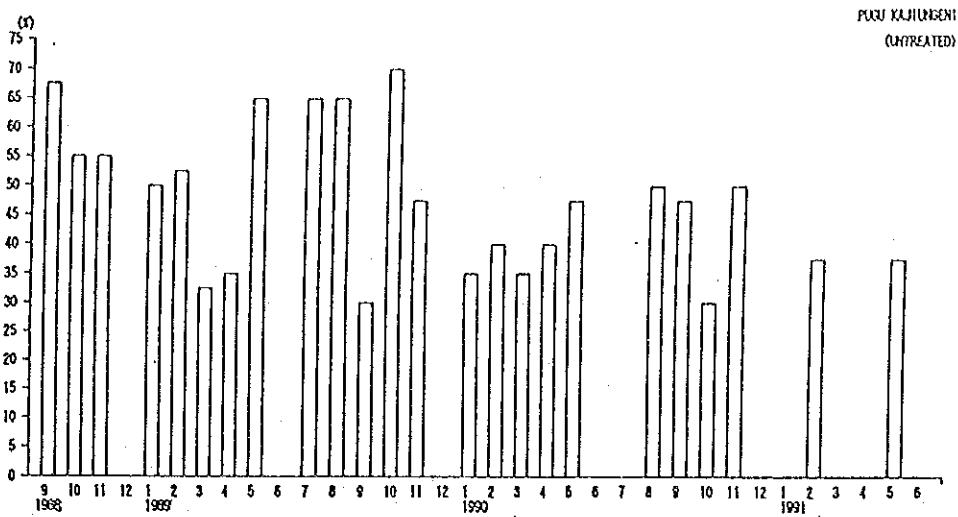


Fig. 2-16 DSM : Village Malaria Infection Rates of Primary School students

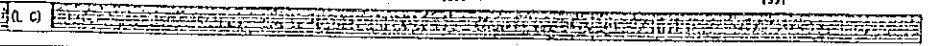
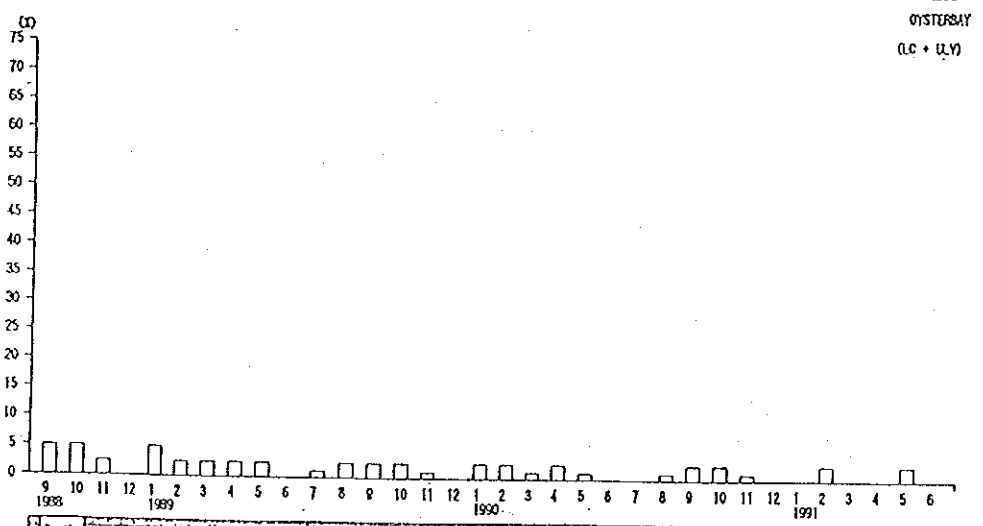
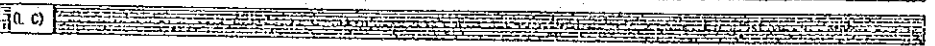
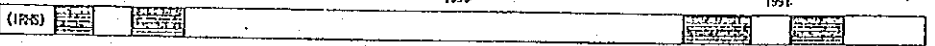
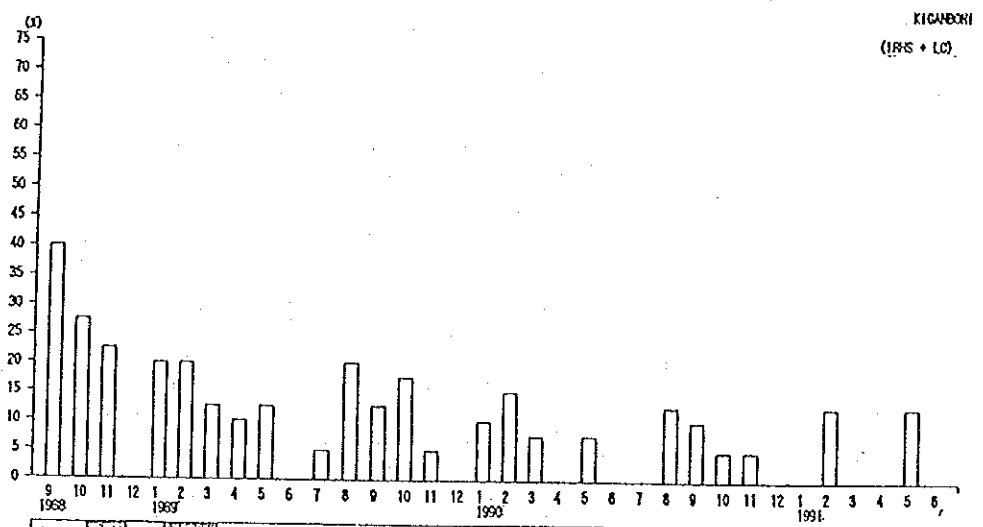
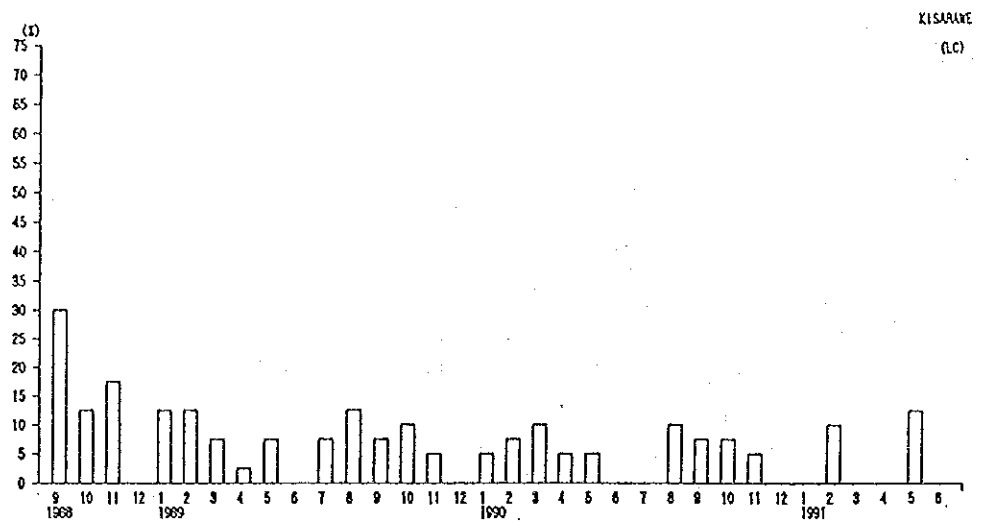


Fig. 2-17 TNG : Village Malaria Infection Rates of Primary School students

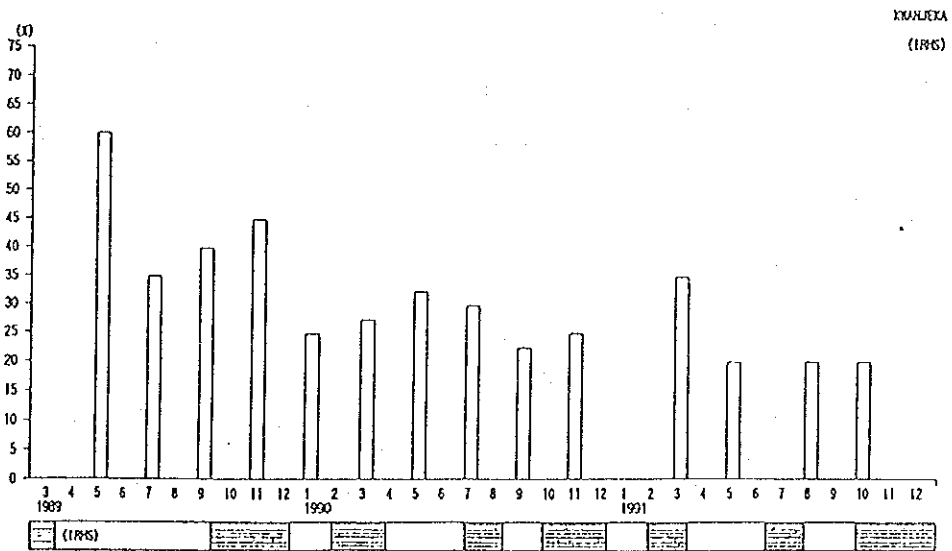
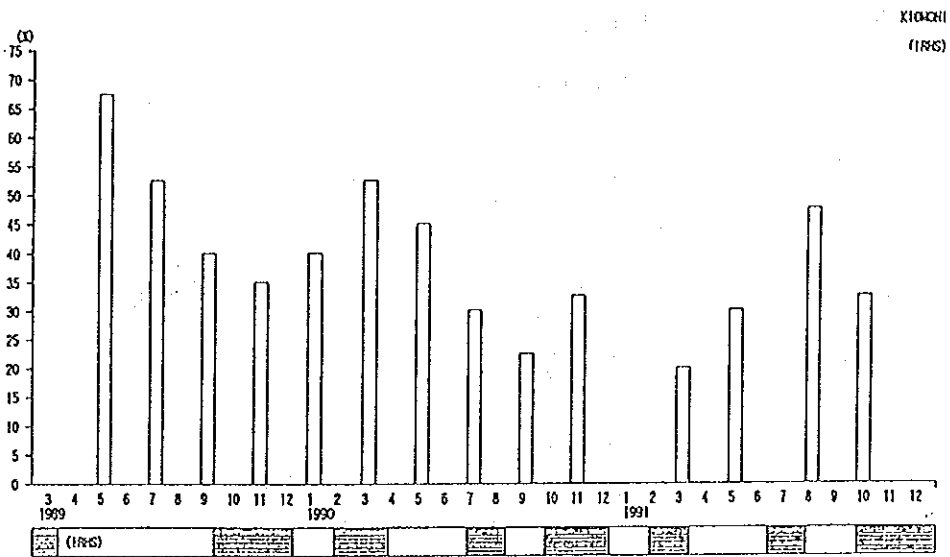
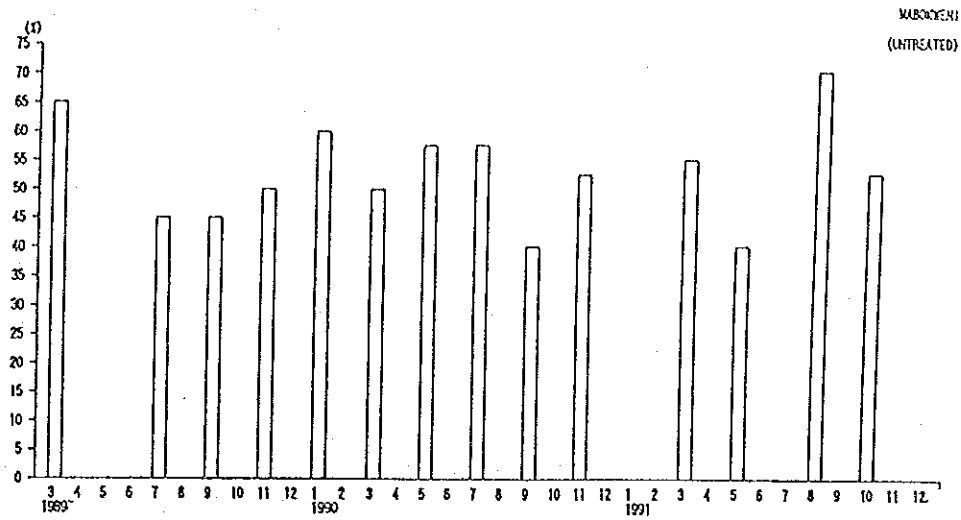


Fig. 2-18 TNG : Village Malaria Infection Rates of Primary School students

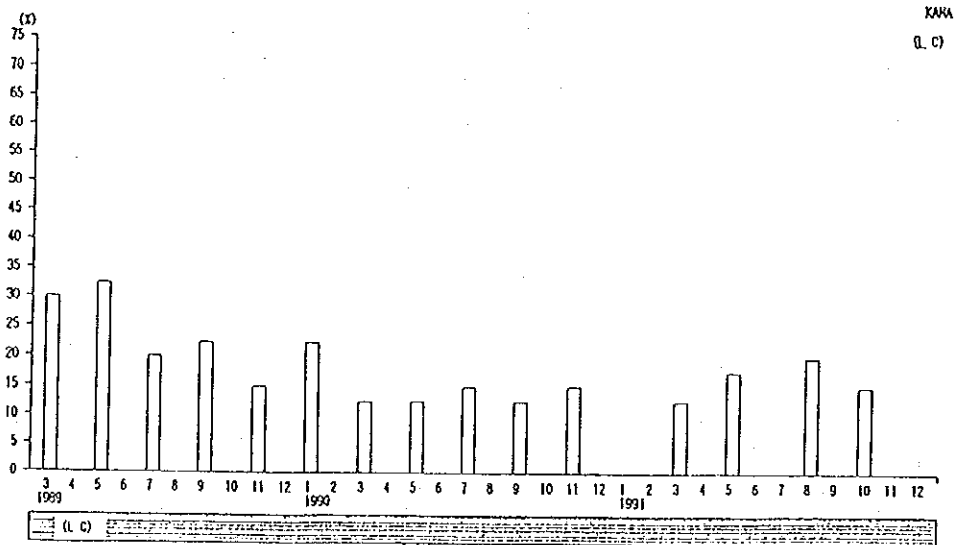
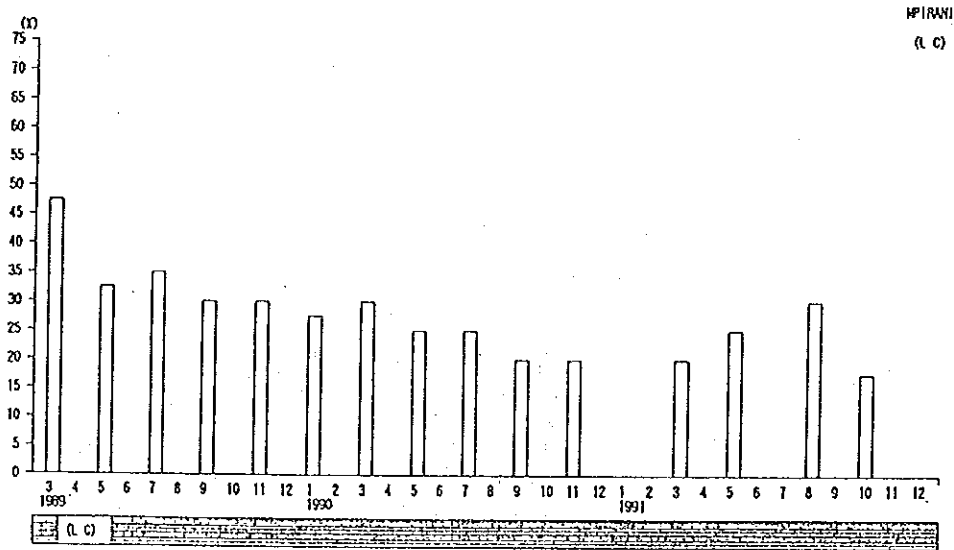
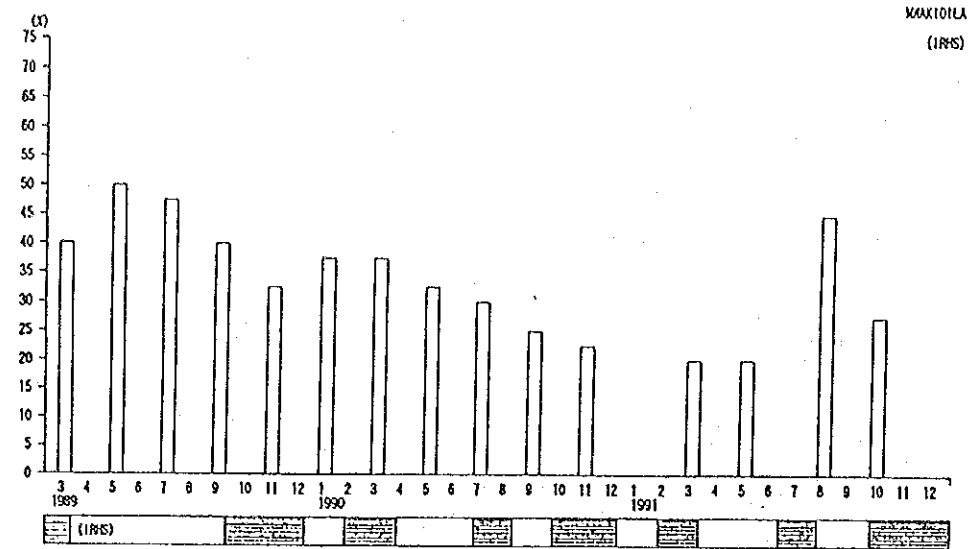
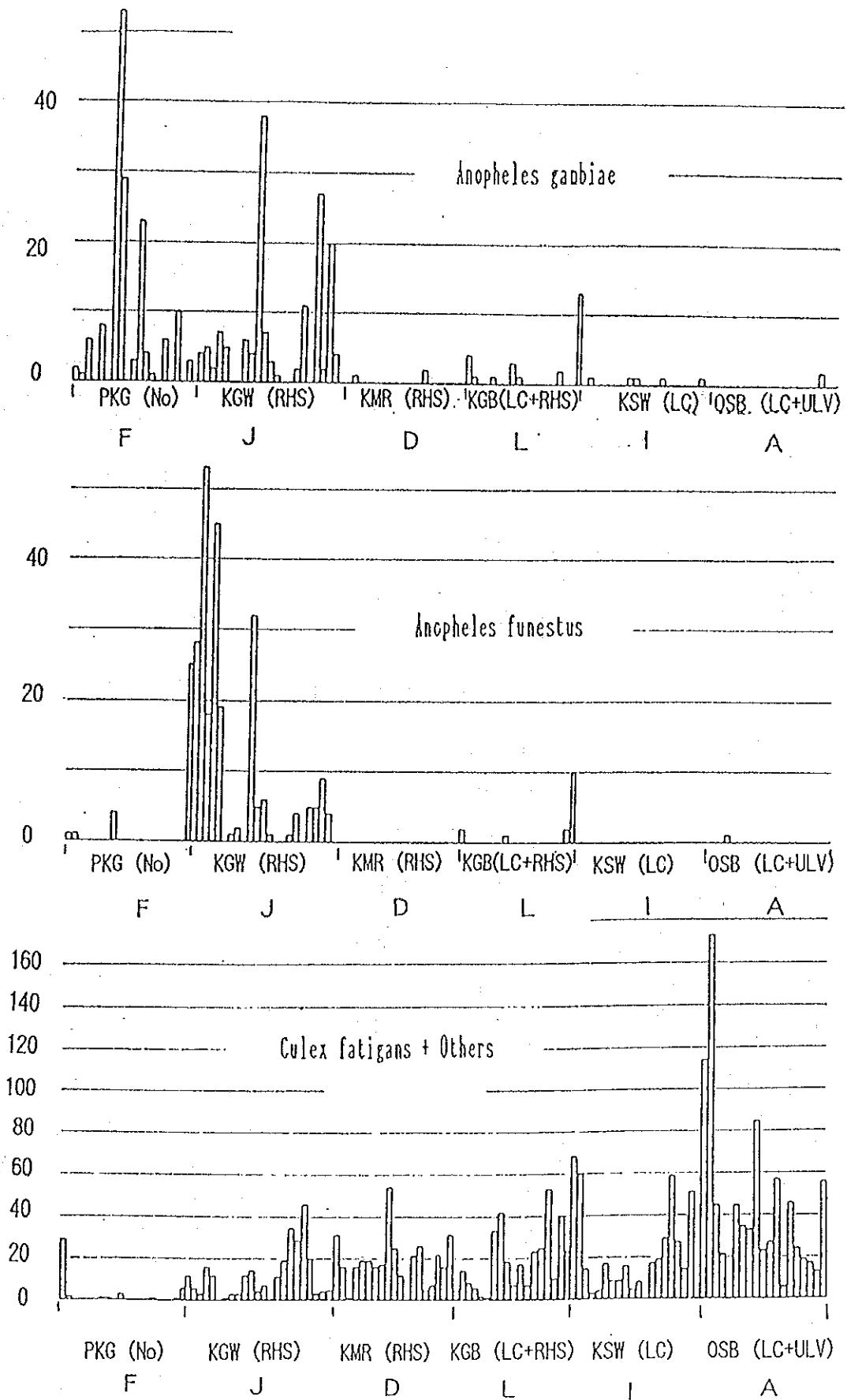


Fig.2-19 DSM : Seasonal Changes of Adult Mosquitoes Density



(6) Technical Assistance

a. Experts

Major factors that have brought this Malaria Control Project into good condition have resulted from the work of the experts dispatched from the JICA. Activity execution plans have been conceived of by the JICA expert since the start of the project, and the layout of the project areas, the strategies, and the methods of monitoring and evaluating in the project have been all determined by them. The Tanzanian staff has been depending on them for instructions, up until this "phase 3". The staff is still dependent in determining and planning new measures at this transition from the "attack" stage to the "maintenance" stage of the project as well as in trying or introducing those new measures determined. Therefore, the role played by the JICA experts is critical at this stage of the Malaria Control Project.

b. JOCV

A member of the JOCV has been dispatched to the department of epidemiological and entomological evaluation in TNG. The work carried out by them has been appreciated by the officials of the municipal staff, so they are amicable to the JOCV member. As for DSM, JOCV member had been dispatched to the department of inventory management at the beginning of the project and another one to the department of epidemiological evaluation till the middle of the "phase 3". The work done by them have been also appreciated there as much as that done by the other member in Tanga. However, it is regrettable that the work of the JOCV member was disrupted and suspended in the middle of the third phase in DSM. The reason for the suspension was that the system of reception for the JOCV member was not well organized there due to the municipal budgetary difficulty. If it is impossible for the city of DSM to improve the reception system, then the dispatch of a JOCV member can be carried out in another way, with consent from the Ministry of Health, in which scheme the ministry becomes an organization to receive a JOCV member and then that member is dispatched from the ministry to the municipal office of DSM.

2-4 Background and Outline of the Project

2-4-1 Background of the Request

Malaria is prevalent almost throughout the land of Tanzania (in 75% of the land). The morbidity and mortality caused by malaria have been ranked high among the diseases in statistics there. From 13 to 15% of the outpatients visiting the medical facilities there are afflicted with malaria.

Measures against malarial infection have been taken since 1983 mainly by distributing medicines organically throughout the country. The measures have attained some results by implementing the first method of WHO to reduce the mortality from malaria. However, malaria has not been controlled yet in DSM and TNG, which are urban cities with populations of 1.5 millions and 200 thousands, respectively. Difficulty of getting cooperation from the people living in those urban areas are impeding those measures to be effectively executed. People living in big cities tend to ignore group activities or cooperation. Thus, those areas have been listed as "holoendemic Areas".

Concerning the conditions that both cities are the centers of social and economic activities of the country as well as the areas of severest malarial infection, the government of the United Republic of Tanzania conceived of a project to eliminate the mosquitoes that carry malaria causing organisms. After the conception of the project, the Government of Tanzania requested the Government of Japan for extending its grant aid assistance for the project. In response, the Government of Japan has sent some experts in the field of malaria control and members of the JOCV since 1986, and the Government of Japan offered the grant aid assistance three times, once in 1987, in 1988 and 1990. The strategy of malaria control carried out using the materials and equipment procured for "phase 3" has come to a transition from the "attack" stage to the "maintenance" stage. A grant aid for carrying out "phase 4" was requested this time, to procure materials and equipment necessary to continue the malaria control activities.

In response to this request, the Government of Japan decided the implementation of basic design study on this request, including the evaluation of the activities carried out during "phases 1-3". The Government of Japan sent a basic design study team to Tanzania in February, 1992.

2-4-2 Outline of the request

The following shows, in general, the contents of the request that has been made by the Malaria Unit of the Ministry of Health.

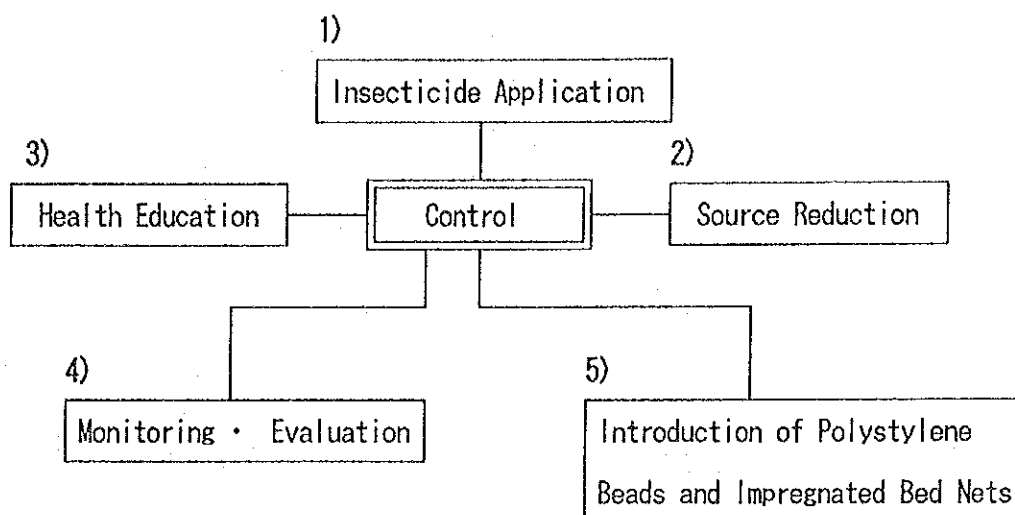
(1) Objectives of This Phase of the Project

- 1) To eliminate the malaria-causing mosquitoes and to reduce the mortality and morbidity from malaria,
- 2) To improve the environment of the project areas and to promote health education, and
- 3) To make proposals for future strategies of the Malaria Control Project.

(2) Executing Bodies

The Ministry of Health manages the project, and the city council of DSM and TNG carry out project activities.

(3) Activity Plan



- | | |
|---|---|
| 1) Insecticiding | (1) Indoor Residual House Spraying
(2) Ultra Low Volume (ULV) Space Spraying
(3) Larviciding |
| 2) Source Reduction | (1) Land reclamation
(2) Maintenance and construction of anti-malaria drains |
| 3) Health Education | (1) Seminar
(2) Distribution of Posters
(3) Audio-Visual Education (8m/m, VIDEO etc.) |
| 4) Monitoring Evaluation | (1) Epidemiological Evaluation
(blood collection of primary school students)
(2) Entomological Evaluation |
| 5) Introduction of Polystyrene beads for the control of CULEX
Introduction of impregnated bed nets | |

(4) Materials and Equipments

- 1) Materials for Vector Control Operation
(Insecticide, bed nets, polystyrene beads)
 - 2) Materials / Equipments for Vector Control Operation
(Insecticide sprayers, protectors for spray men etc.)
 - 3) Materials / Equipments for Source Reduction
(Surveying instruments, shovels etc.)
 - 4) Materials / Equipments for Community Health Education
 - 5) Materials / Equipments for parasitological,
Entomological and sociological Evaluation Activities
 - 6) Vehicles for transporting personnel and materials, spare parts for
maintenance
- * Spare parts involved for maintenance of vehicles procured in previous
years. (phase 1 - 2)

CHAPTER 3 OUTLINE OF THE PROJECT

CHAPTER 3 OUTLINE OF THE PROJECT

3-1 Objectives of the Project

Infectious diseases are still main problems of the health and medical care of Tanzania. As more than a half of the patients visiting the medical facilities are afflicted with infectious diseases, the Ministry of Health places high priority in the promotion of measures against infectious diseases in connection with a plan to improve medical services. Measures against infectious diseases have been being carried out since 1980, toward the year 2000. The ministry considers that measures against malaria are so important that they should be set as a national project. Thus, the ministry has conceived of the National Malaria Control Program, which lasts from 1990 to 1995, and has been promoting it. Because the patients infected with malaria in DSM and TNG together account for more than a half of all the patients infected with malaria throughout the country and since those cities are the centers of political and economic activities, the Government of Tanzania made the Five-Year Urban Malaria Control Programme in 1983. For the implementation of the project, the Government of Tanzania asked the Government of Japan for assistance. In response, the Government of Japan has been sending experts and members of the JOCV to Tanzania for technical assistance since 1987. The Government of Japan has also provided the grant aid assistance three times since 1988 for the Government of Tanzania to procure the materials and equipment necessary for carrying out the project. Since measures of malaria control require continuous and long lasting strategies, the aim of this basic study is to contribute to the Malaria Control Project by assisting the Tanzanian side to procure the materials and equipment necessary for carrying out "phase 4".

3-2 Study and Examination of the Request

3-2-1 Examination of Propriety and Necessity of the Project

It is necessary to take a measure that will prevent the contact between the people and the mosquitoes in "phase 4" of the Malaria Control Project, which is a period during which the suppressed stage of malarial infection must be maintained. A new measure should be applied in addition to the conventional measures of insecticide spraying, which have been a major strategy for the "attack" stage of the project. It has been proven by an epidemiological evaluation that the morbidity from malaria has been reduced to 15 - 20% in some areas from 50 - 70% during the first phase. It is necessary that this Five-Year Urban Malaria Control Project should be continued to improve further the well-being of 1.36 million people living in DSM Region and that of 190 thousand people in TNG. This improvement is possible by reducing the morbidity in the Districts of Kinondoni, Ilala, and Temeke and in the District of Tanga. Also, it is clear that what has been or will be achieved in this Five-Year Project will greatly influence the National Malaria Control Project for the better. Therefore, it is determined appropriate that this project should continue.

3-2-2 Study on the Components of the Project

It is emphasized that the following activities should be carried out, in parallel, during "phase 4": spraying conventional insecticides, source reduction, giving health education, monitoring and evaluating effects of the activities, distributing impregnated bed nets, and introducing polystyrene beads. Impregnated nets showed a remarkable result in the trial use carried out during "phase 3", and the application of polystyrene beads is a measure against "culex". It need scarcely be said that any measures against malaria should deal with anopheles, which are vectors of the parasite causing malaria. However, it is necessary to control "culex" as well because they account for more than 90% of all the mosquitoes propagating in the project areas. It is important that those mosquitoes be suppressed in order to achieve public acceptance and cooperation. The polystyrene beads are going to suppress the breeding of anopheles and to contribute to the promotion of public cooperation.

The applications of those impregnated bed nets and polystyrene beads are expectedly cost-effective, requiring only a small labor cost and a few materials. Both the nets and beads are being applied as trial in "phase 3" and are getting good results. The applications of those nets and beads are also going to make the people malaria conscious. The introduction of those materials is desirable, also because they will play important roles in "phase 4" in maintaining the suppressed stage of malarial infection. Introducing a new measure requires with it a need for consideration of budget and personnel necessary for its implementation, so the introduction of those materials is considered to be very meaningful for promoting independent actions initiated by the Tanzanian side.

In the future, the use of impregnated bed nets is going to replace the spraying of insecticides as the main measure against infectious diseases in Tanzania. However, at present, the Malaria Control Project is in the transition from the "attack" stage to the "maintenance" stage, so it is necessary to carry out those two measures in parallel. IRHS, ULV, and LC spraying should be continued during "phase 4" as well.

Conventional activities are going to be carried out: for reducing mosquito-breeding sites, for promoting health education, and for monitoring and evaluating the activities. Those activities should also contribute to the promotion of community cooperation in the project. At present, seminars are given, posters are distributed, and video movie are shown for health education in DSM and TNG. Though some efforts have been made, e.g., those posters are

used also as calendars to get the people's attention, the activities of health education carried out in both project areas lack continuity, probably because of a shortage of funds and personnel.

3-2-3 Operation Plan of the Project

(1) Personnel Plan

In the Malaria Unit of the Ministry of Health, DSM, and TNG, the personnel engaged in the activities of "phase 3" is going to manage the activities planned for "phase 4" (see Table 2-14 and 2-15). No additional personnel has been planned. As for TNG, there has been a reduction in the staff assigned to the spraying activities and environmental improvement activities from that assigned at "phase 1" because of difficulty in acquiring employees. However, it does not seem to affect the execution of the activities that are going to be carried out in "phase 4".

Table 3-1 Plan of Man Power Allocation

Occupation	DSM		TNG	
	88/89	1992/93	1988/89	1992/92
I.R.H.S	326	625	75	45
Source reduction (Environmental improvement)	18	100	42	21
Epidemiological evaluation Monitoring	10	13	7	9
Entomological evaluation Monitoring	7	11	10	13
Health • Health Education	5	7	5	3
Bed nets • Beds application	-	16	-	8
Material control	5	2	3	2
Driver	30	24	13	18
Others	15	2	18	39
T O T A L	416	800	173	158

(2) Budgetary Plan for the Project

The budget necessary for carrying out "phase 4" is estimated, from the budget allocated for the fiscal year of 1990/1991, as shown in "3-3-4 Administration Plan of Activities". The budget to be allocated is estimated at: about 15 million shillings for the Malaria Unit, about 101 million shillings for DSM, and about 20 million shillings for TNG. Considering the budgets that have been allocated since the start of the Japanese grant aid assistance, those estimated budgets are quite massive. It is about 200% the budget allocated for "phase 3" in the case of DSM and about 400% in the case of TNG ("phase 3" of the project corresponds to the Tanzanian fiscal year of 1990/1991, i.e., the period in which materials and equipment were being procured for "phase 2" with Japanese grant aid assistance). Currently, petitioning for a budget for "phase 5" (1992/1993) is going on. The basic design study team is advocating the importance of securing a budget, especially for the personnel expenses of the project and fuel expenses for the vehicles used because it seems very difficult to secure a budget enough to operate the project smoothly.

3-2-4 Ascertaining the Interrelation of This Project with Other Similar Projects and Other Aid Projects Carried Out by International Organizations

The Ministry of Health of the United Republic of Tanzania had executed a multi-layered strategy for malaria control in six Regions of the country as target area from 1973 to 1979, with cooperation offered from WHO. That strategy offered indoor residual house spraying (IRHS) and activities of larviciding (LC) in rural areas with high malaria infection. It also offered antimalarial drugs to some patients in urban areas. After that strategy against malaria infection was terminated in 1980 because of financial difficulty, the ministry had implemented a test project of small scale environmental improvement for promoting improvement in sanitation and public health as a measure of malaria control from 1984 to 1986 in cooperation with DSM and TNG. This test project also involved the people in the communities of DSM and TNG. After this test project, an educational center whose main purpose was to train health officers to control the vector borne diseases was established in Tanga District in 1989.

Turning to aid programs provided from other international organizations, USAID (the Department of International Development, the U.S.A.) had executed a malaria eradication campaign on the Island of Zanzibar from 1958 to 1968, by carrying out IRHS of DDT in rural areas and LC spraying in urban areas. However, a malarial epidemic reappeared in 1971. By this time, anopheles had acquired resistance against DDT, and the malarial parasite carried by anopheles had also acquired resistance against chloroquine, which is an antimalarial drugs. Under those circumstances, USAID started the Zanzibar Malaria Control Project in 1981, and the project lasted until 1989. In 1991, USAID started a new project which was to last for five years. In this new project, measures are specifically designed to each area which is differentiated by means of stratification (i.e., distinguishing the degree of malarial epidemic in each area) in four Districts in the Islands of Zanzibar and Pemba.

UNICEF, in accordance with its function of improving the health care of mothers and children, is currently carrying out bed net distribution (receiving small payment) to families having children under 5. So far, 20 thousand nets have been distributed in the communities of the Islands of Zanzibar and Pemba. Also, 9 thousand nets have been distributed in Mtwara Region which is in Southern Tanzania bordering with Mozambique.

UNICEF is planning to distribute 85 thousand more bed nets in the areas of both the Islands of Zanzibar and Pemba, as well as in the Region of Mtwara and

Iringa, which is located southwest of DSM.

As described above, while the project of USAID focuses on the activities of insecticide spraying in specified areas of the Islands of Zanzibar and Pemba, the project carried out by UNICEF is focused on promoting the well-being of mothers and children also in specified areas in a similar way as done by USAID. From those data, it is clear that there is no overlapping of this Malaria Control Project with those other similar projects including those aid projects carried out by the above mentioned international organizations, because this Malaria Control Project is targeted at urban areas of DSM and TNG. Therefore, this project which introduces new measures from this coming phase should be continued.

3-2-5 Examination of the Materials and Equipment Requested

The contents requested are necessary for the continuation of the activities of the project in accordance with the conventional activity plan. The items of the materials and equipment requested include many consumables, of which insecticides are main consumables because of their necessity being very high. Appropriate items are determined as follows, after taking into consideration the inventory of the existing materials (the materials procured during "phases 1-3" and still left) and the maintenance ability of the staff of the project.

(1) Materials and Equipment for Malaria Control

1) Conventional Insecticides

The insecticides requested are Fenitrothion 40% WP, 50% EC, 80% EC, Pyrethroid EC, and Permethrin 10%, all of which have been also procured for the previous phases. Those insecticides acquired in "phase 2" will be used up by the end of 1992, and now those acquired in "phase 3" (September, 1991) are coming to be used. The manufacturers of those insecticides guarantee that the effectiveness of the insecticides last for three years after their production. Thus, there will be no problem even if the insecticides acquired in "phase 3" are left into 1993. Fenitrothion 40% WP was not requested at all last time because there was a lot of that stored. At the start of "phase 3", that Fenitrothion 40% WP was in store as a leftover from "phase 2". As for the other insecticides, the amounts requested should be adjusted in consideration of their inventories.

It is a progress seen in inventory management that all the inventory is now managed at Temeke Storage. The capacity of the storehouses there is not enough to store all the materials needed for the project, so some containers are used for storage. So far, there has been no problem in the storage conditions because care is paid to control the temperature and humidity.

2) Insect Growth Regulator (IGR)

IGR is a chemical agent used in this project for a trial use. Fenitrothion 50% EC which has been used until "phase 3", requires much personnel and physical costs even though it is not very effective in suppressing "culex". Moreover, Fenitrothion 50% EC has much risk when applied into the reservoirs of drinking water. On the other hand, IGR prevents the generation of "anopheles" as well as "culex" and even flies by interfering their larval growth or by preventing them from acquiring wings. This IGR is in a granular form and does not affect mammals. It can be thrown onto the water surface without any priming and its effectiveness lasts for a long time. Therefore, the IGR seems to reduce the operational cost for materials and personnel and to suppress the propagation of both "anopheles" and "culex". Reducing "culex" is going to improve the trust of the people in this project because more than 90% of the mosquitoes annoying them are "culex". If the evaluation of the results of this trial use turns out as expected, the IGR can replace all the use of Fenitrothion 50% EC. The IGR is safe, easy to use, and not easily converted to other uses, so it is preferable especially when the communities are involving in the project.

3) Polystyrene Beads

There are many "culex" annoying the people even though they are not vectors of the parasite causing malaria. They easily multiply in the sewage waters around the cities. Research data taken in DSM show that only six out of the 2,000 mosquitoes collected in a room during the night are "anopheles" and all the rest are "culex". The "culex" have a stronger resistance to insecticides than the "anopheles". Even though "anopheles" are exterminated by IRHS, "culex" are not. The people are annoyed with "culex". They may doubt the effectiveness of the Malaria Control Project if the "culex" are left uncontrolled. Measures against the "culex" are important in order to attain the people's understanding and cooperation, which is also essential for the independent future Tanzanian execution of the Malaria Control Project. For this purpose, polystyrene beads are effective in being applied to cover the surfaces of sewage tanks, etc., which are the breeding-sites for "culex". The beads shut out the aeration of the sewage, and the mosquitoes are choked

to death. This is a new method applied in this phase of the project to suppress the propagation of mosquitoes. The method is easy, not requiring any special equipment or protectors, and the polystyrene beads so applied are effective as long as they stay there. The material of the beads is similar to other plastics, so it does not offend the environment. Also, they are cost effective, i.e., a small investment with a large return.

4) Bed Nets

By using bed nets impregnated with an insecticide (Pyrethroid group) having an immediate effect, the contact between the people and the mosquitoes is severed. The mosquitoes landing on the nets are possibly killed as well. This method has been tried also by UNICEF, in the past, applying impregnated bed nets for the protection of mothers and children in a small scale in Tanzania. They are more cost effective than IRHS, and their use will reduce the costs of the project greatly on personnel and materials. Since the trial use carried out in "phase 3" has received a good response from the people, the request made for impregnated bed nets for "phase 4" is quite appropriate.

(2) Materials for the Activities (Environmental Improvement) to manage the Mosquito Breeding Sites

Activities to manage the mosquito breeding sites are carried out throughout the year. Shovels and easily operable survey instrument are requested for this purpose, to fill up swamps and to construct drainage canals. Therefore, this request is judged appropriate.

(3) Equipment for Monitoring and Evaluating Epidemiologically and Entomologically

During the field survey, the basic study team could not ascertain the inventories or conditions of the materials that had been procured for this purpose until "phase 3". The contents of the request for this category

are the same with the past requests, so the quantities of consumables and semiconsumables are determined from the plans and scope of the activities to be carried out. As for non-consumables or durable items, they are eliminated from the request if identical items have been procured for the past phases of the project or if they are determined not necessary. The items are determined also in consideration of activities of future malaria control even after this phase, as well as of the personnel's operating abilities.

As many items of materials and equipment are being procured, the Tanzanian side is paying sufficient care in managing them. Main items are all stored at Temeke Storage. A member of the JOCV worked as an inventory manager at the storage for two years during "phase 2", so the inventories there are managed by booking. This system of inventory management is also applied for the handling or storing of insecticides.

(4) Vehicles

16 vehicles are requested without specifying their models. The requested number of vehicles is judged too much in consideration of the current conditions of the vehicles that have been procured for the previous phases and also of the scope of the activities to be carried out in this phase. Vehicles should be planned for the transportation of equipment and personnel for spraying activities as well as for monitoring and evaluating activities. Moreover, the supply of vehicles should be considered only for the newly introduced activities.

3-2-6 Examination of the Need for Technical Cooperation

The following technical cooperation should be offered in tandem with a grant aid assistance so that the Japanese grant aid assistance to "phase 4" will play an important role in the strategies of malaria control. The technical cooperation should also help in the orientation of those strategies as well as in the realization of a self-reliant Malaria Control Project executed independently by the Tanzanian side.

(1) Dispatch of Experts

Dispatching experts to Tanzania is essential for a smooth execution of the project since those experts play an important role in transferring technical knowhow to the Tanzanian personnel engaging in the project.

(2) Japan Overseas Cooperation Volunteers (JOCV)

Currently, two members of the JOCV are working for the Department of Epidemiological and Entomological Evaluation in TNG. For the continued execution of the project, it is hoped that the assistance of JOCV should be directed to other activities as well, including the activities carried out in DSM.

(3) Training

Training sessions for the personnel engaged in the project are currently being held at the National Institute of Medical Research (NIMR). Also, OJT is being held within the Malaria Control Project. However, it is necessary to have more systematic training programs.

Though it is very difficult to offer them training in Japan, it may be possible to hold training sessions in countries other than Tanzania and Japan. Offering training in such a manner is a matter to be considered not only here, in this project, but also in other projects.

(4) External Evaluation

Currently, technical exchanges with researchers of other countries are actively carried out in the National Malaria Control Programme of Tanzania, and those technical exchanges are playing an important role in the execution of the Malaria Control Project. The "External Evaluation", which has been advocated by Dr. Ichimori, JICA expert, is a meeting for evaluating this project epidemiologically and entomologically, held by the Government of Tanzania, involving hospitals and research centers of Tanzania, research centers of other countries, and international organizations. This meeting ascertains the orientation of strategies for malaria control, so it should be held continually.

3-2-7 Basic Policy of Japanese Grant Aid Assistance

With the above described considerations, ascertainment has been made on the presumable effects and practicality of "phase 4" as well as on the executing capability of the Tanzanian side. Also, the suitability of this phase of the project has been ascertained to make sure for Japanese grant aid assistance to be applied. As a result, "phase 4" of the project has been judged appropriate for its execution by a grant aid assistance from the Japanese government. The outline of "phase 4" of the project is determined as follows by the execution of a basic design study. However, as for items that are to be changed or eliminated from those requested, they are examined in such a way as mentioned in the section "Ascertaining the Contents Requested".

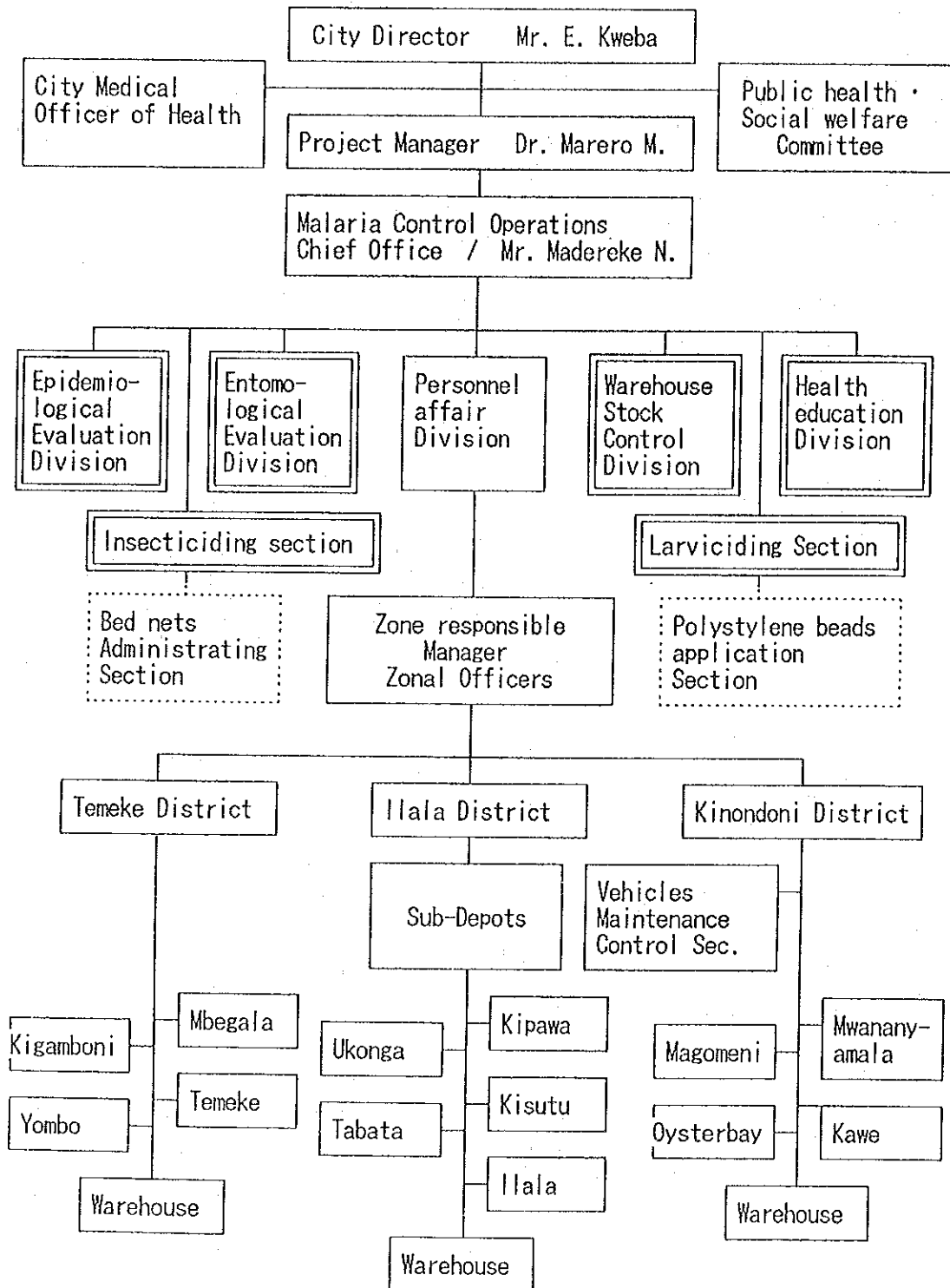
3-3 Outline of the Project

3-3-1 Executing Agency and Managing System

The executing bodies of this project are the Dar es Salaam City and Tanga Municipality. They execute the project under the authority of the Malaria Unit of the Ministry of Health. Therefore, the staff of the project are all employees of both urban municipalities. The Ministry of Health is responsible for planning, coordination, supervision monitoring and evaluating project activities. The staff of DSM and TNG is organized in six departments to execute project activities smoothly.

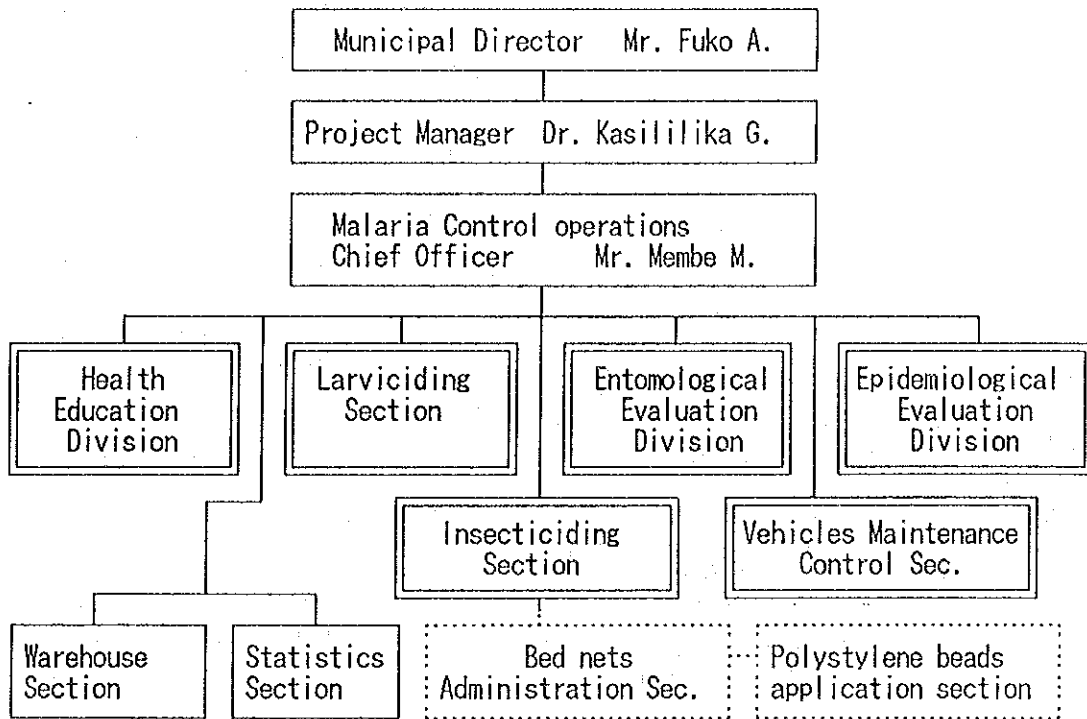
The personnel for "phase 4" is organized as seen in Tables 2-14 and 2-15. The personnel is organized in the same way as for "phase 3". There are 800 staffers in the executing body of DSM, and 158 in TNG.

Fig.3-1 DES Implementation System



(Source : DSM Executing Body)

Fig.3-2 TNG : Implementation System

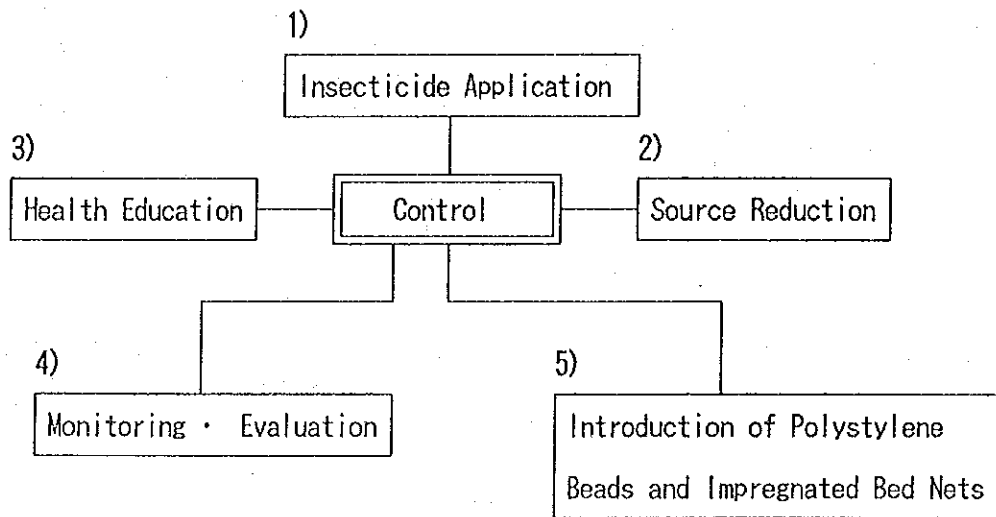


(Source : TNG Executing Body)

3-3-2 Activity Plan

The following are activities to be carried out in "phase 4"(fig. 3-3).

Fig.3-3 Urban Malaria Control Activity



(Source : TNG Executing Body)

The contents planned for each activity are shown in the item 4. Maps are attached to illustrate the plan of the insecticides spraying and the distribution of the impregnated bed nets.

(1) Activities of Spraying Insecticide and of Distributing Bed Nets and Polystyrene Beads

1) Spraying Insecticides

Spraying activities are planned to include: ULV spraying of Pyrethroid solution at the centers of urban areas of DSM and TNG, Larviciding of Fenitrothion 50% EC to eliminate larvae in waters where they breed, and IRHS of Fenitrothion 40% WP and Fenitrothion 80% EC in areas surrounding the city centers.

The areas to receive those spraying activities are: 1 Ward/Branch for ULV, 24 W/B for LC, and 19 W/B for IRHS in DSM and 3 W/B for ULV, 22 W/B for LC, and 8 W/B for IRHS in TNG .

ULV spraying is planned to be carried out for a duration of four weeks in January and July, which periods come after the rainy seasons of Tanzania. LC spraying is planned to be carried out every week throughout the year. IRHS is planned to be carried out twice a year, during the months of February and March as well as the months of September and October, which periods are before the rainy seasons.

2) Impregnated Bed Nets Distribution Plan (Figs.3-6 and 3-9)

Impregnated Bed nets are now being tried in Kibugumo of DSM. For this trial, the distribution of the nets and the work of impregnating the nets with an insecticide are carried out smoothly by help of the CCM, receiving great interest of the people in the project, there. Kibugumo has been selected for the trial because when mosquitoes were collected there by the Spray Catch method and Light Trap method, the ratio of anopheles, which are vectors of the parasite causing malaria, to all the other mosquitoes was higher than in any other area of Tanzania. In "phase 4", the distribution of impregnated bed nets is planned mostly in the areas where IRHS is currently carried out. Effects resulting from the introduction of the nets will be studied. The nets will be distributed to 16 thousand families in DSM and 3.3 thousand families in TNG, each family receiving an average of 1.5 double size nets and 1.5 family size nets as standard receipt.

(DSM)	No. of village	: 7
	No. of families	: 16,000 (5% of total No. of families in DSM)
	Population	: 72,000 (5% of total population in DSM)
(TNG)	No. of village	: 5
	No. of families	: 3,300 (8% of total No. of families in TNG)
	Population	: 15,000 (8% of total population in TNG)

3) Introduction of Polystyrene Beads as a Measure mainly against "Culex"

At the time of procuring the materials and equipment for "phase 3", a trial use of polystyrene beads was carried out in the District of Ilala of DSM. Since 1 kilogram of polystyrene beads can cover one pit, one pit being owned and used by a single family, 20 thousand pits or families in DSM and 10 thousand pits or families in TNG are planned to be covered with the beads supplied for "phase 4" together with those supplied for "phase 3". The main objective of the application of polystyrene beads is to suppress the propagation of "culex" in the urban areas and thereby to achieve the people's respect on the project. The following tables show the areas planned to receive those polystyrene beads.

4) Target Area and Activities

1) DSM

—Kinondoni District—

Ward	Village/Location	Operation					REMARK
		IRHS	LARVI-CIDING	ULV	BED NET	BEADS	
Magomeni	•Makuti •Mapipa		○ ○				En.
Makurumla	•Kagera Mikoroshoni •Kilimahewa •Kimamba •Jongo •Mianzini •Mburahati Barafu •Kisiwani Mburahati •Mburahati NHC •Sisi Kwa Sisi		○ ○ ○ ○ ○ ○ ○ ○ ○				
Ndugumbi	•Ndugumbi •Vigaeni •Ndugumbi Mpakani •Makanya •Bomani •Ndugumbi Mikoroshini Kagera		○ ○ ○ ○ ○ ○				
Tandale	•Kwa Ali Maua •Bwawani •Kijitonyama •Mkunduge •Mtogole •Pakacha •Kwa Tumbo •Mhalitani •Mpakani •Sinza B •Sokoni		○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○				
Mwananyamala	•Mwananyamala Kisiwani •Kambagwe •Kopa •Makumbusho •Minazini •Mbuyuni •Mchangani •Msisiri •Mwinyijuma •Bwawani •Hospitalini	○	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○				En.

Ward	Village/Location	Operation					REMARK
		IRHS	LARVI-CIDING	ULV	BED NET	BEADS	
Msasani	•Msasani	○	○	○			En.
	•Makangira	○	○	○			En.
	•Oysterbay		○	○		○	
	•Mikocheni	○	○	○	○	○	
	•Mikoroshoni		○	○			
	•Masaki		○	○			
	•Bonde la Mpunga		○				
Kinondoni	•Kinondoni		○			○	En.
	•Kinondoni Malongwe		○			○	En.
	•Kinondoni Shamba		○			○	En.
	•Hanasif		○				En.
	•Kisutu						
	•Kinondoni Mjini		○				
	•Mkunguni		○				
	•Upimaji Ramani		○				
Mzimuni	•Makumbusho Mzimuni		○				En.
	•Idrisa		○				
	•Mtambani		○				
	•Mwinyimkuu		○				
	•Polisi Magomeni		○				
Kigogo	•Kigogo B		○				
	•Kigogo Kati		○				
	•Kigogo Mbuyuni		○				
Mabibo	•Mabibo	○	○				
	•Azimio		○				
	•Chuo Cha Usafirishaji		○				
	•Jitegemee		○				
	•Kanuni		○				
	•Majimaji		○				
	•Matokeo		○				
	•Mwongozo		○				
	•Ubungo Saruji	○	○				
	•Ubungo Spinning	○	○				
•Upogoroni	○	○					
Manzese	•Kilimani		○				
	•Midizini		○				
	•Mferejini		○				
	•Mnazi Mmoja		○				
	•Muungano		○				
	•Mvuleni		○				
	•Mwembeni		○				
	•Sinza A		○				
	•Uzuri		○				
Ubungo	•Kimara Matangani	○					En. Ep. En.
	•Baruti	○			○		

Ward	Village/Location	Operation					
		IRHS	LARVI-CIDING	ULV	BED NET	BEADS	REMARK
	•Malakua						
Mbweni	•Mbweni •Ununio	○					
Bunju	•Bunju A •Bunju B •Boko •Mabwe Pande •Mpiji Magohe						

—Ilala District—

Ward	Village/Location	Operation					
		IRHS	LARVI-CIDING	ULV	BED NET	BEADS	REMARK
Ukongu	•Majumba Sita •Kitunda •Nguruka Kwa Lala •Mwembe Madafu •Gongo la Mboto	○ ○ ○ ○ ○	○				
Pugu	•Pugu Stesheni •Pugu Sekondari •Pugu Kajiungeni						En. Ep.
Msongola	•Masongola •Mvuti •Chanika •Buyuni •Majohe						
Tabata	•Tabata •Kimanga •Segerea	○	○ ○				
Kinyerezi	•Kinyerezi-Bonyokwa • -CCM • -Msigwa • -Zimbile	○ ○ ○ ○			○ ○ ○ ○		En.
Ilala	•Shaurimoyo •Ilala Bomani •Amana •Bungoni •Sharif Shamba		○ ○ ○ ○ ○			○ ○ ○ ○ ○	
Mchikichini	•Mission Quarter		○			○	

Ward	Village/Location	Operation					REMARK
		IRHS	LARVI-CIDING	ULV	BED NET	BEADS	
	•Hala Quarter •Msimbazi Bondeni		○ ○			○ ○	
Vingunguti	•Mtambani •Kwa Kombo •Mtakuja •Miembeni		○ ○ ○ ○				
Kipawa	•Kipawa •Yombo •Kiwalani •Minazi Mirefu	○ ○ ○ ○	○				
Buguruni	•Mnyamani •Madenge •Kwadaa •Kwamoto •Kisiwani •Malapa		○ ○ ○ ○ ○ ○				
Kariakoo	•Kariakoo Mashariki •Kariakoo Magharibi •Kariakoo Kaskazini		○ ○ ○			○ ○ ○	
Jangwani	•Mtambani •Ukombozi •Mnazi Mmoja		○ ○ ○				
Gerezani	•Gerezani Mashariki •Gerezani Magharibi		○ ○				En. Ep. En.
Kisutu	•Kisutu •Mtendeni		○ ○			○ ○	
Mchafukoge	•Mchafukoge •Kitumbini		○ ○				
Upanga East	•Upanga Mashariki •Kibasila		○ ○				En.
Upanga West	•Upanga Magharibi		○				
Kivukoni	•Kivukoni		○				

--Temeke District --

Ward	Village/Location	Operation					
		IRHS	LARVI-CIDING	ULV	BED NET	BEADS	REMARK
Kigamboni	•Kigamboni •Mjimwema •Kibugumo •Tungi •Tuangoma •Magogoni	○ ○ ○ ○	○ ○			○ ○ ○ ○ ○	En.Ep.
Vijibweni	•Vijibweni •Kisiwani	○ ○					
Kibada	•Mizimbini •Mkize/Kibada						
Kisarawe II	•Chekeni Mwasonga •Tumaini/Kisarawe II						
Somangira	•Amani Gomvu •Mbutu Nguvukazi •Mwongozo •Gezaulole						
Kimbiji	•Kizito Huonjwa •Yale Yale Puna •Buyuni •Pemba Mnazi •Tundwi Songani						
Mbagala	•Mbagala •Makuka •Kizuiani •Mbagala Kuu •Kizinga •Mtoni Kijichi	○ ○ ○ ○ ○ ○	○ ○ ○ ○		○ ○ ○		
Chamazi	•Misufini/Chamazi •Mbande •Mipeko	○					
Yombo Vituka	•Yombo Vituka •Buza	○ ○			○		
Charambe	•Rangi Tatu •Nzasa	○ ○			○		
Toangoma	•Mwanamsekwa/ Mibwanehe •Yasemwayo/Tuangoma •Kongowe	○					En.Ep.
Miburani	•Miburani/Uwanja wa Taifa		○				

Ward	Village/Location	Operation					REMARK
		IRHS	LARVI-CIDING	ULV	BED NET	BEADS	
	<ul style="list-style-type: none"> •Wai lesi •Mgulani •Mjimpya •Kichangani •Mbuyuni •Tambukareli •Azimio 		○ ○ ○ ○ ○ ○ ○				
Temeke	<ul style="list-style-type: none"> •Temeke •Maganga •Sandali •Mamboleo •Maguruwe •Tandika •Kilimahewa 		○ ○ ○ ○ ○ ○ ○			○ ○ ○ ○ ○ ○	
Mtoni	<ul style="list-style-type: none"> •Mtoni •Relini •Mtongani •Bustani •Sabasaba 		○ ○ ○ ○ ○				
Keko	<ul style="list-style-type: none"> •Keko •Magurumbasi •Mwanga •Toroli •Chang'ombe 		○ ○ ○ ○ ○			○ ○ ○ ○ ○	
Kurasini	<ul style="list-style-type: none"> •Kurasini •Minazini •Shimo la Udongo •Kiungani •Mivinjeni 		○ ○ ○ ○ ○				

2) TNG

--Tanga District--

Ward	Village/Location	Operation					REMARK
		IRHS	LARVI-CIDING	ULV	BED NET	BEADS	
Ngamiani Kask.	•Ngamiani Kask.		○			○	
Central	•Central		○			○	
Mzingani	•Mzingani		○				
Usagara	•Usagara Mashariki (Raskazone) •Usagara Mashariki •Usagara Magharibi		○ ○ ○				
Makorora	•Makorora •Sahare •Kwanjeka •Mtakuja	○ ○ ○	○		○ ○ ○ ○		Ep.
Bombo	•Bombo		○				
Chumbageni	•Chumbagini •Fish Market		○ ○	○		○ ○	
Nguvumali	•Kisosora •Chumbini	○	○	○			En. Ep.
Mabokweni	•Mabokweni •Kibafuta •Mpirani •Ndaoya •Chongoleani				○ ○ ○ ○ ○		En. Ep.
Mzizima	•Mafuriko •Mleni •Amboni •Kihongwe	○ ○ ○	○			○ ○ ○ ○	
Kiomoni	•Majanimapana •Kiomoni	○	○ ○		○ ○	○ ○	En. Ep.
Kwaminchi	•Nguvumali		○				
Majanimapana	•Kwaminchi •Saba Saba Ground		○ ○	○			
Pongwe	•Pongwe •Maranzara •Kisimatui						

Ward	Village/Location	Operation					REMARK
		IRHS	LARVI-CIDING	ULV	BED NET	BEADS	
Maweni	•Kange •Kichangani •Kasela •Maweni •Kange Jeshini •Buhuri •Saruji	○ ○ ○ ○ ○ ○ ○	○ ○ ○		○	○ ○ ○ ○ ○ ○	
Duga	•Jaje •Duga •Masiwani •Mabanda ya Kuku	○ ○ ○ ○	○				
Tangasisi	•Tangasisi		○				
Tongoni	•Tongoni •Migombani •Mahere •Mwarongo						
Marungu	•Marungu •Geza •Mkembe						
Kirare	•Kirare •Tandewa •Mapojoni						
Mwang'ombe	•Mwang'ombe •Mwakidila •Mwahako	○ ○ ○	○ ○				Ep.
Ngamiani Kati	•Ngamiani Kati		○		○		Ep.
Ngamiani Kusini	•Ngamiani Kusini		○				
Msambweni	•Msambweni		○				
Mwanzange	•Mwanzange		○				
Majengo	•Majengo •Maskini Camp		○ ○				
Mabawa	•Mabawa •Mikanjuni •Magari Mabovu	○	○ ○				

En. ... Monitoring area for entomological evaluation

Ep. ... Monitoring area for epidemiological evaluation

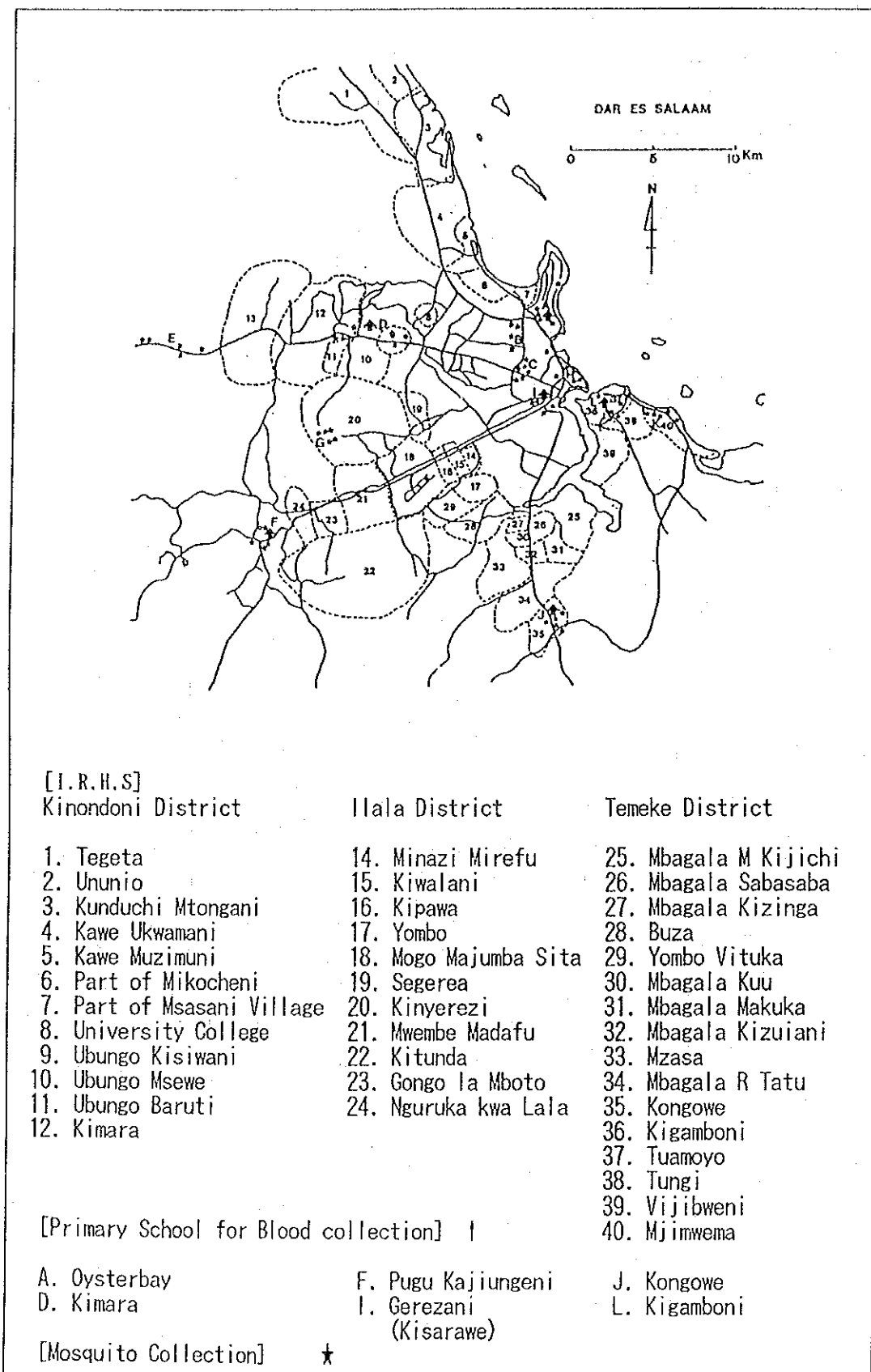


Fig.3-4 DSM: Location of I.R.H.S., Blood Collection, Mosquito collection

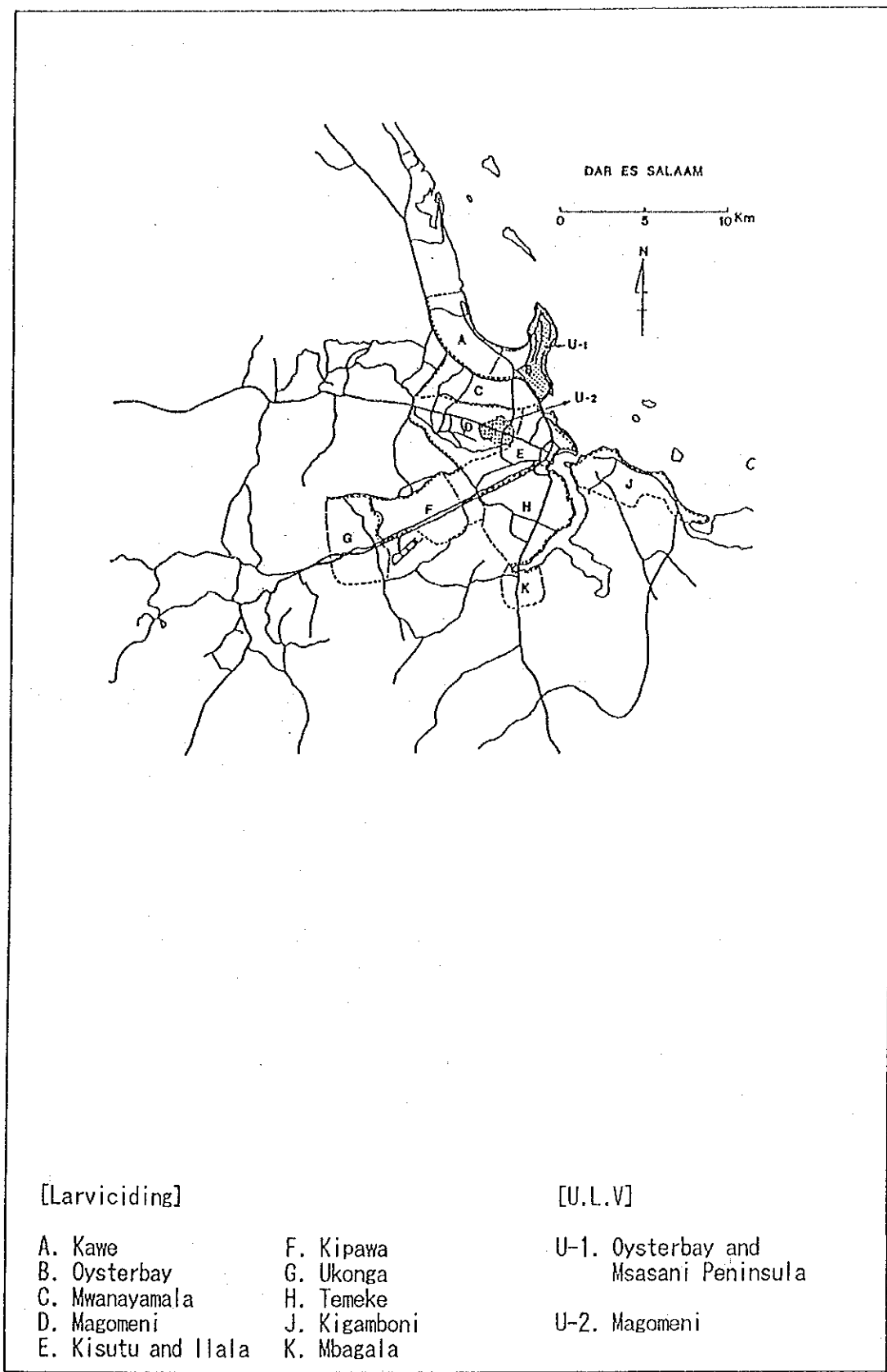


Fig.3-5 DSM: Location of Larviciding and ULV

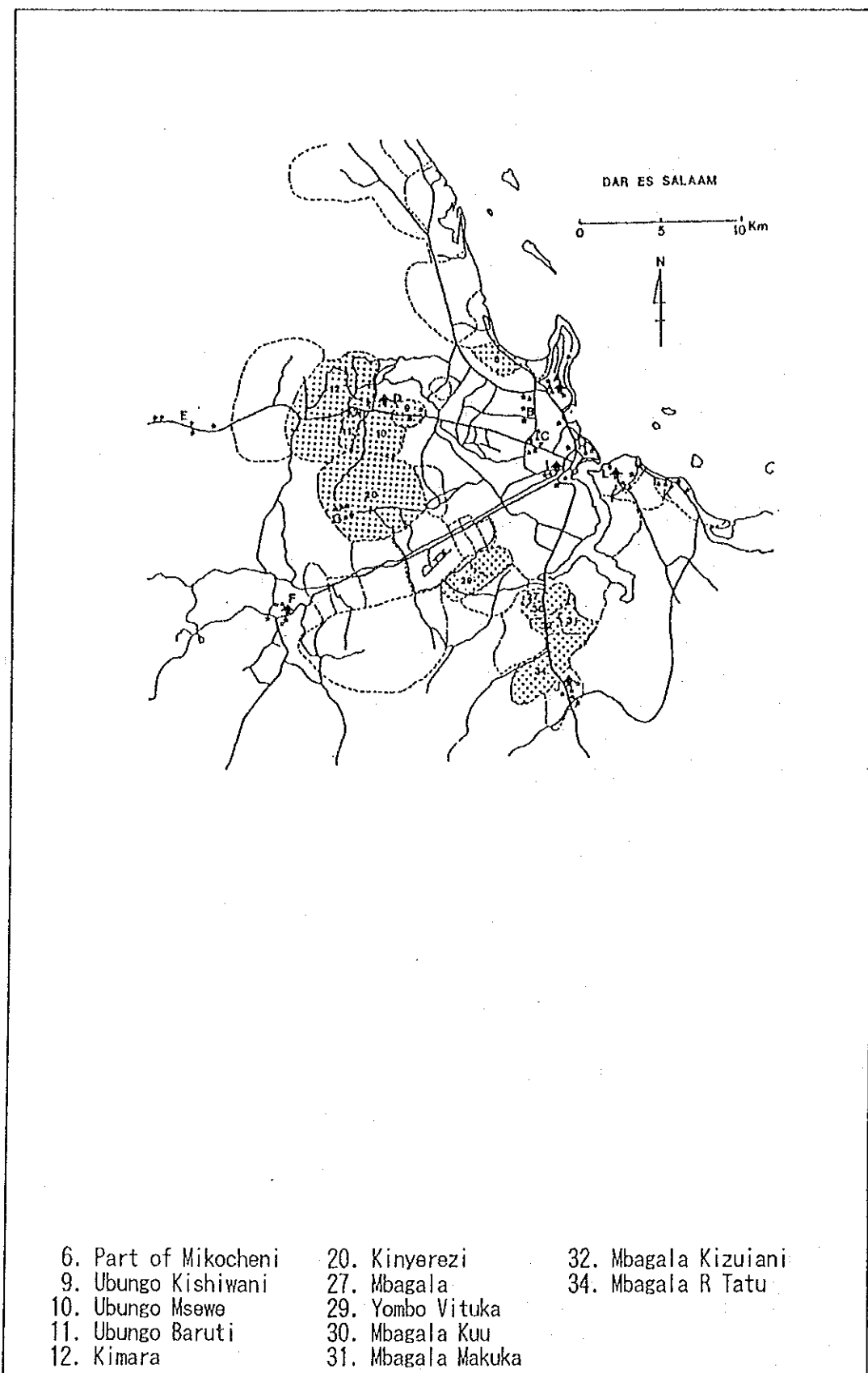
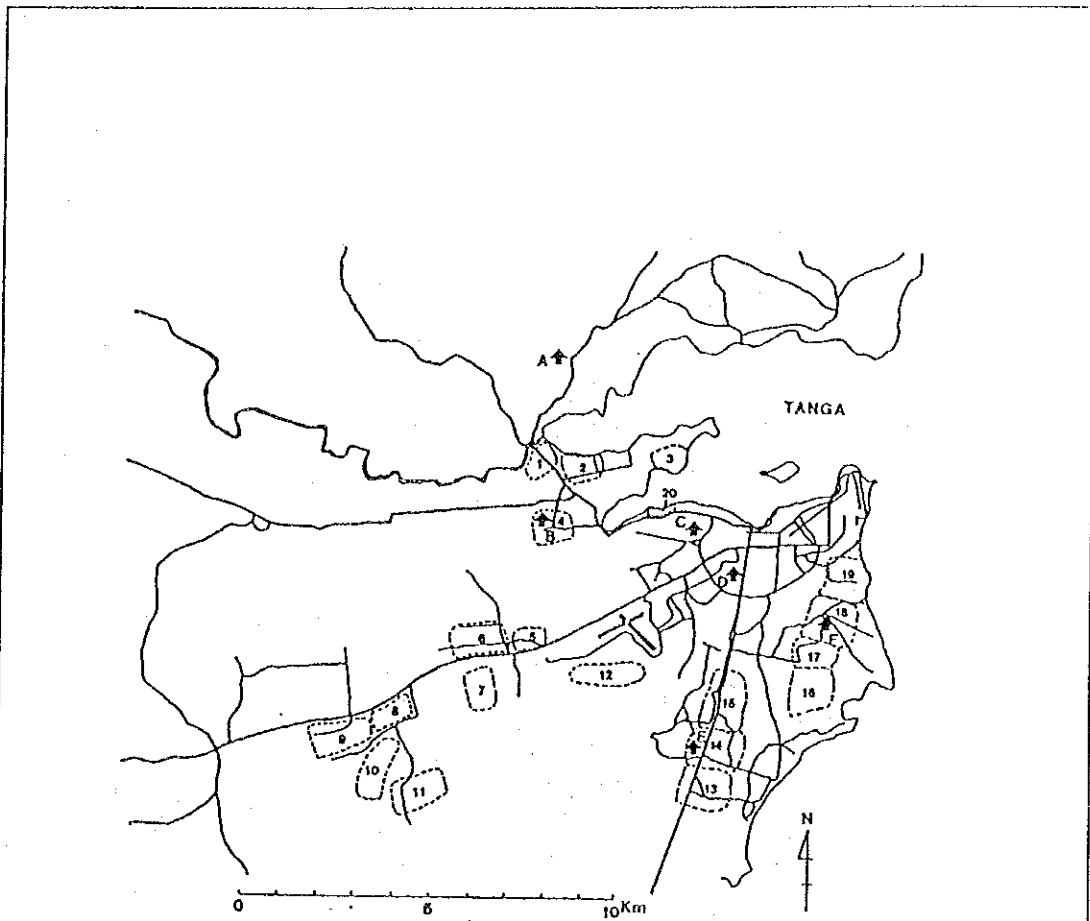


Fig.3-6 DSM : Impregnated Bed nets Distribution Area



[I.R.H.S.]

[Primary school for blood collection]

1. Amboni
2. Mafuriko
3. Kihongwe
4. Kiomoni
5. Kange Jeshini
6. Kange
7. Kasela
8. Maweni
9. Saruji
10. Kichangani

11. Buhuri
12. Masiwani
13. Mwahako
14. Mwakidila
15. Mwang'ombe
16. Magari Mabovu
17. Mtakuja
18. Kwanjeka
19. Sahare
20. Chumbini

- A. Mabokweni
- B. Kiomoni
- C. Mpirani (Kisosora)
- D. Kana (Ngamiani Kati)
- E. Mwakidila
- F. Kwanjeka

Fig.3-7 TNG: Location of I.R.H.S., Blood Collection

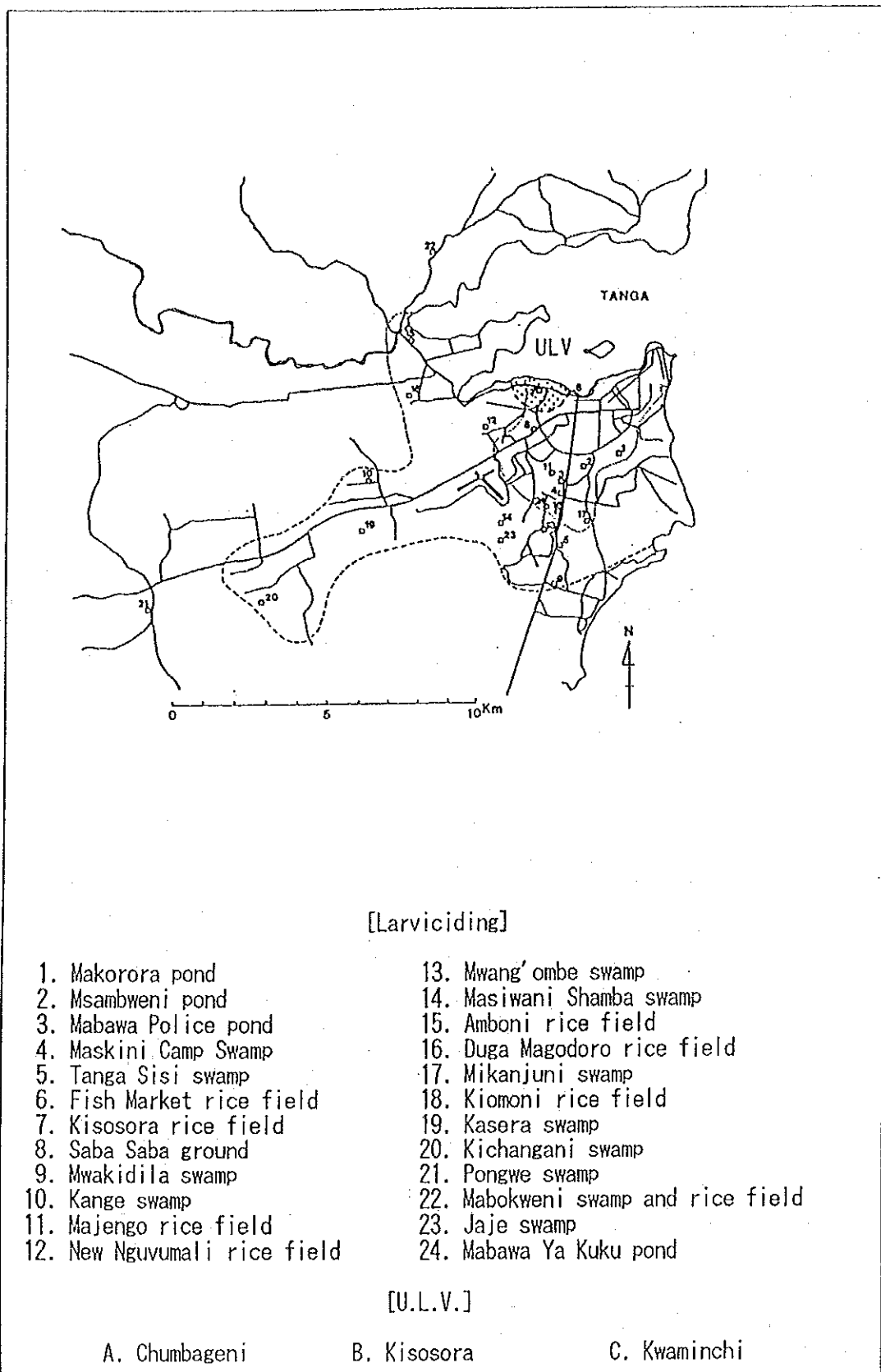
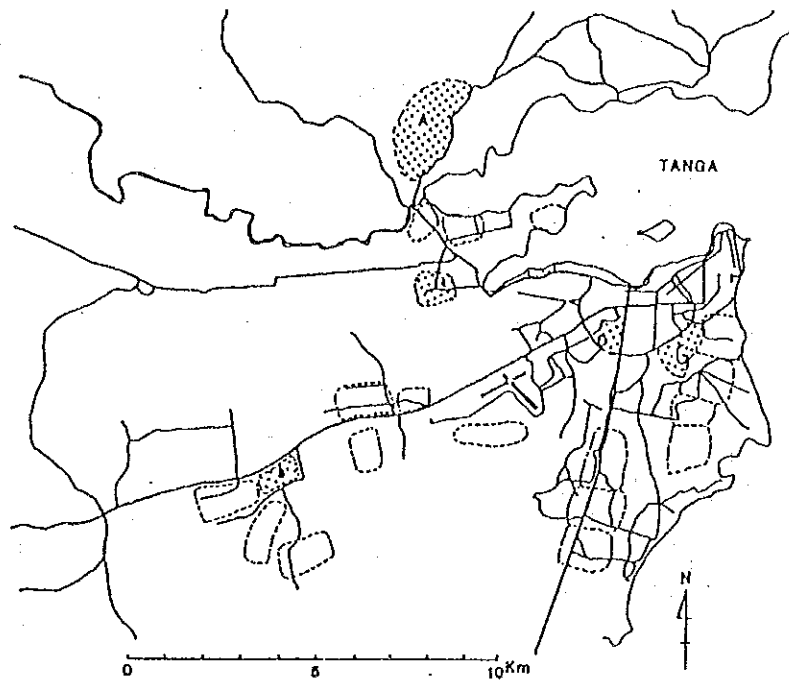


Fig.3-8 TNG : Location of Larviciding and ULV



[Bed nets Distribution Area]

- | | |
|------------|----------------------------|
| 4. Kiomoni | A. Mabokweni |
| 8. Maweni | D. D. Kana (Ngamiani Kati) |
| | G. Makorora |

Fig.3-9 TNG : Impregnated Bed nets Distribution Area

(2) Measures to Reduce Mosquito Breeding Sites (Environmental Improvement)

1) Landfill

Marshes are being filled up in both DSM and in TNG. In DSM, the filling-up of a pond is planned to be continued at Kinondoni primary school. The capacity of the pond is 1,000 cubic meters (with 50% of it already filled up at present). In TNG, Doga pond, which has a capacity of 95,000 cubic meters, is planned to be filled up.

2) Construction of Drainage Canals

As for DSM, the drainage canals listed in the table below are being constructed in the project. As of December, 1991, it is reported that 63% of the canals planned have been completed. The construction of those canals is continued until completion in "phase 4". Construction of no other canals are planned to be started.

As for TNG, about a half of the drainage canals that have been planned in the past (a total length of 18 kilometers) have been reportedly completed, so the remaining half will be constructed in "phase 4".

Drains	Target	Completed	Coverage
1. Mchikichini - Muhimbili	3.5 Km	3.0 km	85.7 %
2. J.W.T.Z. Mtoni	3.0 km	2.0 km	66.7 %
3. Keko - Pwani	5.0 km	-	-
4. Msimbazi - Kigogo	1.6 km	1.0 km	62.5 %
5. Temeke - Hospital	0.5 km	0.5 km	100.0 %
6. Temeke - Mwembe Yanga	1.0 km	1.0 km	100.0 %
7. Temeke - Tazara	5.0 km	5.0 km	100.0 %
Total	19.6 km	12.5 km	63.8 %

(3) Health Education

Health education will be given to specific groups of people. It is carried out by introducing video movies of health informations at primary schools, and is also carried out through the network of CCM.

(4) Monitoring and Evaluation

1) Epidemiological Evaluation (refer to figs.3-4 and 3-7)

As an easy way to monitor the condition of malaria infection, the ratio of the number of the patients (not examined by microscope) hospitalized of malaria to the number of the outpatients infected with malaria has been tracked at dispensaries. This practice of tracking is to be continued to see the transition of the number of patients effloresced with malaria. Also, the transition of the number of carriers of malaria-causing parasite will be traced in the same way as before by executing blood screening. With microscopes introduced for this phase, blood screening will be carried out more extensively on pupils of the first and second years at primary schools that are located in the areas where insecticide spraying is currently carried out as well as at those that are located outside the areas of insecticide spraying.

2) Entomological Evaluation (Collecting and studying Mosquitoes)

Transition in the numbers of mosquitoes caught are researched by the following three methods. These are the same methods as those done during the past phases of the project.

- a. 0.1% Pyrethrum is sprayed in a predetermined house and then the mosquitoes that have fallen because of the spraying are collected.
- b. Mosquitoes are collected at a predetermined place by Light Trap method.
- c. Mosquito larvae are collected from the waters on which insecticide spraying has been carried out.

With those methods, the effectiveness of the IRHS carried out in the project is evaluated by tracking the changes in the numbers of the mosquitoes caught in a selected area where the IRHS is being carried out and by tracking also the changes in the numbers of the mosquitoes caught in a selected area where the IRHS is not being done. The effectiveness of the ULV is evaluated by seeing the changes in the numbers of the mosquitoes caught before, during, and after the execution of ULV spraying activity. The effectiveness of the LC spraying is evaluated by tracking the changes in the numbers of the larvae collected in breeding sites where the LC spraying activity is being carried out and by tracking also the changes in the number of the larvae collected in breeding sites where no insecticide spraying is done.

3-3-3 Outline of the Materials and Equipment

If Japanese grant aid assistance is executed for "phase 4", the items regarded as appropriate are as follows. Those items are selected and approved in the determination made in the previous section, titled "3-2 Study and Examination of the Request".

- (1) Materials for controlling mosquitoes;
Insecticides, bed nets, polystyrene beads, etc.
- (2) Materials and equipment for activities of mosquito control;
Insecticide sprayers, protection suits for spraymen, etc.
- (3) Materials and equipment for reducing larva-breeding site;
Survey instruments, etc.
- (4) Materials and equipment for health education;
Overhead projectors, materials needed for drawing posters, etc.
- (5) Materials and equipment for epidemiological, entomological, and sociological evaluation;
Light traps, microscopes, dryers, etc.
- (6) Vehicles for transporting materials and personnel, and their spare parts;
Spare parts are for the vehicles procured in the previous fiscal year (i.e., in "phase 1-2").