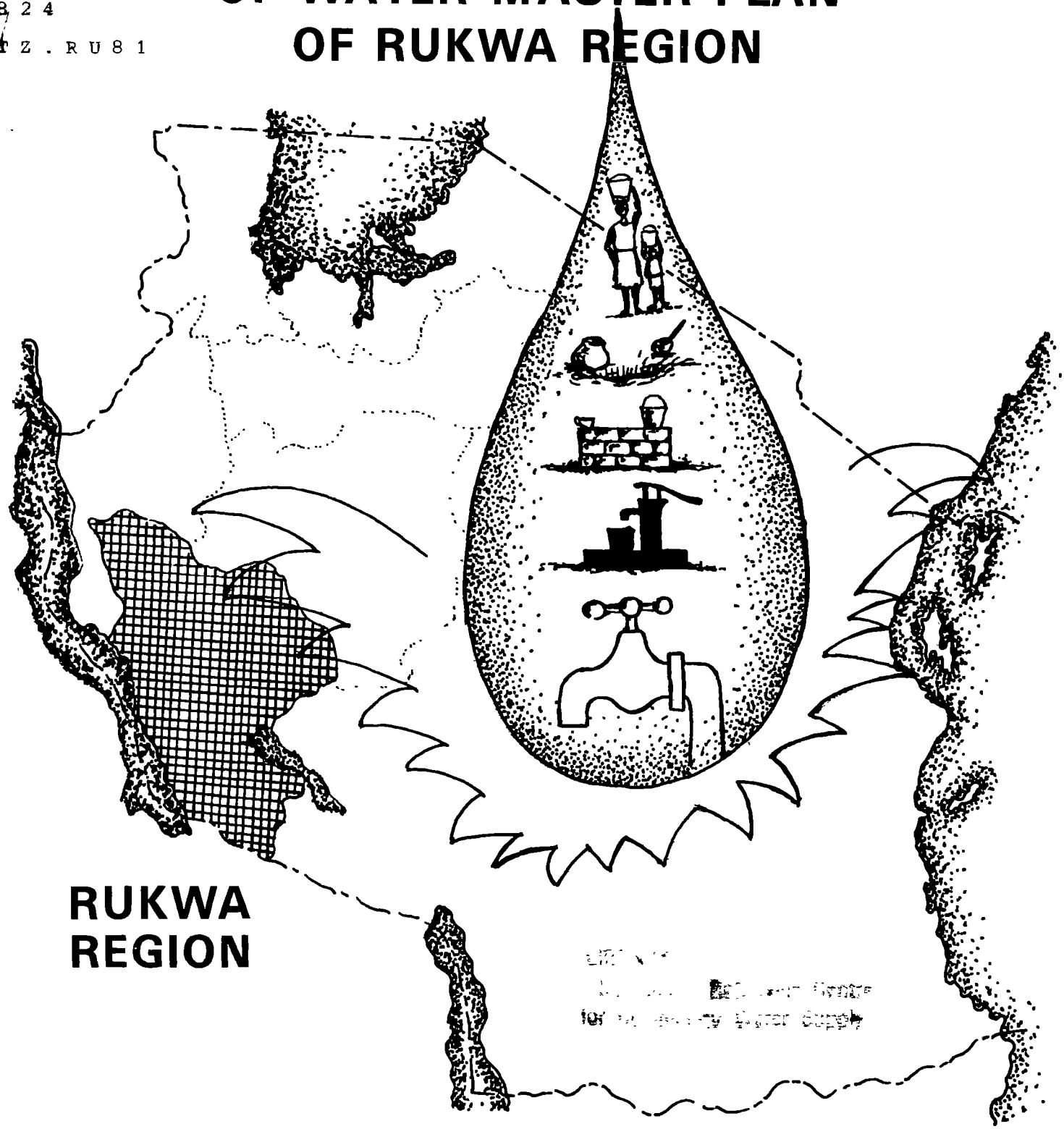
SOCIO-ECONOMIC ASPECTS OF WATER MASTER PLAN OF RUKWA REGION



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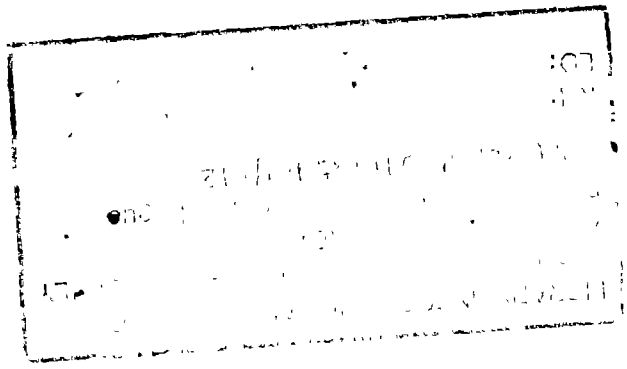

SOCIO-ECONOMIC ASPECTS OF WATER MASTER PLAN OF RUKWA REGION

DIRECTOR : PROFESSOR A. C. MASCARENHAS
PRINCIPAL RESEARCHER: DR. A. S. KAUZENI
RESEARCH ASSOCIATES : MR. J. LOMOY
MR. K. RONNINGEN
RESEARCH ASSISTANTS : MR. D. SHIRIMA
MR. B. A. KAUNDE
FIELD ASSISTANTS : MR. A. S. KAPELE
MR. J. S. SAYANA
MR. E. ULAYA
MR. A. J. YONAH

1981

* T2.RU → Tanzania (Rukwa)

P R E F A C E

In the undertaking of this socio-economic study, there was an element of as much coincidence as there was of planning. In addition, it depended a great deal on the goodwill of a number of people and institutions concerned with development.

As the 1970s rapidly faded and the Third International Water Development Decade came into being, it became necessary to put into practice the many good ideas that had emerged from the last Water Development Decade. In preparation for the Third Decade, the UNICEF and WHO had commissioned me to work in Geneve and draft a policy paper for them on Water and Sanitation as Part of Primary Health Care. By coincidence towards the end of the study, I met with a Norwegian Agency for International Development (NORAD) team heading to Dar es Salaam on a feasibility study for a Water Master Plan of the two Western Regions of Tanzania. As a result of this meeting it was possible to second Dr. M. Stahl, a staff member of BRALUP, to work with the NORAD field team. Both Mr. J.E. Lindstad (Team Leader) and Mr. A. Samuelsen (Water Engineer from NORAD) subsequently helped to facilitate the involvement of BRALUP in the study.

The Ministry of Water, Energy and Minerals, unhesitatingly encouraged BRALUP to undertake the consultancy. In this respect the Principal Secretary, Mr. Bakari Mwapachu and his deputies, Mr. W. Balaile and Mr. D. S. Bushaijabwe, were always available for consultation. Since we work on the basis that national institutions must reinforce each other, we were pleased that MAJI could second Mr. Shirima to work and learn with us.

Late in 1979, Dr. A. S. Kauzeni, whose home is in Rukwa Region, completed his Ph.D on agricultural extension services and the opportunity was too good to waste. Therefore, he was appointed as principal researcher. To complete the tun of luck, two postgraduate students from the University of Trondheim, Mr. J. Lomoy and Mr. K. Ronningen, were interested in working in Tanzania on a topic linked to the socio-economic study of water supply. They were invited and accepted to join the team.

The logistics to undertake a comprehensive study were formidable. The area under investigation is large - over 100,000 sq. km. with over 500 villages and having a population of nearly a million people. In order to ensure that the entire region was covered, some 25 enumerators were used during the survey. To cover the area of study, two land revers and two other vehicles had to be supplemented by bus, train, boat and bicycle.

Mr. Olav Myklebust, the NORAD Resident Representative, with his usual understanding of BRALUP's problem, helped to see that assistance was available to make us self-reliant. Two NORAD desk officers for the project, Mr. J. E. Lindstad and Mr. S. Peterson, ensured a smooth flow of information, funds and supplies needed for the research.

There were a few formal and informal contacts and exchange of ideas on the study between BRALUP and NORCONSULT. The Regional Water Steering Committees also offered an opportunity for BRALUP, NORCONSULT and respective Regional Authorities to exchange ideas, discuss findings and to tentatively plan for implemontation.

Some of the data was manually processed in BRALUP, but as the amount of data increased and it had to be processed more rapidly, we had to make use of facilities not readily available in the country. Mr. I. Jakobson from the University of Trondheim, now with UNDP, made arrangements for the two research associates, as well as for Mr. D. Shirima, from the Ministry of Water, to use the facilities at Trondheim to assist in the processing of the data.

In the course of the work there were four Regional Development Directors, Mr. E. Mwambulukutu, Mr. S. Farahani, Mr. R. Lukindo and Mr. S.K. Masinde for Kigoma and Rukwa respectively who offered the team all ancouragement especially through the Steering Committee. However, ultimately, we depended on the people and the village leaders to assist us. Their hospitality and cooperation in giving information made our task both rewarding and useful. We wish to thank them all.

With the end of this phase of the work, a baseline data now exists about rural water supply in the two regions. This is only the first step of a long process. A baseline survey can also be used not only to monitor the changes but also enables the team to assess the problems and prospects for rural water supply for the two regions. With all the strengths and weaknesses of the study one feature stands out - the implementation of the project will take long to complete but because of the past neglect and consequently a greater degree of self-reliance among the people, there is just the probability of a greater chance of success.

ADOLFO MASCARENHAS

DIRECTOR
BUREAU OF RESOURCE ASSESSMENT
AND LAND USE PLANNING

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1. INTRODUCTION:

For the last few years much more interest has developed and great emphasis has been placed upon the provision of adequate wholesome, dependable and potable water in villages and in the rural areas. The main questions that have been always asked are related to the level of service to be provided in terms of quantity and quality of water also proximity to the consumers.

The present water situation in the regions particularly after the completion of villagization programme leaves much to be desired in terms of quantity quality, reliability of sources and in terms of distances to be covered from residential areas to water sources. In most villages water is not readily available. In many instances water must be fetched from several kilometres away. Even then the quantity of water available in the traditional wells or dug holes might be very low especially during the dry season, and in many cases there is severe water contamination.

Resulting from the above situation the per capita consumption of the water used for domestic purposes is relatively low. From the health point of view this is undesirable, It also means that the long distance covered in fetching water takes up a lot of time and consumes a lot of physical energy. Moreover, the generally poor quality of water due to both bacteriological and chemical pollution or contamination creates health hazards to the villagers. It is clear from the above situation that the development of both the welfare and the economy of the rural population depends largely on the provision of improved water supply not only for domestic uses but also for other uses such as irrigation, livestock, hydro-electric power supplies and for fish rearing as well as for industrial purposes.

The objectives of the socio-economic study were:

(a) To establish a retrievable social and economic baseline data on Rukwa Region which would form an essential input and information for the planning, implementation and evaluation of the Water Master Plan in the Region.

(b) To explore in what ways rural water supply schemes would affect the health of the villagers and stimulate production.

(c) To assess villagers' willingness and timing of self-help contribution which would show their preparedness and the ability to accept the responsibility in the planning, construction, operation and maintenance of water schemes after their completion.

(d) To assess the impact and status of the schemes that existed before the initiation of the Water Master Plan.

(e) To understand villagers attitude's towards the proposed water master plan project.

2. LEVELS OF INFORMATION FOR SOCIO-ECONOMIC STUDY.

The socio-economic aspect of the Water Master Plan for Rukwa Region is being undertaken at three discriminatory levels: the district, the village and the household. These three levels represent extremes of the macro-micro spectrum. However, their significance goes beyond this obvious division. At a district level one is confronted with information of a general nature but which is also of administrative value and because of its general nature the information gives one an idea of the magnitude of the problems, the resources which are present and those which will be needed. At the household level, one has the smallest unit of operation. Variations between families are considerable and their shear number alone precludes the household being a planning unit. The norms that exist are shaped by a variety of factors some of them, such as taboos, being quite complex. Therefore, a manageable operating unit becomes a village.

Village level surveys have several benefits. First, they represent a clustered opinion of facts or attitudes. Thus if village after village responds that water is a problem during the dry season, not only will it be verifying generalities expressed at the district level, but also make this information more specific. Secondly such information gives a true indication of the magnitude of the task to be accomplished. Planners wish to know whether they are dealing with one large village several very large ones or numerous small villages. Such information input help to determine that the right type of technology is used and also assists in the design of the water schemes. The distribution, size of the cluster of villages and the proglems to

be tackled, will give planners and technicians some idea of scheduling activities if for no other reason than to cut down cost. For instance heavy drilling rig should not be randomly moved from one village to the next; or for that matter, the design of gravity water schemes could be optimized if prior information exists on the villages or people to be served with water. Special care was taken during the surveys to collect information which had a bearing on design capacity.

The village surveys also collected information about the infrastructure and other socio-economic data. Planners, technicians and decision makers need this array of facts, to take advantage of options, whether technological or administrative, which may have some bearing on the water scheme. Thus, a village which already has a cheap installed power source, is in a better position to use a pumped water scheme which uses power than a village which does not have this facility. Similarly, a village with a government is probably more able to mobilize village participation than a village without such a structure. A village with a school is preferable from which to launch on a water and health campaign than a village without a school.

At this stage there is need for a note of caution. This flow of data and information cannot be one sided. Thus while all the socio-economic data may go to make a very strong case for shallow wells, in the sense that there are craftsmen who could repair pumps, the ultimate decision rests on whether the geology of the area will permit shallow wells. Therefore even when village surveys help to give specific and even multi-dimensional information, it is still important for this information to be matched with technical data.

3. REGIONAL INFORMATION

(a) LOCATION OF RUKWA REGION:

Rukwa Region was established in 1974, on the ~~extreme~~ south-west of Tanzania. It lies between latitude 3^{o} and 9^{o} south of the equator and between longitudes 30^{o} and 32^{o} 31'E. The region is bordered by Zambia to the South West, Lake Tanganyika to the west and Mbeya Region lies to the south. Tabora and Kigoma Regions lie to the North-East and North-west respectively (figure 1).

The region occupies approximately 69, 720 km^2, that is about 7.9% of the total mainland area. It is made up of three districts namely Sumbawanga, Mpanda and Nkansi districts.

(b) PHYSICAL FEATURES, CLIMATE AND ECOLOGY:

The topography of the region falls under four broad catagories of land features (figures 2) namely:-

(i) Mountain Ranges:

There are two ranges of mountains formed by the two arms of the rift valley running in north-west to south-east direction. The south-East ranges along Lake Rukwa (attitude 810m) includes Mbizi mountains which rises to a maximum height of 1600 m. The North-west ranges along Lake Tanganyika extend to the border with Kigoma Region and they rise to a maximum height of 1936m.

(ii) Ufipa Plateau:

The Ufipa plateau is located between the two mountain ranges described above and rises to a maximum height of 2461m at Malonje. The plateau is separated from the lakes by steep escarpments and a continuous mostly narrow lacustrine plain along Lake Rukwa but only small isolated lacustrine terraces along lake Tanganyika.. In the northern part of Sumbawanga District the slopes descend gently down to lake Tanganyika. The plateau itself comprises a very undulating plain surrounded, except in the north-west by upland ridges.

(iii) Lake Rukwa Valley:

The lake Rukwa plain extends in a north-westerly direction. Half of the area of the plain was originally covered by the lake, and it is swampy especially during rainy season, and therefore unsuitable for agricultural development

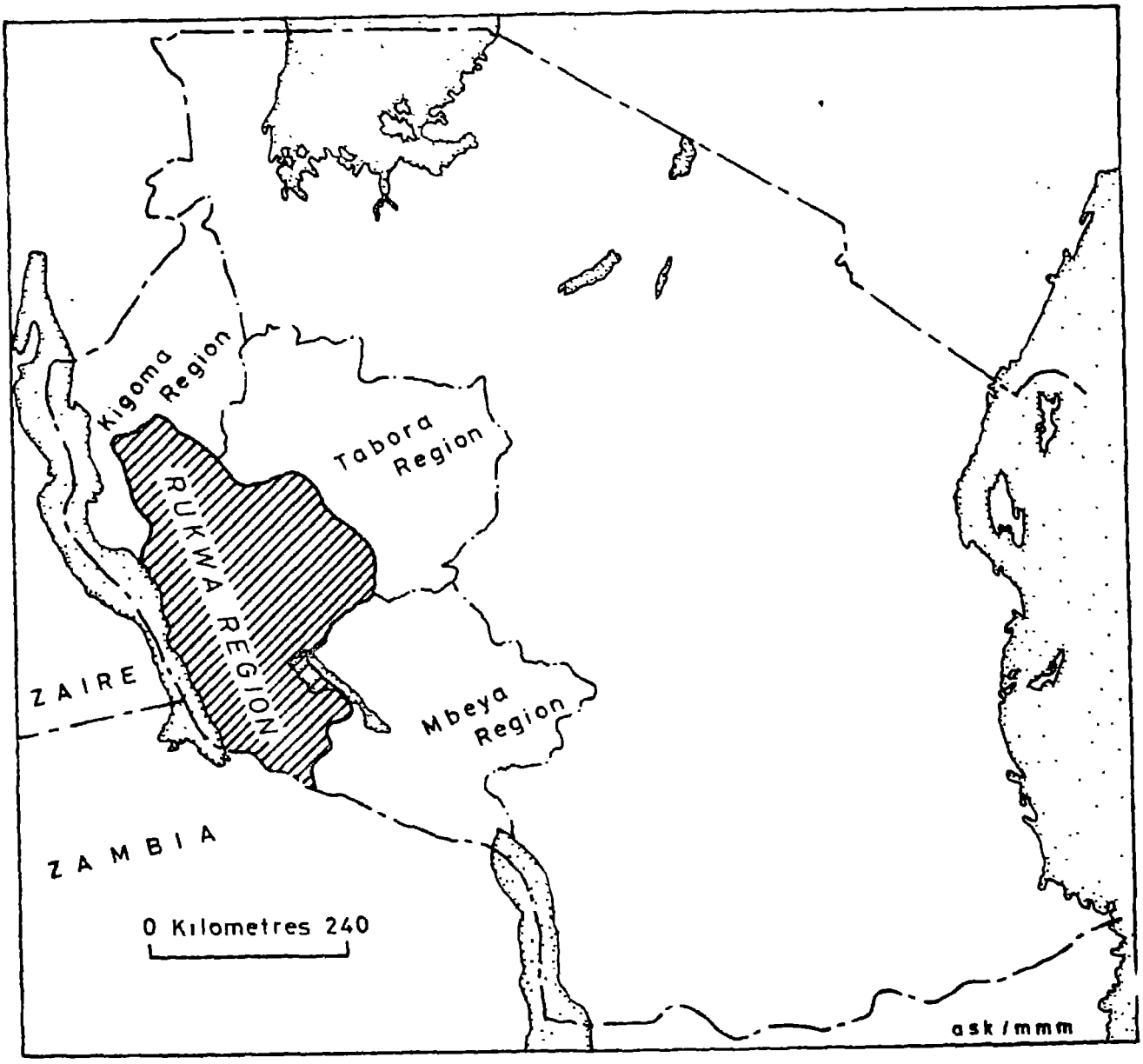


Fig.1 : Geographical location of Rukwa Region

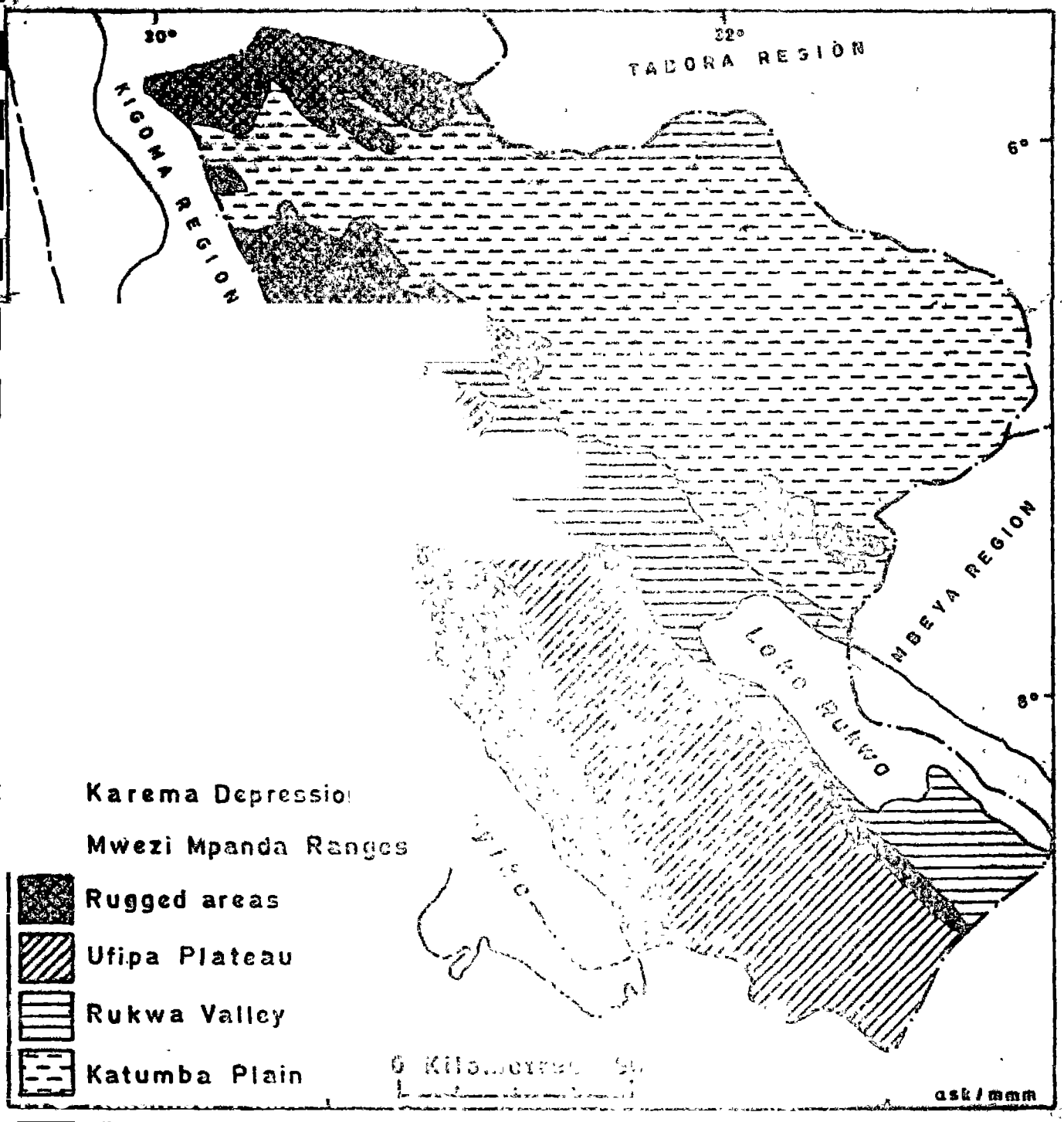


Fig. 2 : Physical features of rural development areas - Rukwa Region

(iv) Lake Tanganyika Shore:

Being a rift-valley lake, it is characterized by a very narrow coastal strip, with almost a continuous chain of steep hills. The coastal strip is also interrupted by narrow river valleys formed by numerous streamsdraining the region into the lake. These rivers include: Kalambo, Ifume, Mfwizi, Rungwa, Ugalla and Rugufu rivers.

It is however difficult to exhaustively discuss the climate of the region due to the inadequacy of a well established weather recording station. On the whole, the region has a generally favourable climate for both agrioulture and animal husbandry. Throughout the region the probability of the annual rainfall reaching or exceeding the minimal value for rain fed agriculture (750mm) ranges between 52 and 97.5%. Most of the region has more than 4 months moisture surplus and consequently for most of the region crops should not lack water. The rainy season last for six months from November to May. The heaviest rainfalls are between December and April.

Areas recording the highest levels (1000-1300mm) are those around Kala in Mkansi district and south to Kasanga, in Sumbawanga district. Similar areas are to be found around Mpanda, Kabungu, and Mwese high-lands. Areas receiving moderate rainfall of between (900-1000mm) are those around Ulumim, Mwazye, Malonje, Mamba, Kapapa and Inyonga. The areas on the plateau stretching from Chala down to Katengesa and the coastal strip of Lake Rukwa running from around Mkulwa-Usevya receive the lowest rainfall of between 800-900mm. The mean annual rainfall value for the region is 996mm.

Most of the plateau from Namanyere in Nkasi District to Sumbawanga and south wards to Ulumi in Sumbawanga district has a mean annual maximum temperature of 24-27°c Mpanda district, Lake Tanganyika shore and Rukwa valley have a mean annual temperature of 27-29°c. The mean annual minimum temperature of Mpanda District, Lake Tanganyika shore and Rukwa Valley ranges between 16-19°c while that for the plateau is between 13-16°c.

Potential evaporation for lake Tanganyika shore and western portion of the plateau running north-west is approximately 1800-1000m per annum. Elsewhere in the region the value is 2000mm per annum. Roughly Rukwa region can be divided into three ecological zones:

(i) Woodland
(ii) Grassland
(iii) Montane and riverine forest and bushland, escarpment vegetation, swamps and highland vegetation.

(i) The woodlands are mainly of miombo type and they approximately occupy 80% of the region. This zone covers most of Mpanda district, the Rukwa valley and the sloping areas which separate the Ufipa plateau from Lake Tanganyika. A large part of she woodlands, especially Mpanda District is tsetse-infested and it is virtually uninhabited.

(ii) Grasslands account for nearly 12% of the region and cover most of the Ufipa plateau, parts of Lake Rukwa valley and Mwese highlands. This zone is densely populated due to its suitability as far as agriculture and livestock development is concerned. Nearly half of the region's population lives on the Ufipa plateau. Thus, the natural vegetation has been modified by man's activity through cultivation and grazing.

(iii) The montane forest covers only a small area about 0.1% of the region particularly parts of Mbizi mountain, Mwese and Ipunda hills. The riverine forests are confined to the big river banks particularly along the Ugalla, Malagarasi, Mtambo and Kalambo. This zone accounts for some 1% of the region. The bushland escarpment, highland vegetation and swamps cover nearly 7% of the total regional area.

(c) HYDROLOGY AND DRAINAGE:

The region consists of two major lakes. Lake Tanganyika lies on the west along the western arm of the rift valley while lake Rukwa lies on the eastern arm of the rift valley. Apart from these two major lakes, several small lakes are to be found especially in the southern part of the region. These include lake Kwera, the biggest, lake Sundu, Twelele, Mongali, Kura, Wachumi, Kalomo, Numenya, Mninga, Katasi, Ifena and Kirundi.

These are two important rivers and stream systems that drain the region.

(i) In most of the eastern, south-east and north-east part of the region, the rivers belong to the drainage system of the interior lake i.e. lake Rukwa. These rivers are: Rungwa, Mfwisi, Sakalile, Msadya and Kirida.

(ii) Those draining the rest of the region into lake Tanganyika thus belongs to the drainage area of the Atlantic Ocean. They include Ugalla river which forms the boundary between Mpanda and Tabora Region, hence drain the north-eastern part of Mpanda district into lake Tanganyika. Others include Rugufu river, Magese, Kalambo and Ifume. Several small rivers and streams coming from lake Tanganyika ranges and running into the two lakes are seasonal.

(d) REGIONAL GOVERNMENT AND ADMINISTRATION:

Rukwa region was formed in 1974 by the joining of Mpanda and Sumbawanga formerlyof Tabora and Mbeya region respectively. However in 1979, Sumbawanga district was sub-divided into two districts i.e. Nkansi and Sumbawanga, thus bringing the total number of districts of three.

Administratively the regional breakdown is as follows: The districts are divided into divisions, divisions into wards and finally wards are sub divided into villages. The number of divisions, wardsand villages in the respective districts is based on the population size rather than area.

The chief political head of the region is the Regional Commissioner who is appointed by the President while the districts are headed by the Area Commissioners. The divisions and wards are administered by the Division and Ward Secretaries respectively.

The major aim of the decentralization policy has been to promote more effective rural development. Thus a Regional Development Director (RDD) also appointed by the President of reports directly to the Regional Commissioner who is the head of the Regional Functional Departments which correspond to the national ministries at the regional level.

At district level each district has functional departments parallel to that of the region, thus the District Development Director is the head of the District Functional Departments and reports to the Area Commissioner.

In this way the central ministries now perform advisory and supportive duties only. At divisional and ward levels, there is a merger between government and party. Due to shortage of manpower there is no fixed system of arrangements for Functional Ministerial representation at these levels.

Thus, much more than in the past, the local level political structure from the ten-family cell basic C.C.M. unit through village level, ward, division, district and ultimately regional level interacts with the civil service in programme identification, preparation and implementation. During the 1975 villagization programme both the rural settlement pattern and the administrative structure were considerably changed. To date each registered village is headed by a Chairman, Secretary and a Village Council consisting of at least five committees. A programme is also at hand to introduce village managers in each registered village.

(e) SETTLEMENT PATTERN:

Like most other regions in Tanzania mainland, the 1972/75 villagization programme was also implemented in Rukwa Region. However the new settlement pattern was mainly confined to local movement of people from their scattered homesteads into new villages rather than movement over long distance. Thus most of the new villages were concentrated along the main roads or in areas where at least there is an access road. (figure 3).

In some cases the movement was very unnecessary, especially where people were moved from one side of the road to the other, on a similar physical condition. Strictly speaking Rukwa Region had an advantage over the other regions in Tanzania as far as the implementation of the villagization programme is concerned. This is due to the fact that originally the tribes in the region lived in the villages with many households close together. Thus a number of villages were formed either by amalgamating two or three villages into one or by spliting big villages into two. The official family size as stipulated in the 1975 village Act is between a minimum of 250 and a maximum of 600 families. Up to the time when the survey was conducted, there were a total number of 289 registered villages in Rukwa Region.

However, the new villages have occupied an extensive area, due to the new system of allocating one acre of land to each household around the house (plots). This means that a distant farm land has to be acquired, thus increasing the walking distance from the households. On the other hand the new system has complicated the distribution (location) of social services such as water supplies.

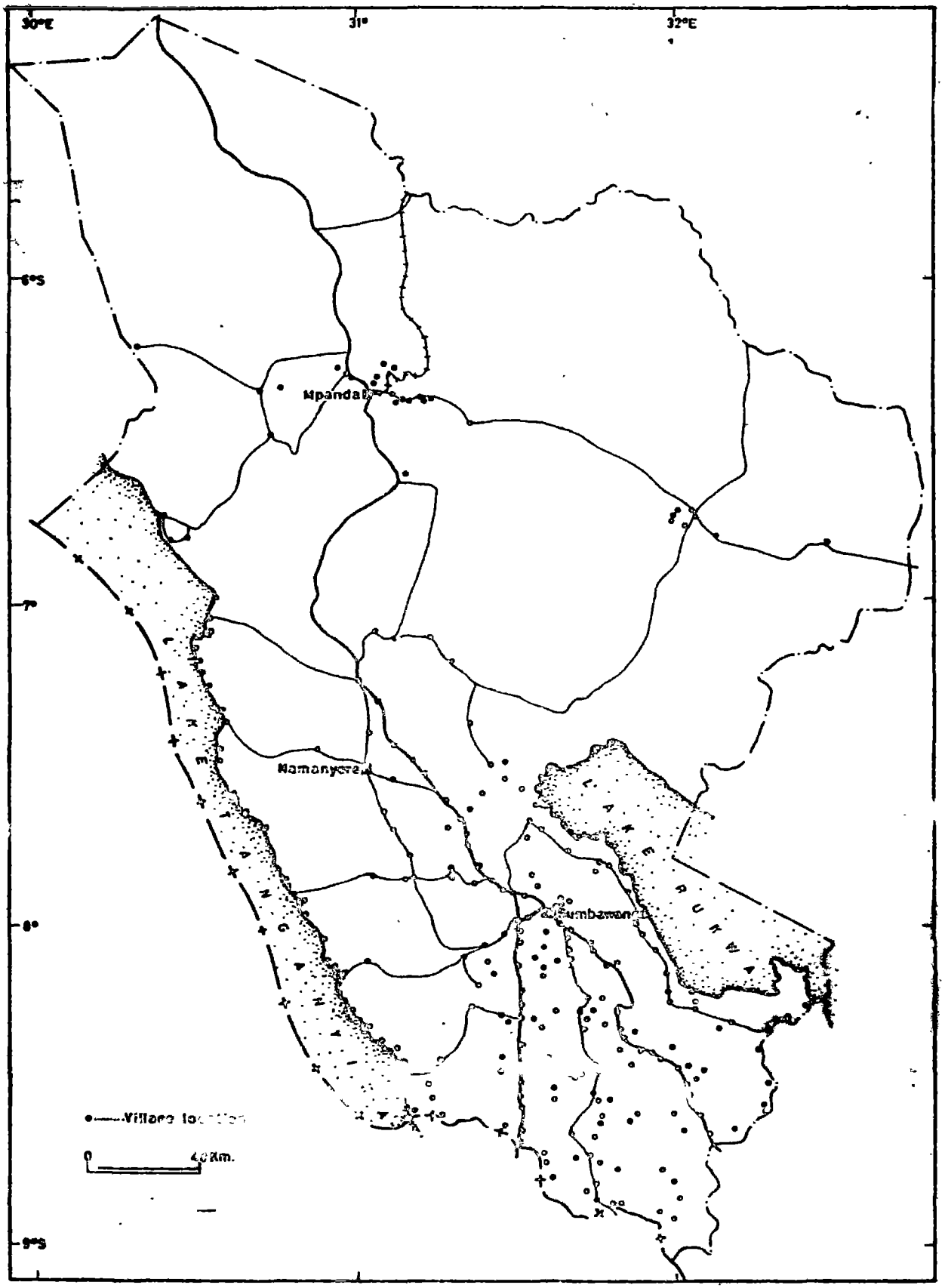


Figure. 3. GEOGRAPHICAL LOCATION OF SURVEY VILLAGES.

(f) HUMAN POPULATION AND DISTRIBUTION:

The number of divisions, wards, villages and their respective population figures for the year 1967 and 1978 are summarized in Table (1).

TABLE 1

ADMINISTRATIVE UNITS AND POPULATION SIZE BY DISTRICT FOR 1967 AND 1978

DISTRICT	NUMBER OF DIVISION	NUMBER OF WARDS	NUMBER OF REGISTERED VILLAGES	TOTAL POPULATION 1967	TOTAL POPULATION 1978
Sumbawanga	6	30	160		213,144
Nkansi	3	10	58	215,288	90,987
Mpanda	7	27	71	60,803	140,914
TOTAL	16	67	289	276,091	445,045

Source: Survey results

As it can be seen from the abovetable there has been a remarkable increase in population from 1967 census to 1978 census. A striking growth rate of 4.4% has been observed in Mpanda District. This is mainly attributed to immigration of refugees from Rwanda and Burundi and partly by the pastoral Wasukuma into the District. Sumbawanga District has also experienced a net gain in population from immigration of Wasukuma into the district. The combined annual growth rate for Sumbawanga and Nkansi District is 2.3%, however the annual population growth rate in the whole region including Sumbawanga town is 2.9%.

Nearly 50% of the total population of the region lives on the Ufipa Plateau with density approaching 13 people per km^2. Other densely populated areas include Lake Tanganyika shore and part of Rukwa valley. Huge tsetse-infested miombo woodland in Mpanda District remain virtully uninhabited. There is also variation as regards the distribution of population in the villages. In order to have a basis for assessing or estimating the magnitude of the social or economic infrastructure to be established in

various districts and finally in the villages, the following grouping of villages according to the population size has been adopted (Table 2).

TABLE 2

VILLAGE POPULATION DISTRICT WISE 1979

Village Population Grouping	Sumbawanga District	Nkansi District	Mpanda District
Less than 1000	53	19	13
1001 - 2000	84	35	36
2001 - 3000	15	8	1
3001 - 4000	4	1	9
4001 - 5000	1	1	2
Above 5000	1	-	3

Source: Survey results.

4. SERVICES AND INFRASTRUCTURE:

There has been an outstanding achievement of the "operation vijiji" as far as provision of basic services are concerned. However there is considerable variation as regards their distribution both at district and village levels (table 3). These services fall under four groups.

1. Agriculture infrastructure i.e. storage facilities, cattle dips etc.
2. Transport infrastructure i.e. roads and traffic
3. Water supply
4. Social service infrastructure i.e. health and education facilities.

TABLE 3

PHYSICAL AND SERVICE INFRASTRUCTURE BY DISTRICT 1979.

INFRASTRUCTURE	DISTRICT		
	SUMBAWANGA N = 165	NKANSI N = 64	MPANDA N = 64
1. Schools	94	86	91
2. Dispensaries	21	27	29
3. Shops	82	95	80
4. Churches	83	94	88
5. Mosques	55	7	32
6. CCM Offices	57	66	57
7. Markets	4	10	29
8. Bus Services	25	33	22
9. Railway Services	0	0	34
10. Boat Services	9	11	3
11. Tap Water	19	16	20
12. Distance-more than 100 km to district headquarter.	46	18	31

Source: Survey results.

As it is observed, too much emphasis has been put on the development of the social service infrastructure, consequently, unbalanced growth in the different sectors has been observed throughtout the region. In most cases the transport infrastructure is poorly developed resulting in poor economic performance by nearly all the established villages.

By combining all the variables, measuring services and infrastructure into a composit index we get a measure of the general centrality of a village (table 4). The index is 0-12. Low centrality is 0-6 and high centrality is 7-12. The measurement used here is a crude one, for it only indicates the existence (quality) of service or infrastructure, but does not show the qualities of the service or infrastructure. There are many villages without the services or infrastructure which are visible

TABLE 4.

PERCENTAGES OF VILLAGE CENTRALITY OF DISTRICT WISE

Degree of Centrality	Percentage of villages according to their degree of centrality. DISTRICTS		
	SUMBAWANGA	NKANSI	MPANDA
Low (0-5)	71	70	48
High (7-12)	29	30	52

Source: Survey results.

signs of village development. There are high percentages of villages with low degree of centrality. It appears that at village level there is a definite connection between general centrality and water supply development. There are more water schemes among villages with high degree of centrality than among those with low degree of centrality (table 5).

TABLE 5

PERCENTAGE OF VILLAGES WITH WATER SCHEMES ACCORDING TO CENTRALITY

Degree of Centrality	Percentage of villages with water schemes
Low (0-5)	12
Medium (6-8)	54
High (9-12)	100

Source: Survey results.

5. WATER SITUATION AND ITS UTILIZATION IN THE REGION:

In the second Five Year Development Plan the importance of improved water supply was stressed on both social and economic grounds. It was clearly stated that the supply of potable and dependable water would not only reduce the incidence of diseases and make

the life of the beneficiaries more comfortable, but also increase the productive capacity of the people and consequently their contribution to the national economy. The degree to which this could be achieved mostly depends on the availability of surface and underground water as well as the intensity and distribution of rainfall in the region.

It is the government policy to provide potable and dependable water within a reasonable distance, not exceeding a walking distance (4km) of every village by the end of 1981 as a free basic service. Also to provide piped water supply to the rural villages by the end of 1991 so that all people will have easy access (less than 400-500m) to a public domestic water point. This situation can be achieved more satisfactorily if certain basic information on the present situation relating to water supply is reviewed. Information such as present water supplies, types of water schemes preferred by villagers and water use pattern.

Water is used for various purposes in Rukwa Region. Water uses include drinking, cooking, washing of utensils, local beer brewing, bathing, washing of clothes, construction of houses, irrigation farming, gardening, watering and dipping of livestock, pottery, processing of palm oil, watering trees and tobacco nurseries. In the process of selecting water sources for various uses and in the way they utilize the different water source, they also reveal their perception and values or their attitude towards water.

There appears to be an interplay between the nature of water supply situation (traditional or modern) on the one hand and the social factors on the other. Division of labour in the households, clothes washing habits, bathing habits, peoples ideas about water quality), create a pattern of water use in a community. Better understanding of this interplay facilitates the evaluation of the potential benefits to be realized from improved water supply and also helps in planning the water supply in a way that these benefits are maximized.

Rukwa Region is not as fortunate as Kigoma Region in terms of physical availability of water particularly surface and ground water. Great parts of Mpanda District especially Inyonga area

and also the southern part of Sumbawanga District are very much affected by water deficiency. The other two major problems are lack of water resource management skills so that villagers could make its maximum and effective utilization for social and economic development, and the serious problem of the high degree of bacteriological and chemical pollution. There is also an appreciable amount of mineral deficiency in water. Other ordinary problems include distance to watering points, scarcity of water and queueing up for water particularly during the dry season all resulting partly from the dry condition of the region and partly from villagization programme which lead to concentration of people in villages with limited watering points or facilities.

6. TRADITIONAL WATER SUPPLIES:

Currently traditional water supplies are the most important water sources for greater part of the year and for the greater majority of villages in Rukwa Region (table 6 and 7). The traditional water sources include springs, rivers and streams, ponds, lakes and traditional wells. On average, about 80.7% of the total number of villages get water from traditional water sources for the entire region. However, the situation differs insignificantly from one district to another. Nearly 83.% of the total number of villages in Sumbawanga and Nkansi Districts and 75% in Mpanda District reported using traditional water sources.

TABLE 6

MOST IMPORTANT SOURCES OF DOMESTIC WATER SUPPLY DURING THE RAINY SEASON

SOURCE	Number of Villages in Districts Using Various Sources of water by district.		
	SUMBAWANGA N = 168	NKANSI N = 73	MPANDA N = 65
Tap water	20	9	4
Modern wells	4	1	13
Traditional Wells	52	12	19
Lake	3	24	2
Spring	9	1	1
River(strem)	72	23	26
Rain	2	1	0

Source: Survey results

TABLE 7

MOST IMPORTANT SOURCES OF DOMESTIC WATER SUPPLY DURING THE DRY SEASON

SOURCE	SUMBAWANGA N = 168	NKANSI N = 73	MPANDA N = 65
Tap water	20	11	3
Modern wells	4	1	13
Traditional wells	55	14	20
Lake	3	29	2
Spring	11	3	1
River (stream)	69	13	26
Rain	0	0	0

Source: Survey results.

PROBLEMS ASSOCIATED WITH TRADITIONAL WATER SUPPLIES:

Traditional water supply problems in villages in Rukwa Region do not differ significantly from those experienced by villages in Kigoma Region or other regions of similar geographical characteristics. The nature and severity of these problems differ from one season to another on the same water sources (Table 8) and from one village to another. These problems are mainly related to the location, type and use of the water sources. As shown in the above table, these problems can be grouped into four categories:

- Water scarcity
- Water contamination
- Distance to water points or sources
- Queueing up for water

TABLE 8

PROBLEMS MENTIONED WITH RESPECT TO TRADITIONAL WATER SUPPLIES

PROBLEMS	Total Number of Villages which stated these as most important problems		Total Number of villages that mentioned these as general problems	
	RAINY SEASON	DRY SEASON	RAINY SEASON	DRY SEASON
Scarcity of water	17	89	40	113
Contamination	196	94	111	13
Distance	48	66	4	25
Queueing	4	5	0	33

Source: Survey results

a. Scarcity of Water:

Water scarcity is one of the two most important problems associated with traditional water supplies during the dry season. This problem is most serious during the dry season because during that time the amount and level of water in rivers or streams, springs and traditional wells decreases. Sometimes some of these sources dry up completely. Reduction in the volume of water in these sources in caused by several factors such as evaporation, water table moving further down and lack of rain water that feeds the rivers or streams.

b. Water Contamination:

Water contamination is typically a rainy season problem and it is the most important problem associated with the traditional water supplies in the region. Contamination of water is caused by rain water carrying mud, faecal materials and plant debris draining into the open traditional wells, rivers or streams, dams and springs. Water contamination is also caused by villagers when bathing or washing clothes near the water supply. Contamination of water during the dry season is experienced in few villages mainly where livestock and human beings get water from the same sources.

c. Long Distances to Water Supplies:

Long distances to water supplies is closely related to scarcity of water and it is the second most important water problem during the dry season. Villagers have to travel long distances to fetch water because water volume in some sources closer to the villages decreases or the water dries up completely. The other reason why sometimes villagers have to walk long distances to water points is that, villagers choose the source of water from which to collect water depending on the use for that water; whether it is for drinking, bathing, clothe washing or for building and construction.

In the household survey the distance to water source for each duster of households was arrived at by taking a central point for each 10-cell and pacing it to the water supply. Table 9 gives the range of distance.

TABLE 9

DISTANCE TO WATER SOURCE

Distance	Percentage of households covering the distance to water source		
	Sumbawanga	Nkansi	Mpanda
0 - 200 m	38.65	54.76	23.72
300 - 400 "	19.02	17.86	32.05
500 - 600 "	15.34	10.12	25.64
700 - 800 "	3.68	3.57	11.54
900m - 1km	15.34	1.78	6.41
1.1-1. 2km	-	5.95	-
1.3-1. 4km	0.61	-	-
1.5-1. 6km	1.84	0.60	0.64
1.7-1. 8km	0.61	4.76	-
1.9- 2km	4.91	0.66	-

Source: Household survey results

d. Queueing up for water

After the completion of the villagization programme some villages grew up to twice or three times their original sizes. So, the population in these villages out grew the water facilities already available before the programme. This situation resulted in people crowding around the few water points available in the villages, and this in turn resulted in people queueing up for water. (Table 10 summarises the problems associated with both traditional and improved water supplies at different seasons.

TABLE 10

WATER PROBLEMS EXPERIENCED BY VILLAGERS

SUMBAWANGA DISTRICT

Problems	Percentage of households experiencing problems during different seasons			
	Traditional Water sources		Modern Water sources	
	RAINY	DRY	RAINY	DRY
Scarcity	0.65	37.84	17.54	46.15
Contamination	81.05	31.76	29.83	1.54
Distance	14.38	16.89	8.77	9.23
Queueing	2.61	13.51	7.02	10.77
Quality	1.31	-	36.84	32.31
	N = 153	N = 148	N = 57	N = 65

NKANSI DISTRICT

Scarcity	1.45	41.50	-	40.00
Contamination	91.30	50.34	100.00	30.91
Distance	0.73	2.72	-	1.82
Queuueing	2.90	2.04	-	27.27
Quality	3.62	3.40	-	-
	N = 138	N = 147	N = 9	N = 55

Table 10 (Contd)

MPANDA DISTRICT

Scarcity	1.91	22.39	26.32	40.86
Contamination	70.06	44.78	15.79	13.98
Distance	24.84	29.10	39.79	25.81
Queueing	0.64	1.49	15.79	16.13
Quality	2.55	2.24	6.31	3.22
	n = 157	n = 134	n = 95	n = 93

Source: Household Survey results

7. IMPROVED WATER SUPPLIES:

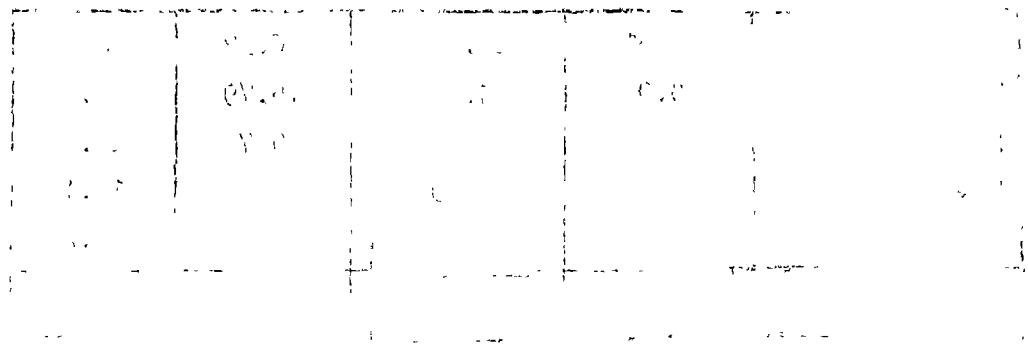
Till the beginning of 1980 there were about 60 villages with water schemes in the region (table 11) of which 56 schemes were from water taps leading from either pump or gravity operated schemes. When in operation they served about 98,173 people which is less than 25% of the total population of the region excluding Sumbawanga, Mpanda and Namanyere towns. Improved water supplies include modern shallow wells, deep wells, tap water and boreholes. Most of these were constructed during and after the villagization programme in order to ease the acute shortage of water resulting from the concentration of people in the newly planned villages. Most of the water schemes especially those in Sumbawanga District are gravity operated while the majority of the remaining schemes are pump operated. There were few shallow wells fitted with hand pumps. During the time of the visit the majority were out of order. For most schemes water is taken from rivers or streams. There are also few water springs used as source of water. Villages along Lake Tanganyika use water from the lake.

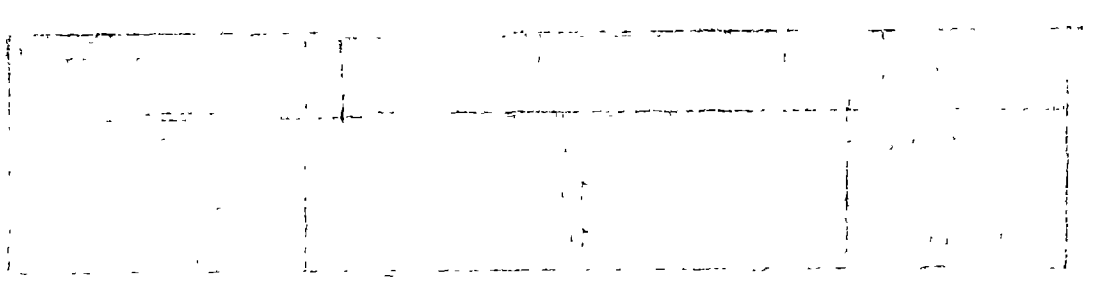
TABLE 11

DISTRIBUTION OF WATER SCHEMES AND TOTAL POPULATION SERVED DISTRICT WISE

DISTRICT	NUMBER OF VILLAGES WITH SCHEMES	TOTAL POPULATION SERVED
Sumbawanga	31	51,062
Nkansi	13	22,367
Mpanda	16	24,744

Source: Survey results.





PROBLEMS ASSOCIATED WITH IMPROVED WATER SUPPLIES:

It is generally expected that villages with improved water schemes should at least experience less water problems compared to those with only traditional water sources. However it has been observed that most problems associated with traditional water supplies are also common to improved water schemes. Table 12 summarizes water problems associated with improved water supplies which as already noted are also associated with traditional water supplies. These problems were found to be caused by similar circumstances and have similar effects on the communities concerned. In addition to problems common to both traditional and improved water supplies, there are those problems that are peculiar to improved water supplies.

Table 12

PROBLEMS ASSOCIATED ALSO WITH IMPROVED WATER SUPPLIES

PROBLEM	PERCENTAGE OF VILLAGES EXPERIENCING PROBLEMS DISTRICT WISE		
	SUMBAWANGA n=31	NKANSI n=13	MPANDA n=12
Scarcity	2%	8%	0%
Contamination	13%	15%	8%
Distance	58%	31%	0%
Queueing	1%	23%	0%

Source: Survey results

Problems associated mostly with improved water supplies have a variety of causes and therefore require different solutions. These problems were said to make improved water supplies highly unreliable particularly pump operated water supplies. As already pointed during the visit to the region most improved water schemes were not functioning for one reason or another. It was claimed that gravity operated schemes appeared to be generally more reliable than pump operated water schemes. Gravity operated water schemes were said to cost less in operating and maintaining, and also required less organizational ability to operate and maintain.

Problems associated only with improved water supplies and which render them unreliable were found to be:-

a. Frequent and Long-term Breakdown of Water Schemes:

The breakages were found to be mainly due to inexperienced water scheme attendants or operators; this was particularly common to villages with water pump operated water schemes. This was due to the fact that water pump operators or attendants had had no training at all in the operation of the water pump system. Sometimes these breakages were also due to malicious destruction by unknown people. Due to lack of trained personnel to repair them, and due also to lack of spare parts and transport. It took several months even up to six months before the repairs could be done. This situation has some psychological effect on villagers. Reflecting on the promises of the government of improved water supplies given during "Operation Vijiji", and the expectations raised by physical water scheme construction, villagers get frustrated and angry when the new water schemes break down after a few months or even weeks of their construction. Sometimes the end result is a deliberate breakage of pipes, destruction of taps and other types of damages. When water scheme breakdowns get to be a regular phenomenon or lasts for several months the normal reaction on the part of the villagers is apathy and sometimes turning to cynicism towards the Ministry of Water and the Government in general. The most, serious effect of these frequent and long-term water scheme breakages is the reduction on villagers' willingness to participate in new water scheme construction or in rebuilding the old ones because they think that the scheme will not last long, before it breaks down again.

b. Lack of Enthusiasm, Motivation and Supervision:

Closely related to frequent breakdown of water schemes is a general lack of enthusiasm, motivation and supervision on the part of the water pump attendants. It appeared that most water pump attendants apart from being unskilled in their work, also have little interest in their work and do not take up their work seriously. This is probably due to lack of motivation. Some of the water pump attendants are not paid for the work they do, so they do not have a sense of commitment to their work and this

situation leads to carelessness and disruption of water schemes. Moreover water pump attendants are not adequately supervised by village leaders and the District Water Office. This situation leads to the slackness and negligence in the performance of their duties and this in turn leads to breakdown of water schemes. Under such conditions, signs of or the actual water scheme breakdowns are not promptly reported to the authorities for quick repair and remedy. There is a serious shortage of trained manpower at all levels (tables 13-15). Due to poor record keeping it was not possible to get a complete staff position for all years.

c. Lack of Fuel to Run the Pumps:

There have been irregular supply of diesel to the schemes. Three major reasons were given for lack of fuel:-

Firstly sometimes villages did not have sufficient funds to buy diesel when it was available. Secondly sometimes diesel was not available at all at the regional or district headquarters, consequently the water scheme did not function. Three, when villages had funds and diesel was available at the regional or district headquarters, often times there was no transport to take diesel to the villages.

d. Water Intake Points Drying Up:-

Sometimes water intake points dried up particularly during the dry season. This situation applies to both gravity operated as well as pump operated water schemes. This situation can be attributed to poor selection of water sources or design errors of the scheme.

e. Low Water Pressure From the Taps:-

Low water pressure from the taps caused much delay in filling up water vessels. This situation contributed to long queues of water drawers. Weak pumps particularly in Sumbawanga District were the major cause of low water pressure from the taps.

f. Queueing up for water:

After the completion of the villagization programme some villages grew up to twice or three times their original sizes. So, the population in these villages out grew the water facilities that existed before the completion of the programme. This resulted in people crowding around the few water points available in the village, and this in turn lead to people queueing up for water.

Table 1

DEPLOYMENT OF STAFF IN THE MINISTRY OF WATER AND ENERGY IN SUMBAWANGA DISTRICT

Designation	1980/81		
	Required	Present	Shortfall
District Water Eng.,	1	1	-
Technician IV	9	6	3
Technician Auxillary I	11	2	9
Assist. Technician I	-	-	-
Tech. Auxillary II	-	-	-
Technician	-	1	-
Water Technician IV	-	2	-
Water Technician II	-	2	-
Asst. Technician II	-	-	-
Asst. Hydrologist	-	1	-
Technician Att.	-	1	-
Water Technician	-	9	-
Driver/Mechanical	-	1	-
Asst., Technician	4	-	4
Water Technician III	-	2	-
Senior Water Technician II	-	1	-
Senior Water Technician III	-	1	-
Meter Readers	-	7	-
Lab. Technician IV	-	1	-
Ass. Executive Eng.	1	-	1

Source: Survey results.

g. Lack of Spare Parts:

As indicated earlier on, delays in repair of water schemes after breaking down is caused by lack of spare parts. Most spare parts for water supply schemes are imported. It has been known for some villages to have to wait for these spares for 6-18 months. During this entire period the village went without water from the scheme.

h. Unsatisfactory State of Cleanliness of the Water Points:

This problem is common to both gravity and pump operated water schemes. This situation applies to villages in which people do the bathing and washing of clothes at water source or at water points and where livestock get water from the same water sources.

8. IMPLICATIONS OF MODERN AND TRADITIONAL WATER SUPPLY PROBLEMS

(a) Use the Traditional Water Sources:-

The above mentioned water supply probmes imply that for certain periods of the year villagers suffer considerably from either complete lack of or scarcity of water. In villages in which both traditional and modern water supplies exist, the obvious consequence is that when modern or improved water supplies fail to supply water, villagers resort to traditional water supplies as their source of water. Such retrogressive action reduces the impact of modern or improved water supplies on both the social (health) and economic (productivity) aspects of the community concerned.

(b) Water Collection:

Water collection is mainly women's work also in Rukwa Region as it is in other parts of the country. Women accounted for more than half of the visits at the observed sources, and men accounted for less than one fifth of the visits (table 16). Men mainly collect water when it is in very short supply or when it is required for non-domestic uses particularly house building. Unmmarried men also collect water for their own personal use. Water is normally collected in the morning and late in the afternoon, that is before going to and after coming back from the fields. Children have their peak water collection in the latter part of the

Table 16

TYPES OF PERSONS COLLECTING WATER FOR DOMESTIC PURPOSES DURING VARIOUS SEASONS

DISTRICT WISE

Sex of water drawer	Rainy season	Dry season
SUMBAWANGA DISTRICT n = 227		
Women	71.50	71.90
Children	27.20	26.80
Men	1.30	1.30
NKANSI DISTRICT: n = 234		
Women	71.40	71.80
Children	28.50	27.80
Men	0.40	0.40
MPANDA DISTRICT: n = 223		
Women	71.30	71.30
Children	26.50	26.50
Men	2.20	2.00

Source: Household survey results.

mornings. In Rukwa Region there is a surprisingly large number of children collecting water during school hours. The above situation involves sacrificing several hours and great amount of energy daily for water collection which would have been spent usefully on more productive activities such as farming and handicraft or for promotng functional and non-functional literacy programmes or using the time for leisure.

c. Amount of Water Used:

This study shows that the average amount of water used is about 51 litres per household of about 5 members and 10.2 litres per person per day, but there are large variations between households. These variations are mainly explained by household size. Per capita per day water consumption varies also within seasons. Water consumption rate is lower during the dry season than during the rainy season. Water consumption rate is also affected by the distance between water points and the place to where water is carried for various uses. The amount of water drawn is determined by time, distance and the number of people drawing the water per household. When water is drawn only by women early in the morning and late in the afternoon and when the distance is long, water drawers can only manage to draw a limited amount of water and consequently use a limited amount of it too. Moreover large households have relatively more people using the water.

Some of the benefits expected from water schemes are associated with increased water consumption rates resulting from shorter distance from the house to the water point. The study shows that there is some effect of distance on water consumption rates. Although the effect is somewhat small it nevertheless gives an impression of the general trend in water consumption in relation to distance. The longer the distance to water points or sources the smaller becomes the amount of water fetched and consumed.

The small decrease in water use found with increasing distance shows that in addition to distance, water consumption rate is also determined by several other factors and that reduction in distance without looking into these other factors is unlikely to increase considerably water consumption rate.

Reduction in distance to fetch water will lead to reduction in time and energy spent on water collection. Time spent in collecting water is calculated using the following formula:

$$T = v(d.\ 30+5).$$

where T = time used

v = no. of visits to water source

30 = walking time per km (minutes)

d = distance to source in km

5 = time for queueing and filling the vessel (minutes)

A round trip to water source 1 km away is estimated to take $\frac{1}{2}$ hour. Time spent at water source is much more difficult to estimate. Time spent on both queueing for water and for filling water vessels vary. In this survey 5 minutes is used as an average figure for queueing and filling the vessels and 30 minutes for walking. Using the above formula one can calculate the time spent in water collection.

9. WATER SOURCES AND THEIR USES:

Most villages in Rukwa Region also have got more than two sources of water within reasonable distance from places of residence or villages. As described earlier there are two major groups of sources of water found in the region. First, improved or modern water sources or supplies includes: the tap, modern or improved wells, and boreholes. Second, traditional waters sources or supplies which includes: springs, rivers or streams, lakes and traditional wells. Generally water from modern or improved water sources or supplies is regarded by villagers to be of better quality. Sources of water in the above two major groups are ranked according to water quality. In the first group, the ranking starts with the highest water quality source as the tap, then modern wells and boreholes. In the second group the ranking is: springs, streams or rivers, lakes and traditional wells. Depending on the water sources available to the village, water for drinking and cooking is drawn from the highest water quality sources. Water from low or poor quality sources or supplies are used for other purposes such as washing, washing of clothes, cleaning of utensils and bathing.

There are however three major factors influencing villagers' decision as to which water source one goes to collect water, these are:-

(a) Distance to the Water Point

The distance from the water source to the village or residential area increased or decreased the number of households using that particular water source. Distance to water source seemed to be the most decisive factor in choosing between alternative sources.

(b) Water Quality:

Most households fetched water from water sources perceived by villagers to contain water of better quality. This applies particularly to drinking water. Water quality was the second decisive factor in choosing between alternative water sources.

(c) Suitability of Water Sources for Various Purposes

Tap water is perceived to be most suitable for drinking and cooking. Water from modern shallow wells and rivers come second in preference. The preference for tap water for drinking seems to be not only for health reasons but is also one of prestige.

10. USE OF WATER AT HOME OR AT SOURCE

Water sources in villages are located at varying distances from villages and households. For the sake of convenience water from these sources was used either at its source or was fetched and used at home for various domestic purposes and other non-domestic purposes such as house construction. (Table 17)

There is a clear indication that bathing and washing of clothes are the two activities most often done at water sources although there is an appreciable number of households which perform these activities both at home and at water sources. Water for drinking and cooking is fetched and almost exclusively used at home. Cleaning of utensils and washing is largely done at home. This is due to the relatively small amounts of water required to perform these two activities.

The use of water at home or at source seem to depend on the purpose for water use (table 17) and also depends on regulations imposed by the village government on the use of water from various water sources. In most village in Rukwa Region the village government forbids the bathing and washing of clothes at water sources in order to minimize health hazards through water pollution.

Bathing and washing of clothes are done at source due to the fact that relatively large amounts or volume of water is required to perform these two activities and less effort is required to carry clothes to the water source than carrying so much water home.

Table 17

PERCENTAGE OF HOUSEHOLDS USING WATER FOR DIFFERENT PURPOSES, AT HOME, AT WATER SOURCE AND AT BOTH PLACES

SUMBAWANGA DISTRICT

Purpose for water	At home only	At source only	Both (Home and source)
Drinking	98.8	00.0	1.2
Cooking	100.0	00.0	00.0
Cleaning of utensils	89.4	00.0	10.6
Washing	95.9	1.2	2.9
Bathing	61.2	0.6	38.2
Washing of clothes	25.9	35.3	38.8

n = 170

NKANSI DISTRICT

Drinking	99.4	00.0	0.6
Cooking	100.0	00.0	00.0
Cleaning of utensils	87.1	00.0	12.9
Washing	78.8	00.0	21.2
Bathing	58.2	00.0	41.8
Washing of clothes	14.7	27.6	57.7

n = 170

MPANDA DISTRICT

Drinking	100.0	00.0	00.0
Cooking	100.0	00.0	00.0
Cleaning of utensils	100.0	00.0	00.0
Washing	92.9	0.6	6.5
Bathing	87.6	1.8	10.6
Washing of clothes	64.1	17.6	18.3

n = 170

11. RAIN WATER

Rain water represents a potential additional source of water to villages. Use of this potential source is limited only to the days with rain within the rainy season. Moreover there is only a limited number of villagers using rain water for various domestic purposes when it is available. Out of 512 households interviewed only 75 (14.6%) said they used rain water as an additional water source. There are two mayor reasons for the low figure of households using rain water: First, respondents said that only a few households had containers for storing large amounts of water. Second, those who did not use it assumed that rain water collected from house roofs was dirty, because it contained particles of grass, had unbecoming taste, smell, yellowish brown colour from smoked grass roofs. Only about 12.1% of households having corrugated iron roofs used rain water as an additional source of water (Table 18). The distance from the water sources to the villages did not affect the use of rain water. The small number of households with grass roofed houses using rain water, obtained this water from holes in the ground and used for purposes for which quality does not matter.

Table 18

USE OF RAIN WATER IN RELATION TO ROOFING MATERIALS OF HOUSES

SUMBAWANGA DISTRICT

Roof materials	Percentage of households using rain water	
Iron sheets	40.0	n = 5
Grass	2.4	n = 165

NKANSI DISTRICT

Corrugated Iron sheets	63.0	n = 16
Grass	4.7	n = 149

MPANDA DISTRICT

Corrugated Iron sheet	97.6	n = 41
Grass	8.8	n = 136

Source: Household survey results

These results imply that improved economic position of villagers may lead to the construction of more corrugated iron roofed houses, under-ground constructed water reservoirs and the purchase of large containers. This will hopefully lead to an increased number of households using rain water.

12. HEALTH

Millions of people in third world countries die every year from diseases caused by unclean or inadequate water and poor sanitary conditions.

The health of the community everywhere depends largely on the ample supply of a wholesome water supply. Diseases of very varied character and nature are transmitted to man by water. The causal agents conveyed by the water may be chemical poisons,

pathogenic micro-organisms and high forms of life like worms. However certain diseases have also been ascribed to either deficiency or abundance of certain chemical substances in the water supply, for instance it is sometimes claimed in the medical field that absence of certain substance in water such as chlorine and calcium is detrimental to health. At the same time the presence of certain substances in water such as arsenic, lead and fluorine, lead to ill-health.

Health is one of the areas where benefits from improvements in the water supply situation are expected. But at the same time it is an area where the mechanisms supposed to lead to such changes are often rather vague. Existing evidence indicates that the relationship between improved water supply and improved health is very complex. Clean and adequate water supply does not necessarily bring better health. And, in some circumstances, improved water supplies can increase health risks when there is, for example, lack of proper drainage, or contamination by storage or transport in dirty containers. In addition, one cannot assume that availability of a water supply or excreta disposal system will ensure its use. Many factors influence the acceptability of water supply and sanitation system such as: health and general education, bathing and laundry practices, dietary habits, climate and economic factors. Clean and adequate water supply by itself will not bring better health unless it is supported by other factors like sanitation, but it will not be possible to bring better health without adeuquate clean water. In other words, clean water supply is not sufficient for good health, but it is a necessary pre-condition for it. The potential health benefits of an adequate clean water supply frequently fail to be realized because infections and parasitic diseases continue to be transmitted by routes which remain unaffected such as:-

1. Old polluted sources of water continue to be used for drinking purposes for reasons of preference or convenience, or breakdown of modern water supply.

2. The water from improved supplies is contaminated between the point of delivery and the point of ingestion, in carrying vessels, storage vessels, drinking vessels and handling.

3. Water, though made more accessible, is not optimally used for personal and domestic hygiene.

4. Waste disposal methods and environmental sanitation are not improved.

13. HEALTH FACILITIES IN RUKWA REGION

The present health situation in Rukwa Region can best be studied by examining the net work of health facilities, their accessibility and quality. The National objective for the health sector is to attain the standards of one bed per 100 people, one rural health centre per 50,000 people and finally one dispensary per 10,000 people. The network of health facilities in the region is well developed (Table 19), but their quality leaves much to be desired.

Table 19

NUMBER OF MEDICAL INSTITUTIONS AND THE NUMBER OF BEDS 1981

Medical institutions	Districts, number of institutions and people served		
	Sumbawanga	Nkansi	Mpanda
1. Hospitals	1	1	1
Number of Beds	175	45	70
2. Number of Health centres	2	1	3
Number of Beds	40	20	67
3. Number of Dispensaries	31	14	23
4. Number of Dispensaries with beds	5	3	3
Number of Beds	86	68	61
5. Total population	213,144	90,987	140,914

Source: Survey results

By mid-1981, there were a total of 74 dispensaries and health centres altogether in the Region. However there is variation as regards their distribution both in the districts and divisions of the respective districts. For instance Sumbawanga District is well covered, but people living in Matai and Rukwa valley areas in the same district have to walk a considerable distance to a dispensary. This applies also to people living in villages along Lake Tanganyika in all Sumbawanga, Mpanda and Nkansi Districts. The problem of transport and communication both within the region and to the regional capital is rather serious. Most of the feeder roads are seasonal and thus make it very difficult to supply drugs and other medical equipment especially during rainy season. Since the regional hospital is supposed to supervise the district hospitals which in turn supervise the health centres and dispensaries, lack of efficient transport and communication system, makes the referral system extremely difficult. Staff position in the region (table 20) is also discouraging.

Table 20

MEDICAL STAFF POSITION

DISTRICT	Number of Doctors	Medical Assistants	Nurses	RMA
Sumbawanga (Urban and Rural)	6	23	11	23
Mpanda	2	11	30	27
Nkansi	-	10	14	2

Source: Survey results

14. DISEASE INCIDENCES IN RUKWA REGION

The main interest as regards the pattern of disease incidences in the region is focussed on those diseases that have some connections with water. The records obtained from the regional hospital, health centres and dispensaries, clearly show a very close relationship between the various forms of diseases and the present water situation in the region.

As pointed out earlier nearly 87% of the total number of villages in the region get water from traditional water sources. However these water sources are dominated by the common water source diseases.

It is important to note here that most of the dispensaries in the region had their health statistics incomplete apparently due to lack of medical equipment and shortage of staff. It is therefore very difficult to have a standard diagnosis of the various diseases especially in the poorly equipped village dispensaries. Nevertheless efforts were made to obtain health statistics from 1[illegible] dispensaries scattered all over the region out of a total of [illegible]8 (tables 21, 22, and 23). These diseases are illistrated in figures 4, 5, and 6, for some dispensaries.

Table 21

DISEASE PATTERN AND INCIDENCES IN 1978

Disease	Dispensaries and total number of cases reported				Total Number
	Chonga	Inyonga	Muze	Nkundi	
Schistosomiasis	-	1304	-	-	1304
Malaria	805	[illegible]904	-	-	7[illegible]09
Diarrhoea	2317	-	-	-	2317
Diarhoea and Dysentery	-	2973	-	-	2973
Conjunctivitis	1703	-	-	43	174[illegible]
Worms	-	473	3	1421	1897
Abdominal pain	4922	-	-	383	5305
Other eye dieases	-	-	-	[illegible]11	[illegible]11

Source: Survey results

Table 22

DISEASE PATTERN AND INCIDENCES 1979

DISEASES.	Dispensaries and total number of cases reported.													
	Kasense	Milepa	Mtowisa	Muze	Chala	Kirendo	Namanyere	Nkundi	Inyonga	Kasokola	Ugalla	Igaluhenge	Usevya	TOTAL
Schistosamiasis	-	120	541	14	-	261	9	-	1528	9	-	48	47	2577
Gatro-enteritis	-	182	-	-	481	138	26	-	1255	177	162	584	9054	1209
Dysentery(Bed.Amb)	398	56	780	-	-	175	-	-	-	-	108	-	771	2288
Malaria	238	347	2340	144	292	-	162	2256	6323	1236	3216	1083	25945	43582
Diarrhoea	-	-	-	-	-	-	-	1155	-	-	-	120	-	1275
Diarrhoea & Dysentery	-	-	-	-	-	-	-	-	2980	586	-	-	-	3566
Eye disease	602	-	35	988	-	-	-	-	-	-	-	-	-	1625
Cholera	-	-	-	-	-	108	-	-	-	-	-	-	-	108
Conjunctivitis	-	-	-	-	-	69	-	192	-	-	-	-	-	261
Gastritis	-	5	359	-	-	-	3	-	-	-	-	-	-	367
Scabies	-	67	275	-	85	-	-	-	-	-	-	-	-	427
Worms	109	111	1123	8	-	1104	3	29	134	122	48	212	203	3206
Elephantiasis	-	-	-	-	-	-	-	-	-	56	-	-	-	56
Abdominal pains	-	-	-	-	-	-	-	1298	-	-	-	-	-	1298
Ascariasis	-	-	-	-	-	-	-	-	-	-	51	-	3	54

Source: Survey results

Table 23

DISEASE PATTERN AND INCIDENCES UNTIL JUNE 1980.

DISEASES	Dispensaries and total Number of cases reported									TOTAL
	Milepa	Chala	Kilangala	Kirando	Nkundi	Kasokola	Ugalla	Igaluhenge	Usenya	
Schistosomiasis	61	-	22	665	-	2	1	25	53	827
Gastro-enteritis	116	207	97	385	-	-	134	133	2198	3270
Dysentery (Bed.Amb)	58	10	102	98	-	76	103	14	412	873
Malaria	247	194	142	-	-	751	2355	712	14156	18557
Typhoid	-	-	2	-	-	-	-	-	-	2
Skin diseas of sub-cutaneuos	45	61	-	-	-	-	-	-	-	106
Diarrhoea	-	-	-	-	375	-	-	71	-	446
Trachomonasis	-	-	39	-	-	-	-	-	-	39
Conjunctivitis	-	-	-	164	77	-	-	-	-	241
Gastritis of duodentis	4	4	-	-	-	-	-	-	-	8
Goitre	-	-	1017	-	-	-	-	-	-	1017
Worms	38	-	-	469	7	53	70	52	97	786
Abdominal paims	-	-	-	-	684	-	-	-	-	684
Inflamatory dis. of eyes	136	417	-	-	-	-	-	-	-	553
Other eye diseases	-	-	-	-	265	203	-	-	-	468
Ascariasis	-	-	-	-	-	-	53	-	35	88
Sleeping sickness	-	-	-	-	-	-	4	-	-	4
Skin sepsis	-	-	-	-	-	-	-	31	36	67
Digestive System	-	-	-	-	-	-	-	99	111	210
Eye diseases	-	-	-	-	-	-	-	36	442	488

Source: Survey results

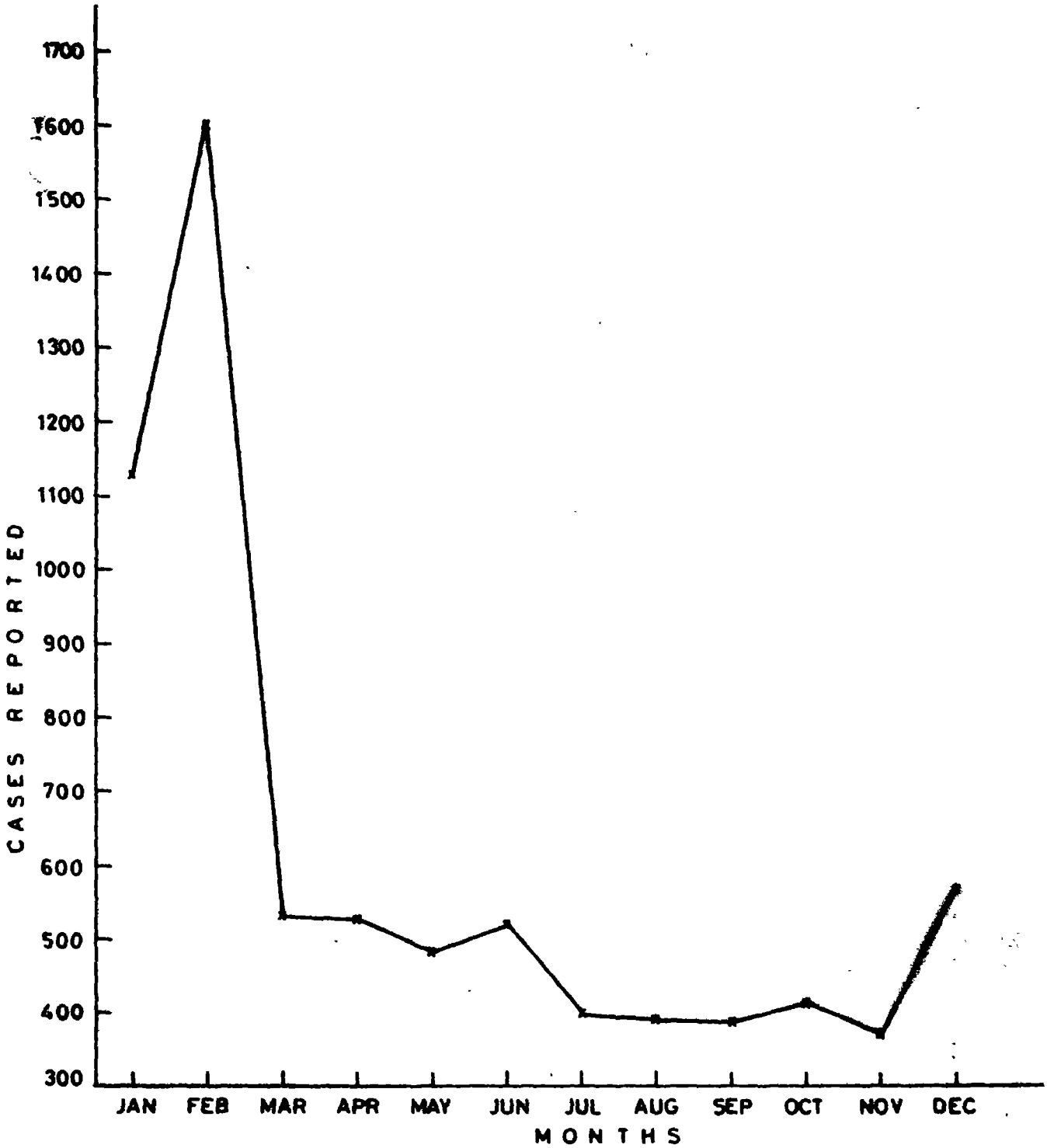


Figure 4.MONTHLY VARIATION IN INCIDENCE OF MALARIA AT THREE DISPENSARIES IN SUMBAWANGA DISTRICT.

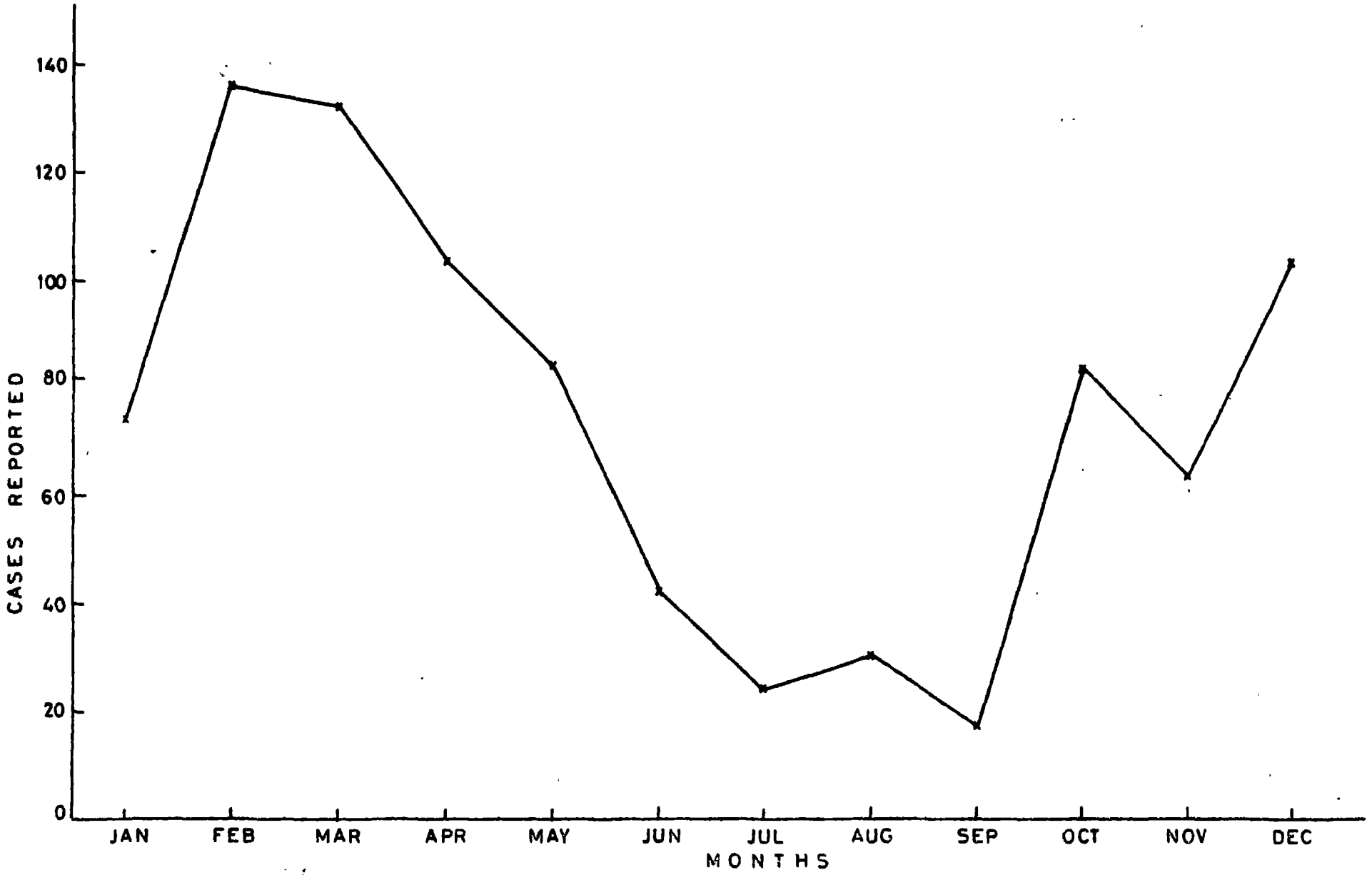


Figure 5 .MONTHLY VARIATION IN INCIDENCE OF DIARRHOEA AND DYSENTERY AT THREE DISPENSARIES IN SUMBAWANGA DISTRICT.

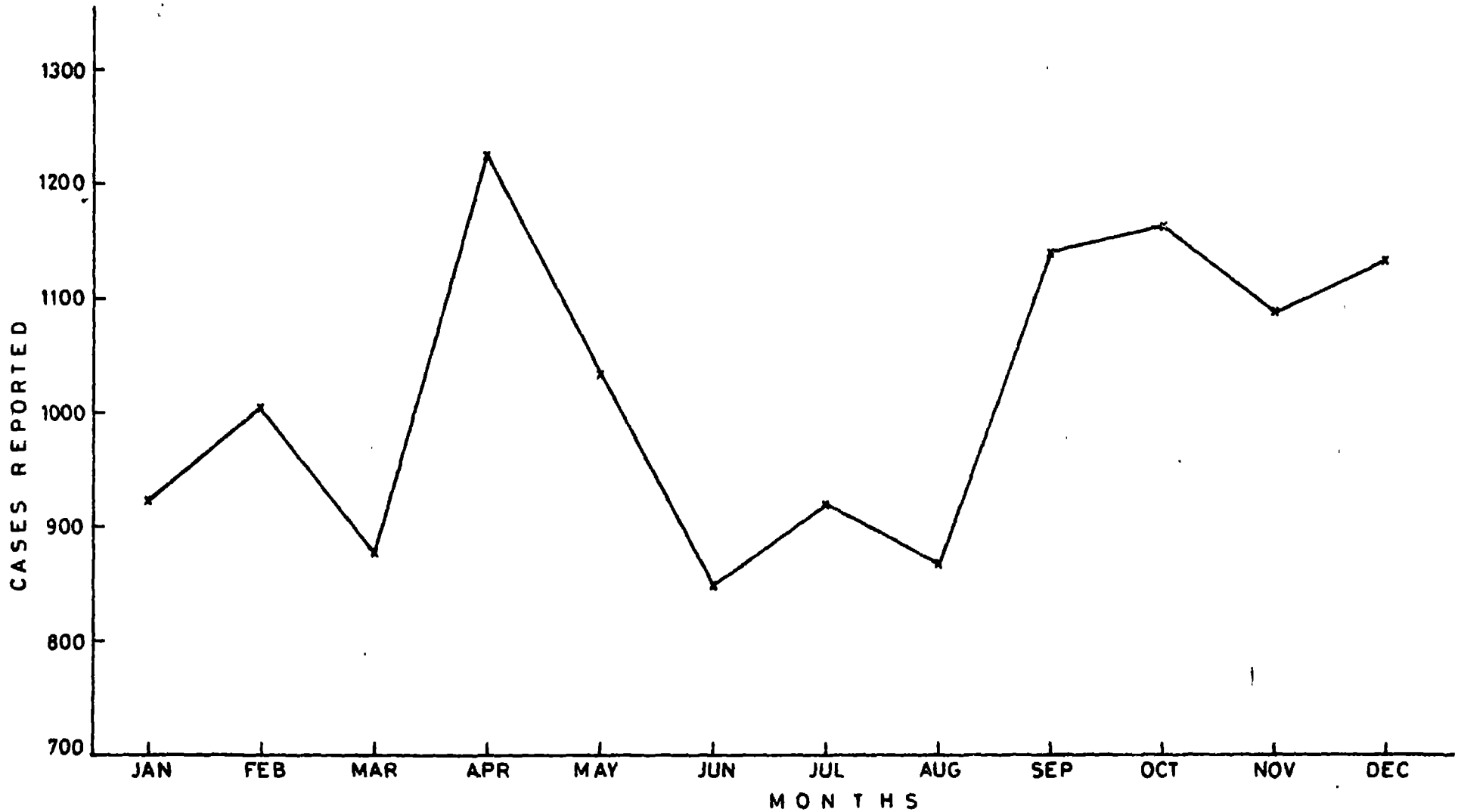


Figure 6.MONTHLY VARIATION IN INCIDENCE OF MALARIA AT FIVE DISPENSARIES IN NKASI DISTRICT.

The common diseases mentioned were divided into five categories:

(i) Water - borne diseases
(ii) Water-washed diseases
(iii) Water-based diseases
(iv) Water-related diseases
(v) Water-mineral deficiency

(a) Water-borne diseases

Typhoid, hepatitis, cholera and diarrhoea were reported as common diseases along lake Tanganyika Shore particularly in Mpanda and Nkansi Districts. Diarrhoea and typhoid are also common on the Ufipa Plateau. Water-borne diseases are infectious and can be transmitted to people when they drink water contaminated by pathogenic organisms. The infective mechanisms is faecal material which has access to sources for human consumption. This situation suggests that the water supply gets polluted at some central points and the infected water is carried to the consumers. This situation is likely to be so because the water supplies are not chlorinated otherwise the microbes would have been killed before anyone is infected. Other possibilities for the sources of microbes are the contaminated containers used for storage and carrying water (tins, buckets, pots gourds etc...) and the polluter who is a disease carrier who goes to fetch water or comes into direct contact with the drinking water or food. This results from poor sanitary conditions prevailing in the areas concerned. Drinking water is not the sole medium, the above mentioned diseases can also be transmitted directly through the faecal-oral or ano-oral route and are thus closely related to personal hygiene.

Respondents indirectly believe and expect tremendous reduction in the incidences of these diseases through improved water supply. They expect that piped water and water from modern wells will have less chance of getting into contact with faecal material or any other materials which will pollute it. They also think that adequate amounts of water would raise the standard of personal and household hygiene.

(b) Water-washed Diseases

Water-washed diseases found to be common in the region include both gastro-enteritis and shigella dysentary (intestinal diseases), scabies (cutaneous diseases), skin sepsis, eye infections such as trachoma and infections transmitted by fleas, lice, ticks and mites. The faecal-oral infections mentioned above are also classified as water-washed. Strickly speaking water-washed diseases are infections caused by lack of water for personal and household hygiene. Water-washed diseases were found to be most common in the areas badly affected by shortage of water. Respondents in these areas said that due to lack of water they were not able to wash their clothes, domestic utensils and take baths as often as they would have liked to. They expected that improved water supply by making available an increased volume of water for washing and cleaning, would be instrumental in reducing the incidences of water-washed diseases.

(c) Water-based Diseases

Water-based diseases reported as common in the region were schistosomiasis (percutaneous disease) and worms (ingested disease). Schistosomiasis was reported to be endemic in many parts of the region and most severe in Rukwa Valley. Isolated cases were also reported along lake Tanganyika shore. Villagers believe that improved water supply including proper water management around residential areas would eliminate or reduce the number of these diseases.

(d) Water-related Insect Vectors

The common water-related insect vectors in Rukwa Region are Malaria (water breeding) which is transmitted to man by mosquitoes breeding in water ponds and the tsetse causing sleeping sickness Malaria was reported as the most serious disease along Lake Tanganyika and the swampy shores of Lake Rukwa. The infections with water related insect vectors may depend on domestic water supply arrangements. Water collection and water storage near people's homes may form suitable breeding ground for the vector mosquito. Sleeping sickness in quite a number of cases is dependent on people going to the streams through the riverine bush infested by

tsetse to fetch water or firewood. Respondents expressed their confidence that improvement in domestic water supplies through piped-water to the village or the construction of modern wells near the villages and proper management of water around households would reduce the incidences of malaria and sleeping sickness.

(e) Water Mineral Deficiency

Exceptionally high rate of incidences of goitre was observed in villages around Kilangala Dispensary on the road from Sumbawanga to Mpanda in Nkansi District. Fifty percent of the villagers interviewed did not know the cause of this disease. The other half said that the disease was caused by water but did not know how. This latter half of respondents expressed some hope that improved water supply could solve the problem. It is said that the disease is caused by the deficiency of iodine in drinking water. Treatment of water with the missing mineral might reduce the incidence of goitre, and this is one aspect of improved water supply. There were few cases reported in dispensaries. This means that the majority of victims did not go for treatment at the dispensary and used local medicine. It could also mean that the disease was not taken seriously to warrant victims to go for treatment.

15. WATER AND ECONOMIC DEVELOPMENT POTENTIAL

Rural water supply in Tanzania is basically a social-service and is being provided free of charge in rural areas. However the aim of this programme is not only geared towards increased standard of health of the rural population, but also to act as a catalyst so as to stimulate some economic development. The relationship between improved water supply and health on the one hand and improved health and economic development on the other hand therefore is of special interest in this study. A greater capacity to produce, very much depends on the health situation in the society, of which provision of improved water supply contributes tremendously. Finally it is important to note that some of the rural water schemes in Tanzania are constructed primarily for domestic purposes, while others are multi-purpose. For instance a hydro-electric scheme can also be used as a source of

water for domestic water supply, flood control and available water can be used for irrigation. The latter will contribute to increased agricultural and livestock production. The water reservoir created can be used for fish production. Improvement in all these sectors will contribute towards economic growth and improved health and nutrition.

Like most other regions in Tanzania mainland, the socio-economic infrastructure of the villages in Rukwa Region has been very much influenced by the 1974 villagization programme. When people were moved from their old scattered homesteads into new planned villages there was a need to re-organize the whole socio-economic set up so as to cope with the new settlement pattern. Some of the new infrastructural facilities established in the region include storage and crop handling facilities, transportation, credit facilities, research and training facilities in support of agricultural development.

(a) Agriculture

The economy of Rukwa region is based on agriculture. It is estimated that over 90 percent of the population are engaged in crop and livestock production. This compares with the national figure of 85 percent which depends on agriculture for their living. The remaining 10 percent is engaged in fishing along Lakes Tanganyika and Rukwa. Other petty economic activities include lumbering, handicrafts and trade.

Traditionally the major crops grown in the region are maize, finger millet, sorghum, wheat, paddy, beans, cassava, groundnuts and Irish potatoes. Other crops grown include grams, pigeon peas, sweet potatoes, bananas, simsim, sunflower, castor, a wide variety of vegetables and cirtus fruits. These crops are grown both for domestic consumption and for sale. The small size of the farms reflects the traditional method of cultivation (handhole cultivation). Large scale farming is confined to the few state owned farms, while communal or collective farming is increasingly becoming common and important.

One of the major advantages of Rukwa Region is its suitability for food production. The region is self-reliant in food production and is capable of producing an even greater surplus. Reliable

measurement of the actual crop yields is impossible to get because villagers do not keep production records on individual fields. However table 24 shows records of crop sales obtained from the National Milling Corporation (NMC). This table does not reflect realistic production figures for the region because it only shows part of the surpluses or the amounts of produce which passed through the open market. It does not show the amount consumed at home and the amounts sold through the unofficial or black market. Regional Authorities remarked that substantial amounts of crops produced in the region find their way through black market to neighbouring countries of Zambia and Zaire. The black market has lately become very popular due to the exceptionally high prices offered, and the difficulties involved, particularly that of late payment for the crops sold through the National Institutions.

TABLE 24

AMOUNT AND VALUE OF CROPS SOLD THROUGH NATIONAL MILLING CORPORATION FOR THE CROP SEASON 1978/79

C R O P	Amount sold in Kgs	Value in Shs
Maize	15,875,225	15,875,225,00
Finger millet	8,108,656	16,217,312.00
Beans	8,250,000	24,750,270.00
Cow peas	76,253	247,822.25
Sorghum	318,424	318,242.00
Cassava	1,291,792	1,489,664.00
Paddy	385,051	577,576.00
Wheet	212,860	286,361.00
Soya	85,738	192,910.50
Bulrush millet	90	90.00
Pigeon peas	4,071	14,248.50
Chick peas	367,128	1,101,384.00
Other crops	1,235	286,927.00
TOTAL	34,976,615	61,358,215.55

Source: Survey results.

The average area cultivated by a family is 5.4 acres, but variations both between and within villages are expected taking into account factors such as family size and income status.

Apart from climate and soil type which determine the type of crops grown at any specific area, crop production can best be studied under five district agro-ecological zones found in the region.

(i) The Rukwa Valley Zone

Most of this area (nearly half) was originally covered by the lake and extends in a north-west direction. This is the driest zone in the region receiving between 800-900mm of rainfall. Most of the area consists of sandy sediment and are poorly drained. The Rukwa valley is sparsely populated, with most of its eastern part used for grazing. This is occupied by the semi-pastoralists Wasukuma usually raising large herds of cattle. The southern section of the valley is occupied by the Wafipa whose major occupation is both livestock keeping and crop production. The northern part is occupied by Wasukuma who are pastoralists and Wapimbwe who are mostly fishermen and hunters. The methods of cultivation used especially as a traditional way of preserving soil fertility, include intercropping and ridging system, semi-intensive and seasonal fallow. Most of the crops grown include maize, figner millet, rice, beans, tobacco and vegetables.

(ii) The Ufipa Plateau Zone

The plateau lies between the two arms of the rift Valley. It receives moderate rainfall of between 900-1000mm. especially around the central part of the plateau. The soils are mostly of ferrallitic type which have very low value of nitrogen and phosphorous. However due to the high base saturation, the soils recover their mineral nutrients within a very short time of fallow. It is therefore suitable for peasant agriculture and accounts for nearly 49 per cent of the regions population. The zone is mostly occupied by Wafipa who practice a uniform agricultural system characterized by the traditional compost mound locally known as "intumba", ox-cultivation is increasingly becoming popular and it is slowly replacing the traditional "intumba" system. A wide

range of crops is grown, including maize, beans, finger millet, cassava, wheat, groundnuts, potatoes and vegetables. The several rivers which intersect the plateau could be utilized for small irrigation schemes.

(iii) The Lake Tanganyika Shore Zone

The Lake Tanganyika shore is characterized by a continuous chain of steep hills and forms a very narrow coastal belt. This offers only a limited agricultural area. Settlements and small farm plots are concentrated on the lacustrine terraces. Most areas along the coastal belt receive the highest rainfall between 1000-1300mm. Since fishing is the most important occupation of the villagers along the lake shore, very little time is devoted to agriculture. Only a limited number of crops are grown including rice, cassava, maize and tree crops such as palm oil. Future agricultural planning along the lake shore, should focus on the expansion of small scale irrigation utilizing the lake water for growing vegetables.

(iv) Katumba Plain Zone

The Katumba plain in Mpanda District is covered by the tse-tse infested miombo woodland. Cultivation is therefore confined to cleared pockets which are usually densely populated. These include the refugee settlements at Katumba and other villages such as Inyonga, Ilunde and Nsimba. Though the plain consists of the most suitable soils of high potential for agriculture, the sizes of farms are usually small compared to the other zones. This is due to the difficulty involved in clearing dense miombo woodland using simple hand tools, and the absence of cattle which could be utilized for ox-cultivation. The most important crops grown are tobacco, cassava, groundnuts, tobacco , maize and beans. Irrigation farming would increase agricultural production.

(v) Mwese-Mpanda Ranges Zone -

The Mwese highlands also receives heavy rainfall of between 900-1300mm. The soil is exceptionally fertile and the agricultural system practiced is similar to that of the Ufipa plateau. Main

crops grown on the highlands are maize and beans. In the valleys where permanent streams are found, vegetables, potatoes and bananas are grown under simple irrigation. This zone is relatively potentially suitable for irrigation farming.

(b) Inputs for Agricultural Production

For the last few years there have been a continuous increase in agricultural production. This increase is mainly attributed to an increase in the area cultivated, but it is also due to an increase in the use of agricultural production inputs such as fertilizers and insecticides as well as improved varieties of seeds. This is the result of positive response to agricultural extension services. There are differences among districts in the use of agricultural production inputs depending on the types of crops grown and geographical location of the area. These differences are insignificant. Maximum profits from an increase in the use of agricultural production inputs would be realized if irrigation farming would be widely used because it would allow crop production all-year round, irrespective of rainfall. Sumbawanga District has the largest number of villages using fertilizers and insecticides, while Mpanda and Nkansi Districts are second and third respectively. The same situation prevails as regards the use of ox-plough, tractors and granaries.

(c) Credit Facilities

Production credits for the purchase of fertilizers, insecticides and seeds are given to village governments which in turn extends them to individual villagers or farmers. Tanzania Rural Development Bank is the main financial institution offering agricultural production credits. Credit programmes directed to Agricultural production in form of irrigation farming would increase production. In turn, increased agricultural production would improve farmers ability to repay the loan.

(d) Marketing facilities

Marketing facilities in the region are satisfactory since crop Authorities and Boards buy crops within villages where they are produced. These provide the necessary items such as cash boxes, weighing machines, bags and transport. Marketing system

development is hindered by the transportation system characterized by the in-accessible roads and lack of adequate number of vehicles. Financially the marketing system has been slightly improved by the introduction of village book-keeping system for village accounts and record keeping. This system which was introduced by the Prime Minister's office has greatly assisted the effort of the crop marketing parastatals e.g. NMC, GAPEX, TCA, TTA, etc.

(e) Industries

There exists a high potential for small scale industrial development in the region judged from the wide varieties of handicrafts currently available in the region together with the number of craftsmen involved and the income earned from those activities. The types of small-scale industries undertaken in the region include blacksmithery, carpentery, sawmilling, tailoring, pottery, brickmaking, basket making, mat making, weaving, boat making and wood carring. Most of the products are for local consumption.

Other current industrial activities include those that are based on the processing of farm products such as groundnuts, palm oil fruits and kernels and simsim for the production of cooking oil, soap making, cotton cake making and for weaving.

Small scale industrial activities are hampered by a number of factors such as lack of electric power, inadequate water supply, lack of marketing opportunities, lack of credit facilites, lack of tools and workshops and finally lack of transport facilities to move raw materials and finished products to where they are needed. Water supply improvement will not only increase the ability of the region in processing farm products but will also aid in the production of hydro-electric power for small scale industrial activities.

(f) Fisheries

Rukwa region is well situated to respond to the government's call for increased fish production. Although there is no reliable data on fish production in the region, there is enough evidence that fish production in the region could be substantially increased. Fish resources in the region include Lake Tanganyika, which is the

major fish resource in the country, Lake Rukwa, and several small lakes, and rivers. To supplement the natural fisheries mentioned above and make fish more available in the remoter parts of the region, few fish ponds have been introduced particularly in Mpanda District. There are only six recognized fish ponds for the entire region, four of these are man-made and the other two are natural ponds. The potential for fish production from artificial or man-made ponds is high if better water resources management could be introduced in the rural areas. For the lake shore villages, fish processing, transportation and storage hinder the development of this important industry.

(g) Forestry

Forestry is an important activity because of its linkage with other economic sectors. Moreover the vegetation of an area has an important bearing on the ecology of a habitat and the ecosystem as a whole. The ecological conditions can determine the productivity of agriculture, and water supply will be seriously affected by disturbing the ecology through vegetation destruction or poor management. Further more, serious soil erosion can result. Additional benefits of trees include provision of fuel and building materials. Provision of adequate reliable water supply to villages would enable the establishment of (tree) nurseries for use in afforestation programme. The National campaign for planting trees will only succeed if there are enough (tree-)nurseries in villages.

Presently large tracks of land in the region have been cleared of vegetation for fuel (mainly charcoal burning), house construction and for curing tobacco. This situation may lead to desertification of the region with its serious consequences. There are only nine government forest reserves in Mpanda District. These include Inyonga, Mulele, Rungwa River, Msaginya, Kabungu, Nkamba, Tongwe Estate, Ugalla, and Mpanda North-East forest reserves. Those in Sumbawanga District include: Kalambo river, Kalambo falls, Mbizi and Ilemba. In Nkansi District there are only two forest reserves. These are Kizi and Loasi river forest reserve. There are only three forest plantations for the whole region. These are located at Mwese in Mpanda District, Muva and Makuzani in Sumbawanga District.

(h) Livestock

Livestock production is the second most important economic activity of Rukwa Region. Ownership of livestock in the region is of three types: individual or private ownership, ownership by the village government and finally ownership by the District Development Corporation and Parastatal Organizations.

The present pattern of livestock keeping is characterized by small herds and a fairly even distribution of cattle throughout the peasant community. Livestock population is however slightly concentrated on the Ufipa plateau, particularly in Sumbawanga District where vast natural grassland exists and the absence of tsetse flies. During the last few years there has been an increase in cattle population in Rukwa Valley in Sumbawanga District and also a similar increase of cattle in Nkansi District. This increase has been partly due to the immigration of the pastoralist Wasukuma into the region and partly due to a slight improvement in animal husbandry practices which include dipping of cattle against tick-borne diseases. Table 25 based on figures obtained from the livestock census of 1979, shows the type and number of livestock in the region. These figures are slightly on the lower side due to the difficulties experienced in counting because some individual villagers were not willing to release the correct figure of the animals they own.

Table 25

LIVESTOCK POPULATION - 1979

District	TYPE OF LIVESTOCK				
	Cattle	Sheep	Goat	Pigs	Donkeys
Sumbawanga & Nkansi	113,786	18,596	26,642	14,323	1,698
Mpanda	70,038	1,958	9,849	2,984	-
Total for the Region	183,824	20,554	36,491	17,307	1,698

Source: Livestock census, 1979

Cattle raising is not practised along the shore of Lake Tanganyika except for lacustrine terraces. Goats are kept along the shore because they can withstand the rugged landscape and the tsetse infested hinterlands. The concentration of livestock in Mpanda is in refugee settlement areas such as Katumba Plain and other areas which have been occupied by the pastoral Wasukuma. There are also appreciable number of cattle in Mwese-Mpanda Ranges. These are half-breed dairly cattle which were introduced into Mpanda District a few years ago.

The major constraints in livestock raising, particularly cattle, are diseases and inadequate amount of water in some areas with high potential. The main cattle diseases include (i) east coast fever (ii) foot and mouth disease (iii) anthrax (iv) black quarter (v) liver flukes (vi) try-panosomiasis (vii) anaplasmosis and (viii) red water.

Some areas with high potential, such as many parts of Mpanda and Nkansi Districts, are virtually devoid of cattle because of the lack of water which precludes the construction and use of cattle dips for controlling tick-borne and tsetse-related diseases. Generally, livestock facilities in the region are inadequate (Table 26). The veterinary division has focused mainly on dipping to combat tick-borne diseases in those areas where water is sufficient for this purpose.

Table 26

LIVESTOCK FACILITIES - 1979

District	Man-made livestock watering points	Livestock dips
Sumbawanga	-	18
Nkansi	3	7
Mpanda	1	5

Source: Survey results.

The most difficult grazing months are June to October when grass in burnt and also in short supply. During this period livestock are driven long distances in search of food and water to swampy areas or rivers. This is the time they come into contact with tsetse in some uncleared areas. Water supply development in villages will help in controlling the fatal diseases (East coast fever and trypanosomiasis) and providing drinking water to livestock. This situation would increase livestock production in the region.

(i) Irrigation farming

There is potential for irrigation farming in the region using river, dam and lake water (Figure 7). In some places where the water table is high small scale irrigation schemes based on the use of ground water might be possible. Currently irrigation farming is done on a very small scale. There are very few people practising irrigation farming either on a communal or individual basis or through government, parastatal or private institutions.

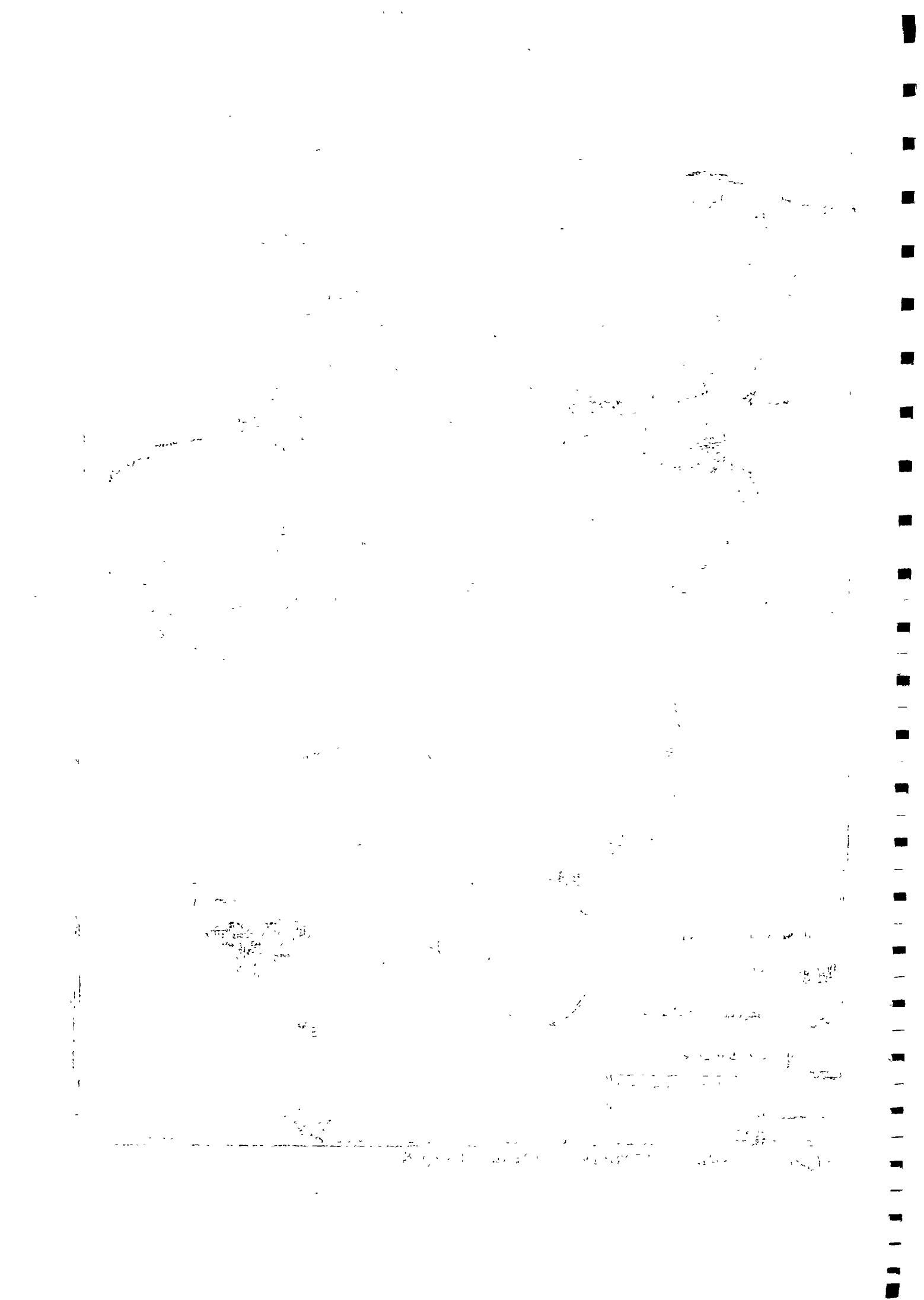
Sumbawanga District has potential for irrigation farming but there are only six recognized irrigation schemes for the entire district and these cover only 70 hectares. The main crops grown under irrigation include maize, rice, and a wide variety of vegetables and fruits. These schemes are located and owned by the following:

1. Kifinga village - Government irrigation scheme
2. Kisa village - Village irrigation scheme
3. Msanzi village - Village irrigation scheme
4. Matai village - Private irrigation scheme
5. Ulumi village - Private irrigation scheme
6. Ulumi village - Government irrigation scheme

In Mpanda District there are only two recognized irrigation schemes both of which are owned and operated on communal or collective basis.

These are:-

1. Urwira village - Village irrigation scheme
2. Katumba settlement - Settlement irrigation scheme



The total area covered by the two schemes is about 421 hectares. The main crops grown under irrigation include maize, rice, beans and a wide variety of vegetables. The district has potential for irrigation farming which has not been fully exploited.

In Mkansi District there are only two irrigation schemes covering slightly over 21 hectares. One of these schemes is located at China Village and is owned by the village. The other is located at Lusembwa near Kanteme village and is owned by an individual peasant.

The above mentioned schemes are in their infancy stage and a feasibility study based on water-resources, engineering, agricultural and economic aspects should be made in order to assess the potentiality for irrigation farming in the region.

One river that has been studied in respect of irrigation is Luiche river in Sumbawanga District. By regulating water flow from this river with a dam, an even supply of water would be made available for irrigation purposes. It is estimated that with an even flow of $1 m^3/s$ it would be possible to irrigate some 700 ha. It is advised, however that the area to be irrigated must be carefully selected because most soils in this part of Rukwa valley through which the river flow have a sandy texture and are not conducive to irrigation.

But some soils along the flood plains of Luiche river have a texture which renders them suitable for irrigation. Luiche river could at the same time be used for hydro-electric production for use in Sumbawanga, the regional headquarters. The provision of electricity to Sumbawanga town would stimulate small scale industrial activities.

It is clear from the above that proper water management resources would not only help in implementing the party's declaration on irrigation farming given in Iringa in 1974 under SIASA NI KILIMO but would also increase agricultural production and improve the nutritional status of the people (protein) both of which would lead to social and economic development of the region.

(j) Hydro-electric Power Production

It is only last year (1980) when Sumbawanga town (Regional headquarters) was provided with thermo-electric power. Before that it used to be the only regional centre or headquarters in Tanzania without a general supply of electricity. The only few institutions equipped with small diesel or petrol driven generators were the hospital, the bank and the mission.

There are a few individually owned electric supplies in the region. Of the few electric supplies in the region only two are hydro-electric generators, one in Nkansi District and the other in Mpanda District. The small scale industrial activities in towns and villages are discouraged by lack of economical sources of energy. The initiation of certain social services in the region are also hampered. Metal work is made difficult, and major repairs of vehicles and machinery cannot be performed in the region economically. There is a great demand for a sawmill industry in all towns and in some villages but investment will not pay off until reasonably priced electricity is available. Furthermore, the absence of street lights in towns hampers all social activities after sunset.

It is envisaged that if cheap electricity could be provided, the adult education programme could expand considerably. It is questionable whether the presently installed thermo-electric power plant in Sumbawanga will offer easy solutions to these problems, letting alone its low capacity to satisfy electric requirement for the rapidly expanding town.

Within Rukwa Region there are several rivers which could be considered for hydro-electric power development. These rivers would form cheap and permanent electric power solution to the region (Table 27) In the past, some recommendations were given that Luiche river be harnessed for hydro-electric power production because of its approximity to Sumbawanga town (20km) and its potential for irrigation below the escarpment in Uzia (Rukwa Valley). It is however not clear as to why this suggestion was not taken. Instead a thermo-electric generator was installed which is definitely several times more expensive to operate and maintain than the hydropower plant.

The importance of hydro-electric power to both social and economic development cannot be over emphasized. The introduction of water resource management in the region would spark off or be instrumental to regional development.

Table 27

SOME RIVERS WITH HYDRO-POWER POTENTIAL

River	Estimated power potential in Megawatts
Rungwa	20 - 50
Msadya/Mfwizi	25
Kalambo	71
Lwiche	0.8
Muze	

Source: Baseline Report for Integrated Development of Rukwa Region, BRALUP, 1977.

16. COMMUNITY PARTICIPATION IN WATER SUPPLY PROGRAMMES

The success of rural water supply programmes does not only depend on Government's degree of commitment, financial resources and technical manpower resources, but depends much on the villager's understanding of the value of improved water supply programmes and their attitudes towards these programmes. Villagers understanding of the value of water supply programmes and their attitudes towards them are functions that indicate the level of villagers' participation or involvement in the planning, construction, administration, operation and maintenance of water supplies.

There are several arguments in favour of local participation in improved water supply programmes. Some of those arguments are:-

1. Local or community participation reduces the financial burden on the government in constructing, operating and maintaining the water schemes and is in line with the policy of self-reliance. Financial constraint is one of the causes for the delay in providing

water in the rural areas. Through community participation villagers could contribute free labour or cash for the installation and subsequent maintenance of the water schemes. This includes the actual digging of trenches, collecting building materials (e.g. stones), building of structures to house the machines; the purchase of petrol, spare parts, the payment of water attendants and meeting the transport cost of materials and personnel to the villages for the maintenance of the water supply.

2. It helps to instill in their minds or create a local sense of ownership and responsibility, which will ensure that villagers actually use the scheme, prevent damage to it, repair it when out of order and help in achieving the benefits expected from the water scheme. This will ensure that the scheme functions all-year round.

3. It helps in building up local capacity for operation and maintenance of the schemes. Often villagers do not know how the water scheme functions and in case of breakdown it is only the experts from the district headquarters who can do the repairs. Community participation in the operation and maintenance of the schemes would help in developing some maintenance skills among some villagers who could take over some repair work.

4. It helps in the contribution of vital information about the areas in which the water schemes are to be constructed e.g. floods, ground water table, perennial or annual sources of water, and about the socio-economic aspects of the people who will be the beneficiaries of the schemes after their completion.

Community participation can be encouraged during the different stages of the project's life. These stages include:- (a) Planning and decision making (b) Implementation of the plans (construction) (c) Operation/maintenance (d) Evaluation and (e) Sharing of the benefits of the schemes.

There are several ways by which the community can participate in improved water supply programmes. This can be done by: (a) Involving the community in the planning and decision- making

processes. (b) Requesting the community to make financial contribution to the water supply programme. (c) Mobilizing the whole community to contribute free unskilled labour and (d) Training and appointing one or a few community members to perform specialized tasks such as the operation of a water supply system or scheme.

17. Local Participation in Water Supply Programme in Rukwa Region

The results of this study show that there has been no local participation during the planning and decision-making stages of the water supply programme in the region. It appears that MAJI staff think that villagers have little or no technical knowledge to contribute to the water projects, consequently villagers are excluded from the planning and decision making processes of the water schemes. This attitude of MAJI staff is a serious obstacle to the participation of the villagers in the water supply scheme and also to the success of the water supply programmes. Although villagers have little or no knowledge about technical aspects of water supply, they however, have a wealth of important information about the areas in which they have lived for the entire part of their life.

The other reason for villagers not participating in the water supply programmes is that they regard the installation of the water scheme the responsibility of the government and that these schemes belong to the government and so it is the responsibility of the government to maintain or look after them. This prevailing attitude of the villagers is the result of villagers' exclusion during the initial stages of planning and decision-making of the water supply programmes. Villagers have failed to develop in their minds that sense of responsibility and ownership of the schemes. Some researchers think that non-participatory attitude of villagers in water supply programmes stem from the arguments used during villagization programme during which promises about water supply were used to persuade them to move to new selected sites. This argument does not seem to have any base because the same villagers are ready and willing and in fact are participating

fully in the contruction of primary schools, community centres and dispensaries for which the ~~self~~ same promises of water was used to persuade them to move into planned villages. This situation suggests that there are other reasons for villagers not participating in water supply programmes. These might have to do with the timing, organization and supervision of the activities and lack of water extension services in villages.

During the construction stage of the water scheme villagers were expected by MAJI staff to contribute free unskilled labour particularly clearing the sites, digging trenches and gathering materials such as stones, sand and gravel. When the call was made upon villagers, few, unwillingly responded to the call. They had naive excuses saying that there was competitions among several self-help activities (construction of village buildings). More over they said self-help activities did compete with private activities particularly private house construction. There were a lot of complaints from MAJI staff about the work done by few villagers who did the work unwillingly. One common complaint was the too shallow trenches dug which left the water pipes exposed to damage. MAJI staff further complained that these villagers put in very little efffort in the work because there was no economic incentive. Since there was no payment villagers felt less obliged to listen and follow the instructions giver by MAJI staff. This situation is to be expected particularly when instruction about what to do is given without adequate explanation. All this is due to lack of involvement of villagers from the very start.

Maintenance and operation of water schemes in the region is done by the District Water Engineer. In few cases in which villages have accepted the responsibilities of maintaining water schemes, the problems have always been related to the selection and training of local personnel and how to ensure that they do their work. Water scheme attendants are either not paid or are paid irregularly. This is the reason for the low morale in their work.

The MAJI offices at district levels said they maintained water schemes because villages do not have the manpower and the financial capability to maintain them. This situation strengthens the belief that these schemes belong to the government and not to the villages. In order to get continuous villagers' contribution to the maintenance of the water schemes, open, efficient and frequent communication system should be established between villages

and MAJI office. After villagization programme people have increasingly become interested in the condition of their water supply whether traditional or improved water supply. This is because of serious shortages of water in some villages resulting in the concentration of more people in village without expanding the water supplies. Under such conditions villagers will be eager to report defects and breakdowns of the water schemes.

Some of the major reasons for poor participation of villagers particularly as regards self-help water schemes are: inaccurate assessment of the seriousness of the water problem, poor timing, illogical sequence of events and unprepared state of villagers.

It has often proved illusory to expect villagers organized for one project under a certain stress or felt need, to carry on with other projects when that need or stress is not there. What one considers to be a problem, may not be so in their eyes. Villagers may be willing to cooperate in solving a more pressing problem such as the need for a dispensary, but be less willing to cooperate in solving unrealistic problems which may not be recognized by all as necessary. There is a need for an accurate assessment of the problem and also a need for educating villagers on the problems they are facing or creating disatisfaction with their water position.

Self-help activities in respect of water scheme installation should be properly timed so that they do not coincide with or be undertaken at the same time as other communal or even private activities. If they coincide there is bound to be divided or competing interests and the attendance will inevitably be poor or a poor job will be done.

Experience shows that from time to time villagers have been mobilized to dig trenches, prepare sites and collect building materials for water schemes before the water pipes, pumps and other parts for the schemes have been ordered or before the plan for the schemes have been drawn. The end results have been that due to long delays, trenches got filled up with sand and sites get overgrown with bush. Such illogical sequence of events discourages

villagers and makes them think that they were wasting their time and energy in the self-help project because nothing materialized from it.

In order to secure maximum participation, awareness of the people in understanding the nature and seriousness of the problem to be solved is of extreme importance. Before villagers are requested to participate in water schemes on self-help basis an effort should be made in preparing them to accept the project, and make collective decisions and commitment to its execution.

18. Villagers' attitude towards the proposed Water Master Plan Project.

A significant number of villages in Rukwa Region are desperately short of good quality water, for most of them get water from traditional water sources. A good number of these villages experience water scarcity especially during the dry season. Villagers do realize and appreciate the value or importance of improved water supply. To most villagers the proposed Water Master Plan Project means the provison of adequate, clean water to the villages within reasonable distances from the households. Villagers think that the project will solve all water problems particularly scarcity and contamination. After travelling long distances in search of water during the dry season and after queueing for water for long hours they understand the value of having water schemes in the villages and this was very clearly shown during the field surveys. Moreover they attributed all stomach problems and dis-orders (diarrhoea, dysentery, worms) to drinking dirty water (mostly coloured, bad tasting water). This shows that they understand the linkage, between water and health, which means that in accordance to their traditional health beliefs they are convinced that certain diseases are connected with water.

Villagers associated the project with increased agricultural production. Most of them have the impression that after the completion of the project there will be surplus water to enable them to establish vegetable gardens. Some of them went as far as thinking of large scale irrigation schemes for villages for growing maize, beans and cotton.

Others believe that after the completion of the project they will be in a better position to implement the campaign for the construction of better houses, progress of which had been hindered by water scarcity in some villages.

Some villagers expressed willingness to pay up to Shs 50/= per month for water in case water was brought to the houses. More over they preferred tap water to water from modern wells for the reason that tap water is cleaner than well water and that in most cases wells are dug far away from households or villages. Tap water is said to add to prestige of the users.

C O N C L U S I O N S

The programe for the development of water supplies in rural areas is an integral part of the overal rural development policy which aims at improving both social and economic development. Water supply development policy aims at providing a source of clean, adequate, potable and dependable water supply within a reasonable distance of every village.

The prevailing conditions in the rural areas of Rukwa Region are such that the water collection journey is long, are time and energy consuming particularly during the dry season when water is in serious shortage. Due to water scarcity, long queues and long distances to water points the daily per capita water use is low.

About 13% of the total number of villages get water from improved or modern water supplies. This means therefore that the majority of villages and hence the greater part of the population obtains water from traditional water sources which include: rivers, springs, lakes, ponds and traditional wells. Since these sources are unprotected the cleanliness of the water is highly questionable and thus present potential health hazard. Most of these sources are highly contaminated particularly during the rainy season giving rise to a wide variety of communicable diseases related to water. Due to these conditions the incidences of water-borne, water-washed, water-based and water-related insect vector diseases are very common. There are more cases of these diseases during the rainy season than the dry season.

It is commonly believed both by villagers and government that improved health and decreased drudgery resulting from the provision of adequate, wholesome water within reasonable distance are the main potential benefits to be gained by the communities. Improved standards of living reflects on the state of health and general welfare of the people. Undernourishment and chronic diseases cause apathy and general delibility seriously affecting productivity of those affected. The prevailing water situation in the region has adversely affected various types of production at varying levels (agriculture, livestock, industry, electric power.....) provision of social infrastructure, health of the people, and the settlement pattern of the people in the region.

Experience gained from existing improved water supplies in some survey villages shows that there are several problems associated with these water supplies. These problems render the water supplies non-

functional for a greater part of the year thus forcing villagers to revert to traditional water sources. These problems include: frequent and long-term breakdown of water schemes, lack of motivation and supervision on the part of water scheme attendants, lack of fuel to run the pumps, inadequate water and low water pressure at the taps, long queues, complete drying up of water sources, lack of spare parts and lack of technically qualified personnel to operate and maintain the schemes.

Another problem which has some bearing on existing situation are the resources allocated to the construction of new water schemes in comparison to the allocation made to operation and maintenance. Invariably allocation for the latter is restricted. The problem arises partly by the mechanisms of the international aid and partly by the financial constraint on the government. It is easier to get aid to build new projects than to operate and maintain the old ones. Moreover the method used in measuring the success of the water policy happens to be the number of villages which have water schemes being constructed. This is misleading because it places greater emphasis on construction of new schemes regardless of the conditions of the old schemes. It is the number of water schemes that are functioning that matters and not the number of water schemes that have been constructed.

Inadequate involvement of villagers in the provision of water supplies to villages is a major weakness in water supply programmes. As a result of this weakness villagers do not feel any responsibility towards the maintenance and operation of the water schemes and also do not have the sense of ownership of these schemes. However, the majority of villagers expressed their general willingness to participate in water supply programmes, if and when asked to do. There is a willingness to participate in several different ways depending on the stage of the water supply programmes.

A successful improved water supply programme for all regions will require a comprehensive national commitment towards the programmes and a willingness by the beneficiaries to share in the responsibilities. Adequate funds and competent technical staff will be required at Maji and the districts. Training programmes to obtain the necessary manpower will have to be accelerated. The village communities will have to be encouraged to participate. This can be accomplished through various legal organizations which already exist through education and self-reliance by shouldering greater responsibility and better management.

From the socio-economic point of view there are no simple and cheap solutions to the provision of water to the rural communities. There are a

number of important policy issues that need to be examined and resolved. These issues are social, economic, administrative and political in nature. Whatever the combination of these issues may be a rational decision should be reached which might be a compromise of the issues involved. It is believed that these issues be discussed by appropriate sections within the government and party structures. The recommendations given here are just the views of the research team.

RECOMMENDATIONS

COMMUNITY PARTICIPATION

1. It is recommended that villagers should as much as possible be made to feel the sense of ownership and responsibility towards the operation and maintenance of the water schemes in their respective villages.

2. It is recommended that community participation should not only be limited to demanding for free unskilled labour but should be extended to include participation in all stages of improved water supply processes such as:-

(i) Planning
(ii) Construction
(iii) Operation and maintenance of the schemes
(iv) Decision-making concerning the source of water, capacity of project, layout of pipes and the determination of total number of watering points etc.....
(v) Evaluation of the performance of the schemes

ADEQUATE RESOURCES

3. For proper and adequate maintenance as well as operation of the water schemes in villages the regional and district budget must be adequate to cater for staff recruitment and training, fuel, transport, spare parts and chemicals. Once a problem is reported to the district headquarters there should be a qualified personnel with repair tools, spares, and transport to go out and attend to the water schemes promptly.

4. It is recommended that the provision of adequate transportation at a district level be specificaly available for MAJI activities. It would go a long way towards improving the services of district water technicians. As a result of lack of transportation, diesel, spare parts and water technicians, villages are forced to go without water for long periods.

5. It is recommended that the role of women in rural water supply development be considered. If women are to be freed from the drudgery, wasteful use of energy and time-consuming work of fetching water, then their participation in rural water supply planning and decision-making must be seriously taken.

6. As a policy there is an absolute need for the Government and the Party to advise villages to set up a special sub-committee or a ful fledged committee to handle water problems. In the present set up the village government lends itself readily for the creation of such a committee. This committee in collaboration with district were office should make sure that one paid member of the village is trained in operating and maintaining the water scheme. Such a person should have basic knowledge on how to detect and fix or repair minor faults of the scheme and should be supplied with the necessary repair tools and spare parts, means of transport (bicycle or motor cycle) to make this person mobile so that the district water office could be visited as often and as quickly as possible to report major faults and get repaired.

7. It is recommended that the manpower requirement at all levels be reviewed and appropriate measures be taken to overcome manpower shortage. This shortage is felt at all levels particularly at district level. This is probably due to the fact that the Ministry is overloaded with many duties which strictly speaking have very little to do with implementation of water resource development at the local level.

8. It is recommended that when implementing the project the water schemes, trends and future growth be considered. MAJI technicians should consider possible rates of expansion of villages both their physical layout and their population and then make provisions of future expansion of water facilities. Liaison with the District Development Directors' Offices inorder to be informed of the future status of the villages and the likely development will ensure proper water development programmes. This will ensure that necessary action will be taken when two or three villages merge or when one single large village is split into two or three separate villages, or when villages are moved to new sites altogether.

9. It is recommended that inorder to minimize water pollution completed water schemes should have facilities for washing clothes and bathing a few metres away from the water source or point. The study shows that there is a substantial number of people from the villages who do the washing of clothes and bathing at the water sources. Bathing and clothe washing at water sources increase the chances and the rate of water pollution leading to a threat to the health of the people.

10. There are several instances in which villagers get water from the same sources as livestock. Again, this practice leads to water pollution. It is recommended that special livestock watering points are constructed so that contamination or pollution hazards are minimized. Such planning should jointly be undertaken between the Ministry of Livestock Development and the Ministry Water and Energy.

11. It is recommended that part of village funds realized from communal economic activities, taxes, licence fees, and agency fees from Crop Authorities and Boards be used for the operation and maintenance of village water schemes. Since it is difficult to get individual monetary contribution for water schemes it is a lot easier to draw the money from the communal funds for the same purpose because it is still a developmental project of the village which is for the common good.

12. In order to maximize from the apparent benefits of an improved water supply, it is recommended that there must be well designed programmes which should integrate water quality improvements with improvements in water availability, sanitation and health or hygiene education for the villagers. Moreover opportunities should be created for the investment of saved time and energy in order to realize increased productivity of the community concerned.

13. It is recommended that the planning procedures for the types of water schemes to be installed in a particular village should be flexible enough to take into consideration the social, economic and environmental factors before finally arriving to the choice of the type of scheme to be installed. This is necessary because various types of water schemes differ in their complexity, initial construction costs, operation and maintenance costs and they also differ in the way they are perceived by villagers and their adaptability to local conditions.

APPENDIX 1

VILLAGE POPULATION AND STATUS OF VILLAGE WATER SUPPLY-NOVEMBER 1979 SUMBAWANGA DISTRICT.

1. ITWELELE DIVISION:

WARD	VILLAGE	TOTAL POPULATION	PRESENCE OR ABSENCE OF WATER SCHEME	CONDITION OF WATER SCHEME.
1.1 Matanga	Chelenganya	1403	P	O
	Kisumba	1263	P	O
	Matanga	1587	P	O
	Mbuluma	888	A	NA
1.2 Miangalua	Kavifuti	1370	A	NA
	Miangalua	1654	P	O
	Movu	972	A	NA
	Tunko	967	A	NA
1.3 Milanzi	Milanzi	1481	A	NA
	Mlanda	255	A	NA
	Nambogo	600	A	NA
1.4 Molo	Isesa	2910	A	NA
	Malonje/Chapakazi	882	A	NA
	Mawenzusi	943	A	NA
	Ulinji	738	A	NA
1.5 Ntendo	Fyengelezya	494	A	NA
	Kizungu	468	A	NA
	Kanondo	847	A	NA
	Luwa	1632	A	NA
	Ntendo	1220	A	NA
1.6 Pito	Katumba/Azimio	1118	A	NA
	Malagano	1212	P	O
	Pito	619	P	O
	Tamasenga	2800	A	NA
1.7 Senga	Kankwale	954	P	O
	Mponda	471	A	NA
	Senga	564	P	O
	Wipanga	648	A	NA

2. KASANGA DIVISION:

2.1 Kasonga	Kafukoka	970	A	NA
	Kapele	1500	A	NA
	Kapozwa	3720	A	NA
	Kasonga	2965	A	NA
	Kasote	1998	A	NA
	Kipanga	1650	A	NA
	Mpombwe A&B	2402	A	NA
	Muzi	841	A	NA
	Ngorotwa	1164	A	NA
	Samazi	1600	A	NA

Appendix 1 (Contd)

3. MATAI DIVISION:

WARD	VILLAGE	TOTAL POPULATION	PRESENCE OR ABSENCE OF WATER SCHEME	CONDITION OF WATER SCHEME
3.1 Matai	Kalalasi	1200	A	NA
	Kisungamile	896	P	O
	Kizombwe	2175	A	NA
	Matai	3900	P	O
	Mikonko	884	A	NA
	Mbuza	865	A	NA
	Myunga	1541	A	NA
	Singiwe	1345	P	O
3.2 Msanzi	Katupulo	765	A	NA
	Katuka	1088	A	NA
	Mao	1215	A	NA
	Mkowe	2853	A	NA
	Msanzi	3880	P	O
3.3 Sopa	Ilambila	1276	A	NA
	Katete	1116	A	NA
	Mtutumbe	600	A	NA
	Ntatanda	995	A	NA
	Safu	1050	A	NA
	Sopa	1450	A	NA

4. MPUI DIVISION:

4.1 Kaengesa	Itela	456	A	NA
	Kazi	820	A	NA
	Kaengesa	1640	P	O
	Katonto	545	A	NA
	Kitete	1277	A	NA
	Kiyanda	749	A	NA
	Lula	1191	A	NA
	Lyapona	1438	A	NA
	Mkunda	1526	A	NA
4.2 Laela	Kamnyaziya	1228	A	NA
	Kitete/Mnolola	915	A	NA
	Kisalala	798	A	NA
	Kizumbi I	1354	A	NA
	Kizumbi II	1225	A	NA
	Laela "A"	1698	P	O
	Laela "B"	1662	P	O
	Lowe	2200	A	NA
	Lusaka	1662	A	NA
	Mititi	1035	A	NA
	Mpembano	712	A	NA
	Ndelema	1800	A	NA

Appendix 1 (Contd)

WARD	VILLAGE	TOTAL POPULATION	PRESENCE OR ABSENCE OF WATER SCHEME	CONDITION OF WATER SCHEME
4.3 Mpui	Ilembo	1130	A	NA
	Ikozi	1428	P	O
	Kalambazite	1645	P	F
	Kapewa	1064	A	NA
	Kilembo	2660	A	NA
	Mkima	1422	A	NA
	Mpui "A"	1454	P	O
	Mpui "B"	1508	P	O
	Mshani	2191	A	NA
	Tentula	1260	A	NA
4.4 Sandulula	Katete	916	A	NA
	Malolwa	1649	A	NA
	Msanda muungano	1196	A	NA
	Mumba	1040	A	NA
	Sandulula	1377	A	NA
	Songambele	370	P	O

5. MTOWISA DIVISION:

5.1 Kipeta	Chombe	689	A	NA
	Igonda	1182	A	NA
	Irambo	864	A	NA
	Kaoze	940	A	NA
	Kapenta	2029	A	NA
	Kilangawana	1011	A	NA
	Kilyamatundu	1050	A	NA
	Kipeta	1149	A	NA
	Maleza	1133	A	NA
	Mpona	5739	A	NA
5.2 Milepa	Ilemba	1470	A	NA
	Kinambo	1277	A	NA
	Kisa	820	A	NA
	Milepa	1842	A	NA
	Msia	670	A	NA
	Nankanga	2003	A	NA
	Sakalilo	797	A	NA
5.3 Mtowisa	Lwanji	1524	A	NA
	Mkamba	1164	A	NA
	Mtowisa	2368	P	O
	Ngo'ngo	768	P	O
	Zimba	1100	P	O

Appendix 1 (Contd)

WARD	VILLAGE	TOTAL POPULATION	PRESENCE OR ABSENCE OF WATER SCHEME	CONDITION OF WATER SCHEME
5.4 Muze	Kalumbaleza	1268	A	NA
	Kasekela	3750	A	NA
	Mpete	1095	A	NA
	Muze	1792	A	NA
	Nfinga	1675	A	NA
	Uzia	2173	P	O
6. MALEMBI DIVITION:				
6.1 Katazi	Chisambo	783	A	NA
	Kafukula	1041	A	NA
	Katazi	1261	A	NA
	Ninga	1728	A	NA
6.2 M/Kenya	Kazozya	724	A	NA
	Kenya/Namema	765	A	NA
	Madibira	754	A	NA
	M/Kenya	1185	A	NA
	Mpanga	1392	A	NA
6.3 M/Nkoswe	Kalembe	771	A	NA
	Legezamwendo	1114	A	NA
	Mkombo	1600	A	NA
	Mombo	880	A	NA
	Mzungwa	675	A	NA
	Utengule	796	A	NA
6.4 Mwazye	Ilango	936	A	NA
	Itekesha	1472	A	NA
	Kambo	1069	A	NA
	Kazila	781	A	NA
	Kilesha	1260	A	NA
	Mpenje	1500	A	NA
	Mwazye	2031	P	O
6.5 Ulumi	Chipapa	1451	A	NA
	Kalepula	1522	A	NA
	Kantalemwa	1291	A	NA
	Mluazi	1162	A	NA
	Mnamba			
	Mtula	957	A	NA
	Mwimbi	1574	P	O
	Selengoma	649	A	NA
	Ulumi	1200	A	NA

Appendix 1 (Contd)

NKASI DISTRICT, 1979

1. CHALA DIVISION:

WARD	VILLAGE	TOTAL POPULATION	PRESENCE OR ABSENCE OF WATER SCHEME	CONDITION OF WATER SCHEME
1.1 Chala	Chala A	1981	P	O
	Chala B	1572	P	O
	Chala C	1375	P	O
	Kasu	1382	A	NA
	Katani	2030	A	NA
	Lyazumbi	950	A	NA
	Lyele	2250	A	NA
	Majengo	1064	A	NA
	Swaila	1250	A	NA
1.2 Mtenga	Kasu/Itekesha	1494	A	NA
	Miyombo	688	A	NA
	Mkole	630	A	NA
	Mtenga	1918	A	NA
	Paramawe	885	A	NA
1.3 Namanyere	Isale	950	A	NA
	Kipundu	3428	P	O
	Mkangale	1742	P	Ø
	Msilihofu	975	A	NA
	Ntatumbila	1650	A	NA

2. KATE DIVISION:

2.1 Kate	China	707	A	NA
	Kate	1463	P	O
	Nchenje	640	A	NA
	Ntalamila	1345	A	NA
	Ntuchi	2675	A	NA
2.2 Kipande	Chonga	1067	A	NA
	Kalundi A + B	1913	A	NA
	Kantawa	2051	P	O.
	Katani	1359	A	NA
	Kipande	1520	P	O
	Milundikwa	1238	P	O
	Myula	1215	A	NA
	Nkundi	1990	P	N
2.3 Sintali	Nkana	1529	A	NA
	Pimbi	395	A	NA
	Sintali	1552	P	O

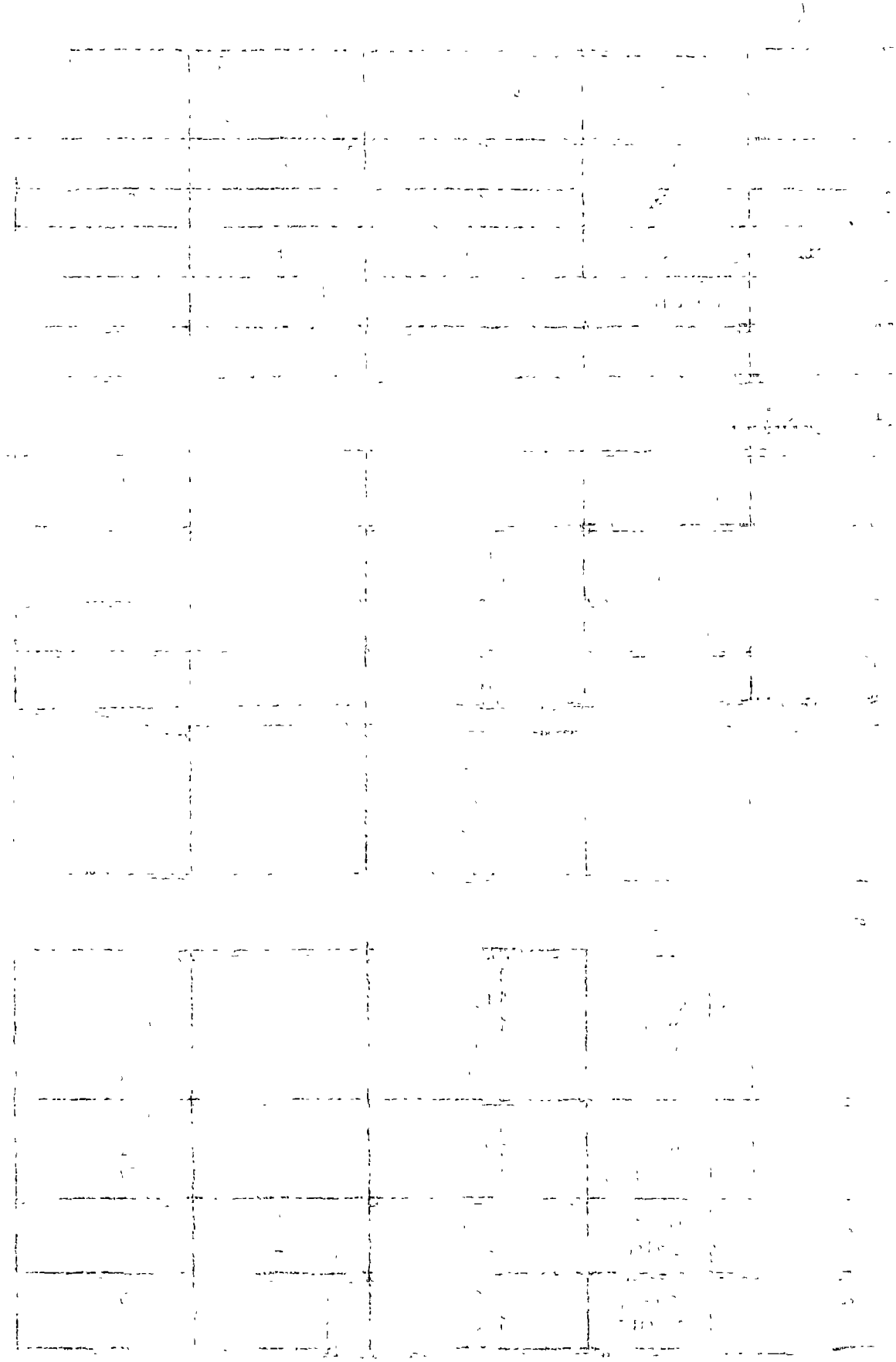
Appendix 1 (Contd)

3. KIRANDO DIVISION

WARD	VILLAGE	TOTAL POPULATION	PRESENCE OR ABSENCE OF WATER SCHEME	CONDITION OF WATER SCHEME
3.1 Kabwe	Kabwe	3800	A	NA
	Kalila	938	A	NA
	Kanchui	728	A	NA
	Korongwe	1389	A	NA
	Utinta	2247	A	NA
3.2 Kala	Chilambo	1043	A	NA
	Chingo'mbe	660	A	NA
	Izinga	795	A	NA
	Kala	1707	A	NA
	Mlambo	844	A	NA
	Mpesa	1256	A	NA
	Ntundu	638	A	NA
3.3 Kirando	Bumanda	924	A	NA
	Itete	1300	A	NA
	Kamwanda	2895	P	O
	Katete	1077	A	NA
	Kazovu	1275	A	NA
	Kipili	1108	P	N
	Manda kerenge	1415	A	NA
	Masolo	968	A	NA
	Mfinga	1285	A	NA
	Mtakuja	2040	P	O
	Namansi	1093	A	NA

Appendix 1 (Contd)

WARD	VILLAGE	TOTAL POPULATION	PRESENCE OR ABSENCE OF WATER SCHEME	CONDITION
4.3 Katuma	Sibwesa	462	A	NA
4.4 Kawajense	Kawajense*	2167	P	O
4.5 Misunkumilo	Misunkumilo	1371	P	O
4.6 Msemulwa	Msemulwa*	4082	A	NA
4.7 Shanwe	Shanwe*	3877	P	O
5. MPIMBWE DIVISION:				
5.1 Mamba	Kalida	575	A	NA
	Mamba	1558	A	NA
5.2 Manga	Kibaoni	2788	A	NA
	Milumba	1725	A	NA
5.3 Rungwa	Igalukilo*	1382	A	NA
5.4 Usevya	Mbede	2506	A	NA
	Usevya	3218	A	NA
6. MWESE DIVISION:				
6.1 Mwese	Katuma	1777	A	NA
	Lugonesi	1170	A	NA
	Lwega	977	A	NA
	Mpembe	783	A	NA
	Mwese	1285	P	O
7. NSIMBO DIVISION:				
7.1 Ikongolo	Ikongolo A	1267	A	NA
	Ikongolo B	1193	A	NA
	Kaburonge A	1387	A	NA
	Kaburonge B	1212	A	NA
	Kajeje	3420	A	NA
7.2 Kasokolo	Kasokolo	1800	A	NA
	Manga	1748	A	NA
	Sungamilo	1350	A	NA
7.3 Katumba	Katumba*	1221	A	NA
	Kapalala	-	-	-
7.4 Magamba	Magamba	2820	A	NA
	Mtakumbuka	1403	P	O



Appendix 1 (Contd)

MPANDA DISTRICT

1. INYONGA DIVISION:

WARD	VILLAGE	TOTAL POPULATION	PRESENCE OR ABSENCE OF WATER SCHEME	CONDITION OF WATER SCHEME
1.1 Ilunde	Ilunde	1231	A	NA
1.2 Inyonga	Inyonga	2265	P	O
	Mapili	976	A	NA
	Mtakuja	1152	A	NA
	Ibwasa	839	A	NA
	Nsenkwa	2079	A	NA
	Wachawaseme	827	A	NA
1.3 Utende	Utende	1397	P	O

2. KABUNGU DIVISION:

2.1 Buyenze	Buyenze	422	A	NA
2.2 Kaburgu	Ifukutwa	1147	P	O
	Igalula	520	P	O
	Kabungu	2427	A	NA
	Kakese	930	A	NA
	Majalila	1660	P	O
	Mchakamchaka	918	P	O
	Milala	1708	A	NA

3. KAREMA DIVISION:

3.1 Ikola	Ikola	1776	A	NA
	Isangule	491	A	NA
3.2 Karema	Kapalamsenga	1642	A	NA
	Karema	1864	P	O

4. KASHAULILI DIVISION:

4.1 Ilembo	Ilembo*	996	A	NA
	Ilembo*	696	A	NA
	Ilembo*	711	A	NA
	Ilembo*	778	A	NA
	Kasimba*	3184	A	NA
4.2 Kashaulili	Kashaulili	9465	P	O

Appendix 1 (Contd)

WARD	VILLAGE	TOTAL POPULATION	PRESENCE OR ABSENCE OF WATER SCHEME	CONDITION OF WATER SCHEME
7.5 Msaginya	Ivungwe A	1423	A	NA
	Ivungwe B	2745	A	NA
	Katumba	3348	A	NA
	Msaginya	4394	A	NA
	Nduwi	3445	P	O
	Nzaga A	2071	A	NA
	Nzaga B	1208	A	NA
	Tambazi A	1999	A	NA
	Tambazi B	1933	A	NA
7.6 Ndurumo	Kahungu	2437	A	NA
	Kaminula	3661	A	NA
	Lwimbi	2475	A	NA
	Ndurumo A	1828	A	NA
	Ndurumo B	2399	A	NA
7.7 Msimbo	Isinde	852	P	N
	Mtakuja	908	P	N
	Mtapenda	2179	P	N
	Sanjandugu	2480	P	N
	Songambele	835	P	O
7.8 Sitalike	Sitalike*	2003	-	-
7.9 Ugalla	Katambike*	1601	-	-
7.10 Urwira	Urwira*	-	-	-

Source: Survey results

A = Absent P = Present O = Operating

N = Not operating NA = Not applicable

* = Villages not surveyed due to their in accessibility or due to the fact that they are parts of the town.

A P P E N D I X 2

IMPORTANT SEASONAL WATER SOURCE

SUMBAWANGA DISTRICT.

1. ITWELELE DIVISION:

WARD	VILLAGE	SOURCE OF WATER	
		RAINY SEASON	DRY SEASON
1.1 Matanga	Chelenganya	Tap	Tap
	Kisumba	Tap	Spring
	Matanga	Tap	Tap
	Mbuluma	Spring	Spring
1.2 Miangaluwa	Kavifuti	Spring	Spring
	Miangaluwa	Tap	Tap
	Movu	Spring	Spring
	Tunko	Spring	Spring
1.3 Milanzi	Milanzi	Spring	Spring
	Mlanda	River	River
	Nambogo	Spring	Spring
1.4 Ntendo	Fyengelezya	Pond	Pond
	Kanondo	Spring	Spring
	Kizungu	River	River
	Luwa	Spring	Spring
	Ntendo	Spring	Spring
1.5 Molo	Isesa	Spring	Spring
	Mawenzusi	Spring	Spring
	Malonje	Spring	Spring
	Ulinji	Spring	Spring
1.6 Pito	Katumba/Azimio	River	Spring
	Malagano	Tap	Tap
	Pito	Tap	Tap
	Tamasenga	Spring	Spring
1.7 Senga	Kankwale	Spring	Spring
	Mponda	Spring	Spring
	Senga	Tap	Tap
	Wipanga	River	River

2. KASANGA DIVISOON:

2.1 Kasanga	Kafukoka	Spring	Spring
	Kapele	Lake	Lake
	Kapozwa	Spring	Spring
	Kasanga	River	River
	Kasote/Kisumba	River	River
	Kipanga	River	River
	Mpombwe	River	River
	Muzi	River	River
	Ngorotwa	River	River
	Samazi	Lake	Lake

Appendix 2 (Contd)

3. MPUI DIVISION:

WARD	VILLAGE	SOURCE OF WATER RAINY SEASON	SOURCE OF WATER DRY SEASON
3.1 Kaengesa	Itela	River	River
	Kaengesa	Tap	Tap
	Kazi	Spring	Spring
	Kitete	River	River
	Kiyanda	Spring	River
	Katonto	Spring	Spring
	Lula	Spring	River
	Lyapona	Rain	Spring
	Mkunda	Spring	Spring
3.2 Laela	Kamnyazya	River	River
	Kisalala	River	Spring
	Kitete/Mndola	River	Spring
	Kizumbi I	Spring	Spring
	Kizumbi II	Spring	Spring
	Laela A	Tap	Tap
	Laela B	Tap	Tap
	Lowe	River	Spring
	Lusaka	Spring	Spring
	Mititi	River	River
	Mpembano	River	River
	Ndelema	Spring	Spring
3.3 Mpui	Ilembo	River	River
	Ikozi	Tap	Tap
	Kalambazite	Spring	Spring
	Kapewa	Spring	Spring
	Kilembo	Spring	Spring
	Mpui A	Tap	Tap
	Mpui B	Tap	Tap
	Mkima	Spring	Spring
	Mshani	Spring	Spring
	Tentula	River	River
3.4 Sandulula	Katete	Spring	River
	Malolwa	Spring	Spring
	Msanda/Muungano	Spring	Spring
	Mumba	River	River
	Sandulula	Spring	Spring
	Songambele	Tap	Tap

4. MATAI DIVISION:

4.1 Matai	Kalalazi	Spring	Spring
	Kisungamile	Tap	Tap
	Kizombwe	Spring	Spring
	Matai	Tap	Tap
	Mbuza	Spring	Spring
	Myunga	Spring	Spring
	Singiwe	River	River
4.2	Katapulo	Spring	Spring
	Katuka	River	River
	Mao	Miwell	M. well
	Mkowe	Spring	Spring
	Msanzi	Tap	Tap
4.3 Sopa	Dambila	Spring	Spring
	Katete	Spring	River
	Mtuntumbe	Spring	Spring
	Ntatanda	M.well	M.well
	Safu	River	River
	Sopa	River	Spring

Appendix 2 (Contd)

5. MTOWISA DIVISION:

WARD	VILLAGE	SOURCE OF WATER RAINY SEASON	DRY SEASON
5.1 Kipeta	Chombe	River	River
	Igonda	River	River
	Irambo	River	River
	Kaoze	River	River
	Kapenta	River	River
	Kilangawana	River	River
	Kilyamatundu	River	River
	Kipeta	River	River
	Maleza	River	River
	Mpona	River	River
5.2 Milepa	Ilemba	River	River
	Kinambo	River	River
	Kisa	River	River
	Milepa	River	River
	Msia	River	River
	Nankanga	Lake	Lake
	Sakalilo	River	River

WARD	VILLAGE	SOURCE OF WATER RAINY SEASON	DRY SEASON
5.3 Mtowisa	Lwanji	River	River
	Mkamba	River	River
	Mtowisa	Tap	Tap
	Ng'ongo	Tap	Tap
	Zimba	Tap	Tap
5.4 Muze	Ilanga	River	River
	Kalumbaleza	River	River
	Kasekela	River	River
	Mpete	River	River
	Muze	River	River
	Nfinga	River	River
	Uzia	Tap	Tap

6. MWIMBI DIVISION:

6.1 Katazi	Chisambo	Spring	Spring
	Kafukola	Spring	Spring
	Katazi	Spring	Spring
	Minga	Spring	Spring
6.2 M/Kenya	Kazoe ya	River	River
	Kenya/Namema	River	River
	M/Kenya	River	River
	Madibira	River	River
	Mpanga	Spring	Spring
6.3 M/Nkoswe	Kalembe	Spring	Spring
	Legezamwendo	Spring	Spring
	Mombo	River	River
	Mkombo	River	Spring
	Mzungwa	Spring	Spring
	Utengule	River	Spring

6.4 Mwazye	Ilango	River	River
	Itekesha	Spring	Spring
	Kazila	River	River
	Kambo	Spring	Spring
	Kilesha	Spring	Spring
	Mpenje	Spring	Spring
	Mwazye	Tap	Tap
6.5 Ulumi	Chipapa	Spring	Spring
	Kalepula	Spring	Spring
	Kantalemwa	Spring	Spring
	Mluazi	Spring	Spring
	Mnamba	River	River
	Mtula	Spring	Spring
	Mwimbi	Tap	Tap
	Ulumi	River	River
	Selengoma	River	River

Appendix 2 (Contd)

NKANSI DISTRICT.

1. CHALA DIVISION:

WARD	VILLAGE	SOURCE OF WATER	
		RAINY SEASON	DRY SEASON
1.1 Chala	Chala A	Tap	Tap
	Chala B	Tap	Tap
	Chala C	Tap	Tap
	Kasu	Pond	Pond
	Katani	River	River
	Lyazumbi	River	River
	Lyele	River	River
	Majengo	River	River
	Swaila	River	River
1.2 Mtenga	Kasu/Ikekesha	River	River
	Miyombo	Well	Well
	Mkole	Rain	River
	Mtenga	Well	Well
	Paramawe	Well	Well

WARD	VILLAGE	SOURCE OF WATER	
		RAINY SEASON	DRY SEASON
1.3 Mamanyere	Isale	Well	W. Water
	Kipundu	Tap	Tap
	Mkangale	Tap	Tap
	Msilihofu	Well	W. Water
	Ntatumbila	River	River

2. KATE DIVISION:

2.1 Kate	China	River	River
	Kate	Tap	Tap
	Nchenje	Well	Well
	Ntalamila	Pond	Pond
	Ntuchi	Well	Well
2.2 Kipande	Chonga	Well	Well
	Kalundi	Spring	Spring
	Kantawa	Spring	Spring
	Katani	River	River
	Kipande	Tap	Tap
	Milundikwa	Tap	Tap
	Myula	Spring	Spring
	Nkundi	Tap	Tap
2.3 Sintali	Nkana	Well	Well water
	Pimbi	Well	Well water
	Sintali	Tap	Tap

Appendix 2 (Contd)

3. KIRANDO DIVISION

WARD	VILLAGE	SOURCE OF WATER	
		RAINY SEASON	DRY SEASON
3.1 Kabwe	Kabwe	Lake	Lake
	Kalila	Lake	Lake
	Kanchui	Lake	Lake
	Korongwe	Lake	Lake
	Utinta	Lake	Lake
3.2 Kala	Chilambo	Lake	Lake
	Ching'ombe	River	River
	Isinga	River	Spring
	Kala	River	River
	Mlambo	River	River
	Mpasa	Lake	Lake
	Ntundu	Lake	Lake
3.3 Kirando	Bumanda	Lake	Lake
	Itete	River	River
	Kamwanda	Tap	Tap
	Katete	Lake	Lake
	Kazovu	Lake	Lake
	Kipili	Lake	Lake
	Manda Karenge	Lake	Lake
	Mfinga	Lake	Lake
	Masolo	Tap	Tap
	Mtakuja	Tap	Tap
	Namansi	Lake	Lake
3.4 Kizumbi	Kizumbi	River	River
	Lyapihda	River	River
	Msamba	River	River
	Mwinza	River	River
	Ninde	River	River
	Wampembe	River	River
4.8 Magamba	Magamba	Pond	Pond

Appendix 2 (Contd)

5. MPIMBWE DIVISION:

WARD	VILLAGE	SOURCE OF WATER	
		RAINY SEASON	DRY SEASON
5.1 Mamba	Kilida	River	River
	Mamba	River	River
5 2 Manga	Kibaoni	River	River
	Milumba	River	River
5 3 Rungwa	Igalukilo***	-	-
5.4 Usevya	Mbede	Pond	Pond
	Usevya	River	River

6. MWESE DIVISION:

6 1 Mwese	Katuma	River	River
	Lugonesi	River	River
	Lwega	River	River
	Mpombe	River	River
	Mwese	River	River

7. NSIMBO DIVISION:

7.1 Ikongolo	Ikongolo A	River	River
	Ikongolo B	River	River
	Kaburonge A	Well	Well
	Kaburonge B	River	River
	Kajeje	Well	Well
	Kambuzi A	River	River
	Kambuzi B	River	River
	Mnyaki A	River	River
	Mnyaki B	Well	Well
7.2 Kasokola	Kasokola	Well	Well
	Manga	Well	Well
	Sungamila	Pond	Pond
7.3 Magamba	Magamba	Pond	Pond
	Mtakumbuka	Tap	Tap
7.4 Nsimbo	Isinde	Pond	Pond
	Mtakuja	Well	Well
	Mtapenda	Pond	Pond
	Sanjandugu	Pond	Pond
	Songambele	Tap	Tap
7.5 Sitalike	Sitalike***	-	-
7.6 Ugalla	Katambike***	-	-
7.7 Urwira	Urwira***	-	-

Source: Survey results

** Villages not surveyed because they are parts of the town

*** Villages not surveyed due to their inaccessibility

APPENDIX 3

VILLAGES WITH WATER TAPS - NOVEMBER 1979 - SUMBAWANGA DISTRICT

1. ITWELELE DIVISION:

WARD	VILLAGE	TOTAL POPULATION	NUMBER OF WATER TAPS	NUMBER OF WATER TAPS OPERATING
1.1 Itwelele	Katandala	191	5	5
	Malangali	1312	5	5
	Mtimbwa	1522	4	4
1.2 Kasense	Kasense	1715	2	2
1.3 Kizwite	Kizwite	727	4	3
1.4 Matanga	Chelenganya	1403	3	2
	Kisumba	1293	5	2
	Matanga	1587	5	3
1.5 Pito	Katumba/Azimio	1118	4	4
	Malagano	1232	4	3
	Pito	884	8	8
	Tamasenga *	1747	-	-
1.6 Senga	Kankwale	954	1	1
	Senga *	574	-	-

2. MATAI DIVISION:

2.1 Matai	Kisungamile	893	4	2
	Matai	3981	24	0
	Singiwe	1345	4	2
2.2 Msanzi	Msanzi	3920	5	3

3. MPUI DIVISION:

3.1 Kaengesa	Kaengesa	1185	6	2
3.2 Laela	Laela A *	2018	-	-
	Laela B	1662	7	7
3.3 Miangalua	Miangalua	1754	6	2
3.4 Mpui	Ikozi	2386	5	2
	Kalambazite	1745	5	2
	Mpui	1454	10	3

Appendix 3 (Contd)

4. MTOWISA DIVISION.

4.1 Mtowisa	Mtowisa	2368	10	8
	Ng'ongo	738	1	1
	Zimba	1925	8	6
4.2 Muse	Uzia	2193	5	5

5. MWIMBI DIVISION:

5.1 Mwazye	Mwazye	2031	1	1
5.2 Ulumi	Mwimbi	1574	7	3

NKANSI DISTRICT

1. CHALA DIVISION:

WARD	VILLAGE	TOTAL POPULATION	NUMBER OF WATER TAPS	NUMBER OF WATER TAPS OPERATING.
1.1 Chala	Chala A	2477	7	7
	Chala B	1672	7	6
	Chala C	1375	3	2
1.2 Namanyere	Kipundu	4000	9	9
	Mkangale	2614	3	3

2. KATE DIVISION:

2.1 Kate	Kate *	1463	-	-
2.2 Kipande	Kipande *	1520	6	5
	Milundikwa	1238	-	-
	Nkundi	1990	2	0
2.3 Sintali	Sintali	1552	9	7

3. KIRANDO DIVISION

3.1 Kirando	Mtakuja	2040	13	4

Source: Survey results

Appendix 3 (Contd):

MPANDA DISTRICT

1. INYONGA DIVISION.

WARD	VILLAGE	TOTAL POPULATION	NUMBER OF WATER TAPS	NUMBER OF WATER TAPS OPERATING
1.1 Inyonga	Inyonga	2245	10	9

2. KABUNGU DIVISION.

2.1 Kabungu	Ifukutwa	1147	8	8
	Igalula	520	4	0
	Majalilo	1560	9	8
	Mchakamchaka	918	7	6

3. KAREMA DIVISION:

3.1 Karema	Karema	1874	4	4

4. MPIMBWE DIVISION.

4.1 Mamba	Mamba	1558	4	4

5. NSIMBO DIVISION.

5.1 Magamba	Mtakumbuka	1403	5	0
5.2 Nsimbo	Isanjandugu	2480	25	25
	Isinde	852	5	5
	Mtakuja	908	4	4
	Mtapenda	2179	5	5

Source: Survey results

* Village with water taps but the number of taps not known