APPENDIX I

PUBLIC AWARENESS SURVEY

APPENDIX I PUBLIC AWARENESS SURVEY

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1 GENERAL

1.1 Objectives

The Study aimed at finding out the knowledge and attitudes of the people in the survey towns (household heads) in terms of water sources and use as well as sanitation facilities and behavior. These are all key information for formulating a long-term water supply development plan in the study area.

1.2 Survey Towns

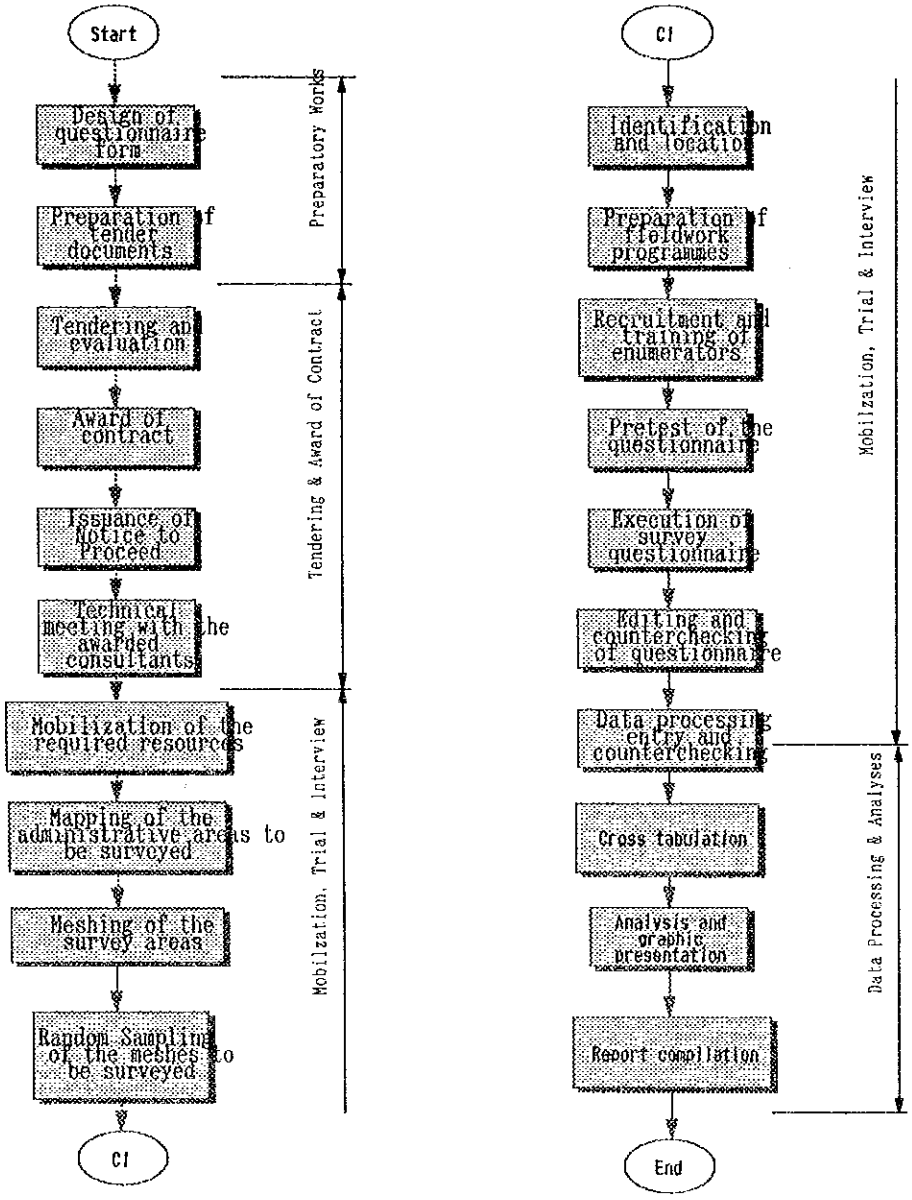
The survey towns are Meru and Nkubu in Meru District, Isiolo in Isiolo District, Chuka and Chogoria in Thraka Nithi District and Maua and Tigania in Nyambene District, all in Eastern Province, Kenya. A location map of the survey towns is given in ***Attachment - 1.***

2 SURVEY METHODOLOGY AND ORGANIZATION

2.1 Procedures

Field works of the survey was entrusted to a local consultant (Biltech Environmental Co. Ltd.). Prior to an initiation of the survey, a questionnaire form was designed by the JICA Study Team in collaboration with the counterpart personnel from MLRRWD and reviewed by district water engineers. Preparatory works, field surveys, data collection, processing and analyses were carried out according to the following procedures.

Survey Procedures



2.2 Methodology

2.2.1 Data Collection Method

Out of several methods generally applied for the survey, finally we selected an "interview" by local staff/engineers familiar with the local conditions. This is most effective and accurate as compared to others such as mailing, telephone, and their combination. The following are considered in the selection:

(1) Respondents are not always responsive for the inquiries. In case of their

misunderstanding, enumerators could immediately point out in a tete-a-tete, asking them a correct answer. Thus, this method minimizes misunderstandings of respondents, resulting in an increase of response rate.

(2) Topographical maps available are not necessarily in a sufficient scale to locate selected households in their exact addresses. Further, enumerators should have basic information on water supply system in the area and be preferable to command a local language. In this sense, local staff/engineers were considered most appropriate for organizing survey team as enumerators. This organization considerably reduces time required for the interview.

(3) Other methods generally applied may have following advantages and disadvantages:

Method	Advantage	Disadvantage
Mailing	-Simple	-Frequent misunderstanding -Less response rate to each inquiry -Requiring a longer period
Telephone	-Reply to be immediately obtained	-Miscommunication in case of a number of inquiries
Combination of mailing & interview	-Accurate	-Considerable time required

2.2.2 Questionnaire Design and Sampling

(1) Questionnaire Design

Prior to developing a questionnaire, reconnaissance surveys were carried out at the survey towns. A draft questionnaire was then prepared by the Team in collaboration with MLRRWD counterparts. The draft was disseminated to every district water office for review. This aim to incorporate district water engineers' opinion in the questionnaire. The questionnaire form was thus elaborated,

specifically for the current survey. The form finally developed is given in ***Attachment - 2.***

The questionnaire consists of five categories: (1) General particulars of households, (2) Water source and usage, (3) General views on water supply services, (4) Household income and willingness to pay and (5) Sanitation, health and public awareness on hygiene education. Under each category, the following are considered relevant to the present study.

1) General particulars of households

- Family size, occupation, type of houses
- Number of students
- Electricity and telephone
- Land size

2) Water source and usage

- Water source, distance, water availability in dry season, alternative source
- Storage, volume of storage
- Water consumption and water use practice

3) General view on water supply services

- Water supply pattern
- Satisfaction and reason for unsatisfaction

4) Household income and willingness to pay

- Income from crops and livestock, income per household
- Willingness to pay

5) Sanitation, health and public awareness on hygiene education

- Garbage disposal, sanitary facilities
- Diseases affecting families

· Knowledge of water related diseases

The above inquiries were arranged in the form to flow smoothly and not to give any misunderstanding to the households.

(2) Sample Size and Structure

To keep uniform reliability of the survey throughout the towns, nos. of households are a determinant factor in deciding a sample size. The sample size considered herein, however, is 100 samples for each town as specified in the Scope of Work.

(3) Delineation of Boundaries

The Study Teams contacted the various DWEs and Physical Planners to ascertain the administrative boundaries to be adopted for the survey. The final maps based on those boundaries are given in ***Attachment - 1.*** All maps are reproduction or copy from the topographical maps on a scale of 1:50,000.

(4) Meshing of Clusters

Once the maps were ready, meshes of 500m x 500m were adopted for each area as per the requirements of the survey. However, the meshes for Nkubu area are 250m X 250m (on an enlarged map) due to the relatively small area covered by the town. It was noted that the people around Nkubu town have persistently opposed the extension of town boundaries due to a fear that their land would be alienated.

(5) Random Sampling of Survey Clusters

The objective here was to select representative areas/meshes for the survey using the random method. Each town (apart from Meru and Tigania rural) was to have a total of 20 meshes. In order to give each mesh a chance to be selected, the stratified random sampling technique was used where X and Y axes would be drawn at the center of the maps to take care of the varying shapes and topographical features of the various sites. In this way, it was later possible to have an even spread of the samples around the study areas. Eventually, the sampled clusters would be numbered (1-20/25) from north to south and from west to east as shown in the maps in ***Attachment - 1.***

2.3 Survey Organization and Interview

2.3.1 Mobilization of Resources

The resources for the survey were mobilized within the first week of the exercise. Survey teams mobilized were comprised of:

(1) Project Administrator (1 No.)

(2) Team Leader (3 No.)

(3) enumerators (14 No.)

(4) Field guides (3 No.)

(5) Drivers (4 No.)

(6) Computer expert (1 No.)

(7) Draught man (1 No.)

These survey staff stationed at Meru and cooperated with JICA Study Team Supervisors (one supervisor and one technical assistant) during the field work.

The equipment including fieldwork vehicles, a computer with the Microsoft Excel for Mackintosh, a fieldwork office, adequate stationery and a meeting room for training of enumerators.

2.3.2 Recruitment of Enumerators

The successfulness of the survey would largely depend upon a well trained and motivated team of enumerators. Thus the key imperative was to recruit local personnel (young men and women) who would be trained and engaged to administer the questionnaires.

Consequently, a team of 14 enumerators were carefully selected from a total of 35 applicants who had been identified on the ground using the assistance of the Consultants local contacts.

2.3.3 Training of Enumerators

Once selected, the Enumerators had to be briefed and trained about the study, data

collection techniques and the associated fieldwork logistics.

Accordingly, two days' training was held at the KNUT (Kenya National Union of Teachers) Conference hall in Meru town where prepared notes were used. The training methodology comprised of lectures, discussions, demonstration and role plays.

During the training, the following issues were stressed:

(1) the importance of research /surveys

(2) planning of a survey

(3) sampling techniques

(4) methods of data collection - questionnaire

(5) qualities of a good Research Assistant

(6) what to interview - locating samples and adhering to the set criteria

(7) how to interview - introduction, establishing a rapport, asking

(8) questions uniformly and recording responses accurately.

(9) translating the questionnaire (***Attachment 2***) into Kimeeru and Swahili

An evaluation of the training was done in three ways; First, the trainees provided oral exams to test a masterly and application of the content. Second, the enumerators were asked to conduct mock interviews (role play) so that it could be possible to tell how far they could own the questionnaire. Third, the enumerators and supervisors were sent to nearby areas to conduct pre-test interviews. The latter exposed them to real field experience and also created an opportunity for the Team to identify the issues which could be perceived in the study areas as undesirable e.g number of family members, number of livestock, water account number, whether the respondent pays for water, etc.

Eventually, it was possible for the Team to advise the enumerators on what to do in order not to offend the respondents.

The evaluation thus indicated that the training had been successful and that the enumerators had gained a lot from the training.

2.3.4 Composition of Survey Teams

Upon the completion of training, the enumerators were allocated duties according to organized survey teams each of which had a Team Leader. A table below shows the composition of the survey teams.

Composition of the Survey Team

Group	Area	No. of Meshes Sampled	Household per Mesh	No. of Enumerators
I	Meru	25	4	6
	Nkubu	20	5	
	Isiolo	20	5	
II	Chuka	20	5	4
	Chogoria	20	5	
III	Maua	20	5	4
	Tigania	25	4	

Notes:

1) Meru and Tigania areas had more clusters sampled due to then relatively larger size of the area covered.
2) In each area, 100 interviews were administered hence a total of 700.
3) Group I had more interviews since it had three areas to cover.
4) Each team was provided with a vehicle, a driver and a guide.

The Team leaders prepared daily work plans for their respective groups in liaison with the Project Administrator.

2.3.5 Identification and Location of Sampled Clusters

The sampled clusters had to be identified on the ground so as to facilitate a determination of the particular settlement pattern and the households to be studied. Thus local officers from the Central Bureau of Statistics and the District Water Offices helped the Team Leaders to identify the clusters on the ground. In addition, the enumerators were from the local areas and were, therefore, familiar with the clusters.

An issue that emerged during this exercise was that some clusters would have no households (due to the presence of a petrol station, a school, a church, a dispensary etc.). It was felt that because the households in these places(e.g. school) were protected by institutions, then circumstances differed a lot from those of the non-institutionalized households. Thus, such clusters would be shifted to a nearby cluster.

2.3.6 Selection of Sample Households

Once the clusters/meshes have been identified, the Team Leaders would lead the enumerators in selecting the households using the random route method. In this case each cluster would be approached from the right. The interviewer would walk through the mesh and interview the heads of the households to the left. He/she would skip several households depending on the size of cluster.

2.3.7 Organization and Management of Interviews

The interviews targeted the heads of the sampled households. If the head was out, a call back would be made the following day on a replacement household would be selected (usually the next household). However, cases of call backs and replacement were very few.

The interviews would concentrate on the introduction before the actual interviews. They would let the respondents set the interview pace. The team leaders would accompany the enumerators. The JICA Supervisor was also there in various areas. She would either travel with Team or join it later while the interview was in progress. In general all the interviews proceeded on well and as scheduled.

3. DATA PROCESSING AND ANALYSIS

3.1 Data Book

The questionnaires were filed in a systematic manner. For each town area, the cluster 1 (Block 1) questionnaire appear first followed by the rest in an ascending order. All filled out are compiled as Data Book.

3.2 Data Entry and Processing

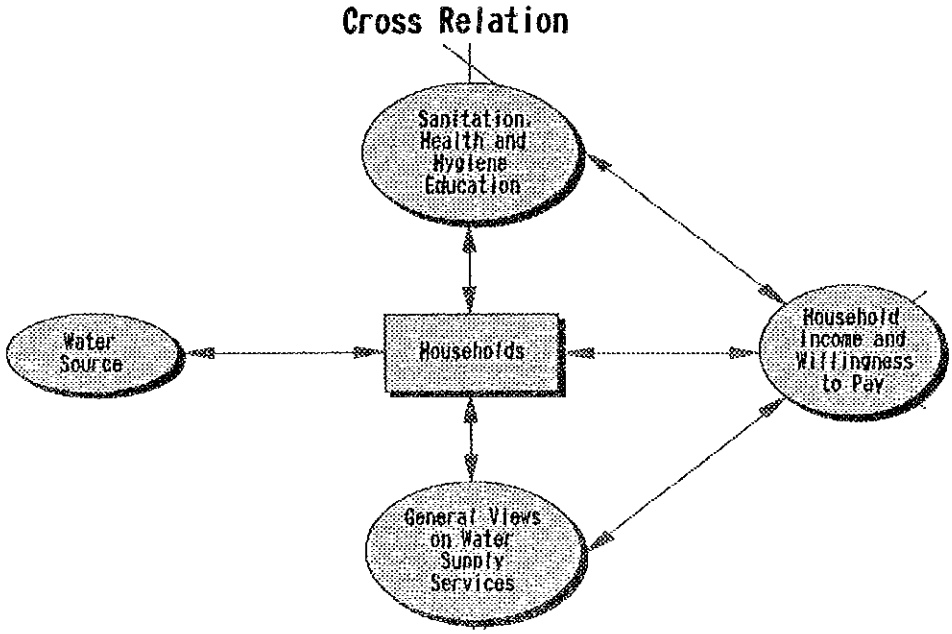
The edited questionnaires were then adopted for data entry. The Microsoft Excel Programme for Mackintosh was used to develop a notebook on which the data could be entered. The entry was undertaken and counter checked using the Code Book attached in ***Attachment - 3***. Each of the variable was quantified to economize on space. Editing and cleaning was made simultaneously with Excel software program for analyses by cross tabulation. This cross tabulation method is considered most efficient to see interrelation among items we inquired.

To compute household income, an additional survey on unit cost of livestock and crops

was carried out by the Study Team. As regards water consumption, efforts were made to obtain meter reading records from District Water Office.

4. RESULTS

Living conditions, household economy, water sources, sanitary facilities and water use practice by households enumerated in ***Section 2.2.2*** are closely related to each other.



For example, public awareness for hygiene closely relates to living circumstances and educational background of the households. People's willingness to pay for water also relates to household income and availability of water sources. This cross relation among (1) general particulars of households, (2) household income and willingness to pay, (3) water sources, (4) sanitation, health and hygiene education and (5) general views (people's view) on water supply services are also focused on in the paragraphs which follows.

4.1 General Particulars of Households

The results of the Survey indicate that (65.3%) of the households are farmers, (14.9%) are businessmen and (12.1%) are employed (***Figure I-1***). Most of the farmers are small scale, with average land size of 2 acres (***Tables I-1 and I-2***).

The average family size is 7.4 persons per household with farmers having 7.2 persons per

household (***Table I-3***). Meru town has the largest average family size, 8.0 persons among the seven towns (***Figure I-2***).

The characteristics of these households are such that the population is made of older people with most of young people away for either higher education or in search of employment (***Tables I-3 and I-4***).

There are three types of housing, with the majority of households living in semi permanent houses (55.8%), (19.0%) live in permanent houses and (25.2%) live in temporary houses (***Figure I-3***).

Other data on households confirm that the socio-economic status of many of the households is low; very few households have electricity (9.4%) and telephone (5%) (***Figure I-4***).

Education levels on the other hand are relatively high with an average of 2.5 children per household sent to primary schools, 1.4 to secondary schools and 1.9 to post secondary education (***Table I-4***).

The results of the Survey further indicate that there is a relationship between occupation and education. Most of the farmers' children received primary school education while the children of businessmen and those in employment continued with secondary and post secondary education (***Table I-4***).

4.2 Water Source and Usage

(1) Water Source:

Most of the farmers use river water and community water supplies (***Table I-5***). The river is preferred because it is culturally accepted, it is reliable and no payments are required. River water is used without restrictions especially to irrigate the crops and to water the animals. The main problem with the river water is that the factories located upstream, discharge their waste in the rivers making them polluted.

The level of service has a lot to do with the social and cultural values of a given community. For example, in our sample 37.3% used community water supplies, while 22.3% used Ministry water supplies (***Figure I-5***). In the study area with the exception of Isiolo, communities have a tradition of constructing their own water supplies, therefore, they attach greater importance to their own water systems.

Ministry water is less preferred because it was designed basically for drinking at the rate of 30 litres per person per day. The problem is that humans are not the only ones who use the water from the piped scheme, it is also used for animals, especially grade cattle which require a lot of water. This high demand for water means that water must be rationed. This in turn makes the system unreliable. Furthermore, customers of community water supplies are generally entitled to use water without charge other than the membership fee. Therefore, there is an outstanding tendency for people to shift from Ministry schemes to community managed schemes.

Many people suffer from collecting water from their water source. 26% of the sample got their water immediately from the tap, while the rest had to walk to the water source covering an average distance of 1 - 2 Kms (***Figure I-6***).

The most used alternative water source during dry seasons is the river, while a few people use kiosks, neighbours' supply, hang dug wells, and springs (***Figure I-7***). Majority of them (79%) do not have storage facilities (***Figure I-8***). This is particularly seen in farmers, the main reason being that there are alternative water sources which can be used, and also the cost of constructing tanks may not be affordable to most of the farmers (***Table I-6***).

(2) Water Usage:

1) Water Collection

The frequency of collecting water and the means of collecting it affect the amount of water collected and thus the amount of water consumed. In the sample, majority of people collect water 4 times a day using a 20 litre plastic container known as jerican (***Figures I-9***). The water is usually collected by female members of the household, but it is used by all members of the household.

Other factors which affect the water consumption are reliability and availability of water during dry seasons and the times one misses water in a given period. In the sample, (53.0%) got water more than 21 days in a month. The water source reliability was (66.0%) and water was available (65.7%) during dry seasons.

The result of the survey indicate that when water is collected from a source, the unit consumption per head is extraordinary low, 10.0 lpcd as shown in

the table below.

Table Collected Water Consumption

Town	Water Collected (liters/day)	Population	Unit Consumption (lpcd)
Meru	5,240	555	9.4
Nkubu	2,340	223	10.5
Isiolo	3,860	474	8.1
Chuka	6,140	593	10.4
Chogoria	4,500	430	10.5
Maua	5,220	495	10.5
Tigania	6,600	634	10.4
Total	33,900	3,404	10.0

2) Ministry and Community Water Supply (Metred Records)

As most respondents (community and ministry water supplies) did not give the right information on water usage, attempts were made to get information on unit water consumption from metered records. It is a stated policy of the government that Ministry water supply targets at the meter installation at all house connections. However, it was difficult to obtain accurate data due to the following:

a) most of house connections are not properly maintained,

b) metered connections are very few,

c) many metres were not functioning, and

d) as meter reading is not necessarily well-organized, metered records sometimes contain inaccurate data.

Table below indicates unit consumption for the few metres obtained from district water offices.

Table	Unit Water Consumption (Metered Records)		
Water Consumption (m3/month)	Nos. of households	Nos. of Consumers	Unit Consumption (lpcd)
8	1	8	33
9	1	12	25
10	1	2	167
11	1	6	61
12	6	51	47
18	1	8	75
25	1	11	76
26	1	5	173
27	1	7	129
30	1	6	167
55	1	3	611
	16	119	**82**

4.3 General View on Water Supply Services

Only 38% of the rural population and 65% of the urban population have access to good quality drinking water. The goal of the Government is to increase the coverage to 69% by the year 2010.

At the beginning of the International Drinking Water Supply and Sanitation Decade, water supply and sanitation followed more or less the methods and technologies which had been developed in developed countries; as a result, the needy communities could not afford to pay the cost of the service being provided.

The Decade introduced concepts of appropriate technology, community and women's participation, socio-cultural relevance and integration with activities such as hygiene education. From the experience gained during the Decade, the Government has been able to identify three problems facing the water sector: These are mainly rapid population growth, improper land use which result into pollution and pollution effects brought about by waste water from industries, towns and agriculture.

The Ministry of Land Reclamation Regional and Water Development (MLRRWD) while still working on the policy framework has devised strategies and approaches to promote the sector.

The policy objective is to create an enabling environment for orderly coordinated and sustained development of water resources including protection against pollution. The Ministry will continue to formulate policies and regulations concerning water resource

management and coordinate the realization of water management by other sectors such as NGOs and communities.

Emphasis is laid on institutional capacity building, cost recovery, consumers management of own water , appropriate research on technologies and methodologies suitable for the sector, gender sensitivity and adequate funds for operation and maintenance.

Further focus is laid on the rehabilitation of existing water facilities to improve the utilization of existing capacity and coverage. The Ministry has gradually moved away from implementing large projects to offering technical support to small scale community projects. This has led to consumers shifting from Government schemes which have a service ratio of 20% to community schemes with a service ratio of 27%. From the result of the survey, more people rely on community water supplies as opposed to Ministry water supplies.

The table below gives a comparison between community water supplies and Ministry Water supplies.

	Ministry Water Supplies	Community Water Schemes	Remarks
1.	22.4% use Ministry Supplies Large schemes	37.6% use Community schemes. Small schemes	
2.	Serving a big population usually in urban areas.	Serving rural Communities with a small population.	
3.	Reliability (58 %)	Reliability (57 %)	See **Figure I4-10**
4.	Low pressure	Slightly higher pressure	
5.	46 % of the consumers were satisfied	64 % of the consumers satisfied	See **Figure I4-11**
6.	Higher payment	They pay less after initial payment of membership fees	
7.	Water is treated	In general, no treatment	
8.	Management done by Ministry employees	Managed by community members themselves	
9.	Revenue collected monthly	Revenue collected whenever O/M problems occur	
10.	Vandalism is common	Vandalism rare	
11.	Time delays between billing and working service	No delays	
12.	Many illegal connections	Very few illegal connections	
13.	Water rationing is practiced	Water rationing is hardly put into place	

From the results of the survey (***Figure I-12***), the following reasons were given as those which made consumers unsatisfied with water supply services:

(1) Water Pressure:

(83.5%) of the consumers were not satisfied with the water pressure, they felt that the pressure was low, which contributed to their missing water.

(2) Management:

(22.5%) were not satisfied with management of water facilities.

(3) Tariffs:

(20.4%) were not satisfied with the water tariffs, they felt they were too high.

(4) Quality:

Only (9.8%) felt that the water quality was poor.

From these results one can conclude that quality of water is not seen as a problem from the consumer's point of view; what matters is the quantity of water.

4.4 Household Income and Willingness to Pay

(1) Household Income:

Major sources of income include crops, livestock and salaries. The income from crops was computed using unit price per crop, while due to lack of data, income from livestock was computed using 25% (namely 4 year interval selling in average) of the total livestock market price. When computing income, land acreage was considered,with average acreage of 2 acres in the study area.

The average income of household in each town is thus estimated as given in ***Figure I-13***. The average income per capita was found to be Kshs13,200/=per year, while the highest, Kshs15,400/=per year was seen in Meru.

In the study area, most people practice mixed farming, therefore most of the income is obtained from sale of crops and livestock. This is not applicable to Isiolo, where income from livestock was found to be higher than that obtained from crops, the main reason being that the climatic conditions in Isiolo district do not favour the growing of crops, therefore livestock rearing is the main economic activity.

From the survey results, we found out that there is a close relationship between income and water source (***Table I-7***). The result indicate that :

1) Low income groups use community water supplies and Ministry Water Supplies. But the majority depend on river water.

2) Middle income groups use community schemes, Ministry Water Supplies and river water.

3) High income groups do not use the river, they use community water schemes, Ministry Water Supplies and hand dug wells (borcholes).

This pattern indicate that the higher income groups can choose to develop their own sources, while the middle and low income groups use whatever is available.

(2) Willingness to Pay:

In economics, a consumers' "willingness to pay" is defined as the maximum amount he or she would be willing to pay for a service rather than do without it.

Willingness to pay can be predicted by asking consumers in advance about their own estimate of their future willingness, one can also look at the previous actual behavior in real situations or look at the improvement in housing".

In our survey, we dealt with willingness to pay in the same way as suggested here, by asking questions on how much the consumers were already paying and whether they were satisfied with the services being offered. For those who said they were not satisfied we went on further to find out, if the problems were solved, whether they would be willing to pay.

As seen in ***Figure I-14***, the results indicate :

1) Willingness to pay for improved water services does not depend solely on income, but equally on the characteristics of both the existing and the improved supplies. In our sample 36.7 % did not pay for all types of water supplies, regardless of the socio-economic status (***Figure I-15***). It is difficult to explain why such a large number were not willing to pay for services. The main reason may be hidden in the cultural factors. Culturally, people consider water to be free, therefore they do not want to pay for it. They will use all means to ensure that they do not pay. Some of them may collude with water authorities so as to get illegal connections, others device ways of using their neighbor's supply without paying.

2) Water tariffs do affect willingness to pay. In our sample we found out that when water tariffs are high less and less consumers are willing to pay for water services (***Table I-8***). For example when the tariff was Kshs 5/= per day, 22 % were willing to pay, when the tariff was Kshs 10/= per day only 6.9 were willing to pay, when the tariff was Kshs 20/= , 2.7 % were willing to pay and finally when they were required to pay more than Kshs 20/= per day, only 1.9 % were willing to pay. Another 4.7 % relied on community water schemes where they paid membership fee, but were not required to pay monthly bills. This pattern indicates that consumers are willing to pay for investment costs at once, but they may not be ready to pay monthly bills. This can be explained in a sense that most consumers in the sample are

farmers, therefore they do not earn monthly salaries to enable them to pay water bills. They would prefer to be billed seasonally when they sell their crops or livestock. Therefore it would be meaningful if the tariffs were designed to be collected when the consumers have money.

3) Willingness to pay is associated with the reliability of a water system. In our sample, 66 % of the water sources were reliable, with river water being the most reliable (83%), hand dug wells (64%), Ministry Water Supply (58 %) and Community water supply (57 %) (***Figure I-10***). When asked whether they were satisfied with water services, 62.8 % were not satisfied with the services and only 37.2% were satisfied (***Figure I-11***). Unreliability may be a major cause for dissatisfaction. If reliability is increased, then people will not have to travel long distance to collect water, therefore most of them will be happy to attend to other concerns. For example only 26.0 % can get water immediately, the rest have to walk up to 2 km in order to get water (***Figure I-6***).

4) People are more willing to pay for individual connections than for kiosks, yard and neighbours water (***Figure I-9***). In our sample we found that individual connections whether Ministry or Community were preferred , and therefore people were more willing to pay for them. The main reason may be attributed to the fact that when one has an individual connection he gets water readily at the tap, therefore cuts on walking distance. The time which could have been spent to collect water is used for other purposes. Therefore individual connections are convenient to the users.

   On the other hand, kiosks and yard taps were used when the water charge was less than Ksh 10/=. When the price went up to < Ksh 20 and > Kshs 20, there was no willingness to pay. The main reason may be attributed to the distance to the kiosk, and waiting time which has to be taken into consideration.

5) There is a relationship between one's occupation and willingness to pay. In our sample, 26.8% of the farmers were not willing to pay for water services, 4.3% employees and 4.3% businessmen. The main reason may be attributed to the type of water sources they each depended on. The farmers depended on the river and community water supplies, while the employees and businessmen depended on Ministry water supply.

6) In our sample, we did not find any relationship between willingness to pay and satisfaction. In the table below, more people who were not satisfied paid for the water services than those who were satisfied.

Table Satisfaction vs Payment

Satisfaction	None or less than Ksh5	More than Ksh5	Membership	Not applicabele	Total
Yes	111	26	18	7	162
No	197	54	15	8	274
Total	308	80	33	15	436

(3) Conclusion:

Willingness to pay depends on a variety of factors ranging from cultural factors, level of service, reliability of the water system, the occupation and water tariffs. In most cases, a combination of the above factors would influence people to pay or not to pay.

4.5 Sanitation, Health and Public Awareness on Hygiene Education

Statistics on the incidence of diseases indicate that malaria is the major killer disease in the study area, accounting for 75%. This view is supported by World Development Report of 1993, which states that 40% of the total global diseases are attributed to water and sanitation related failures. It goes on to say that the situation could drastically be improved if water supply, sanitation and health education are provided to population.

Knowledge and attitudes affect the way people perceive their health situation. In the sample, people were asked whether they knew water related diseases. The result was that 81.3% knew, and 18.7% did not know (***Figure I-16***). In order to check on their attitude, they were further asked to point out the diseases which affected members of their families in the last one year. The result indicate that 75% suffered from malaria, 52% other diseases, 8% typhoid, 5% dysentery and 2% cholera (***Figure I-17***).

The pattern coming from the above scenario indicate that people's knowledge of diseases is not enough to prevent them from getting sick. Attitudes and beliefs affect the way people perceive illness. People may know the symptoms and signs, but they may not know the cause, this may be due to cultural beliefs which associate sickness with other factors such as witchcraft, bad omen, harvest etc.

The results of the survey indicate that there is a relationship between the income levels

and disease incidences (***Table I-10***). The result further indicate that the households from high income groups suffered less from water related diseases. On the other hand, all income groups suffered from malaria, with most of the cases coming from the low income groups.

There is a relationship between water source and disease incidence (***Table I-11***). Malaria is common in all water sources, but it is highest in river water. This may be attributed to breeding of mosquitoes in cans and bushes near the river. High consumption of river water may cause water related diseases such as typhoid, cholera and dysentery.

(1) Refuse Disposal System:

In the study area, there is no organized system for handling refuse. As given in ***Table I-12***, 70.5% throw refuse in the garden, 16.7% in bins and 4.4% burn refuse. Sullage water is disposed outside the compound, usually into open drains. The results indicate that the households are not aware that poor disposal of refuse may cause diseases. This type of behavior may be attributed to:

1) lack of health education

2) non-enforcement of by-laws to ensure that rubbish is not dumped everywhere. Under the Public Health Act, citizens are not allowed to dump refuse everywhere.

From the data, we can conclude that, there is need to create awareness on the dangers of existing refuse disposal practices, and explain the benefits accrued from using safe refuse disposal facilities such as bins. In the absence of bins, to encourage more people to burn refuse, and discourage them from throwing it in the garden.

(2) Sanitation:

Unsanitary means of excreta disposal contribute to the spread of intestinal parasites such as worms which cause diseases.

According to Situation Analysis (UNICEF/GoK 1992) , only 35% of the population in Kenya had access to safe excreta disposal in 1989. The report points out that there are Regional variations with Central Province having the highest coverage of 69%, and Eastern Province having the lowest of 26%.

In the sample, latrines are the main form of excreta disposal, 88.3% use latrines,

6.6% use septic tanks and 4.7% use other forms of excreta disposal, which includes the bush (66%) (***Figure I-18***). From the data, coverage is low in Isiolo because of the nomadic way of life characterized by frequent movements and low population densities; as a result, most of the people in Isiolo use the bush.

The sanitation situation indicate that there is a relationship between the type of housing and the type of sanitation facilities used by the population (***Table I-13***). The data result indicate that the households living in permanent houses used septic tanks, those in semi-permanent houses used pit latrines and those in temporary houses used the bush.

(3) Hygiene Education:

Inclusion of hygiene education as part of sector investments was recognized during the Water and Situation Decade. One of the lessons of the Decade indicated that provision of water supply alone did not bring about the required health benefits.

Transmission of diseases is linked to peoples' behavior, and it can be controlled by interventions such as health education which seeks to change that behavior. Other interventions may include infrastructure improvement and regulations.

For example there is evidence from*(White, Bradley and White 1972)* that an improved level of water supply provision can cause increased domestic water consumption, and much of the increased consumption is used for hygiene purposes. Also *(Curtis 1995)* found to their surprise that a tap in the yard was also a good predictor of hygienic excreta disposal.

In our survey we wanted to know whether there was enough water to wash hands, wash clothes, and bathe. The results indicate that 84.9% wash hands, 84.9% wash clothes and 76.0% bathe (***Figure I-19***). The results can also be linked with usage of sanitation facilities which is high. At the domestic level, people know what is expected of them, and they practice it in their own ways.

But this is not enough, because transmission of disease is a public concern requiring public investment or public regulation to prevent it. The investment to prevent it may be in infrastructure such as drains, excreta disposal and solid waste collection systems. The regulation would include by-laws against dumping of wastes.

TABLES

Table I-1 Land Size

Town	Landless	<2 acres	<5 acres	>5 acres	Total
Chogoria	1	42	38	18	99
Chuka	6	42	34	18	100
Isiolo	4	77	14	5	100
Maua	3	65	27	5	100
Meru	0	48	34	18	100
Nkubu	1	68	21	10	100
Tigania	2	59	25	14	100
Total	17	401	193	88	699

Table I-2 Job vs Land Size (Nos. of Household)

JOB	Landless	<2 acres	<5 acres	>5 acres	Total
Farmer	7	245	143	61	456
Employee	2	47	21	15	85
Business mai	6	72	17	9	104
Others	2	37	11	2	52
Total	17	401	192	87	697

Table I-3 Ave. Family Size

JOB	Ave. Family Size
Farmer	7.2
Employee	7.3
Business mai	7.4
Others	8.3
Total	7.4

Table I-4 Job vs Ave. Students

Job	Kindergarten	Pri. School	Sec. School	Post Secdary
Farmer	1.3	2.5	1.4	2.0
Employee	1.5	2.3	1.4	1.7
Business mai	1.3	2.4	1.5	2.1
Others	1.8	3.0	1.3	1.4
Average	1.4	2.5	1.4	1.9

Table I-5 Job vs Water Source

Job	River	Hang Dug Well	Others	Ministry WS	Community WS	Total
Farmer	24.9%	5.7%	1.7%	8.2%	24.9%	65.5%
Employee	1.6%	0.9%	0.1%	4.2%	5.4%	12.2%
Business man	2.3%	0.6%	0.4%	7.0%	4.6%	14.9%
Others	1.3%	0.6%	0.1%	3.0%	2.4%	7.4%
Total	30.1%	7.7%	2.4%	22.3%	37.4%	100.0%

Table I-6 Type of Storage

JOB	Drum	Tank	Not applicable	Total
Farmer	8	70	379	457
Employee	5	24	56	85
Business man	5	22	77	104
Others	3	10	39	52
Total	21	126	551	698

Table I-7 Income Level vs Water Source

Income Level (Ksh/year)	River	Hang Dug Well	Others	Ministry WS	Community WS	Total
Less than 50,000	84	22	7	38	69	220
50,000-100,000	68	14	2	34	70	188
100,000-200,000	51	15	6	70	100	242
200,000-300,000	8	3	0	13	20	44
300,000-400,000	0	1	0	0	1	2
400,000-500,000	0	0	2	0	1	3
More than 500,000	0	0	0	1	0	1
Total	211	55	17	156	261	700

Table I-8 Satisfaction vs Payment (KSH/DAY)

Satisfaction	None	<ksh5	<Ksh10	<Ksh20	>Ksh20	Membership	Not applicable	Total
Yes	59	52	20	4	2	18	7	162
No	98	99	28	15	11	15	8	274
Not applicable	100	3	0	0	0	0	161	264
Total	257	154	48	19	13	33	176	700

Table I-9 Satisfaction vs Water Source

Satisfaction	River	Hang Dug Well	Others	Ministry WS	Community WS	Total
Yes	9	4	1	49	99	162
No	9	3	3	105	154	274
Not Applicable	193	48	13	2	8	264
Total	211	55	17	156	261	700

Table I-10 Income Level vs Diseases

Income Level (Ksh/year)	Nos of Households	None	Malaria	Typhoid	Cholera	Dysentry	Others
0-50,000	143	21	100	12	2	3	73
50,000-100,000	196	28	151	13	6	12	95
100,000-200,000	256	34	198	25	4	14	145
200,000-300,000	85	13	66	7	1	7	43
300,000-400,000	8	1	6	0	0	1	6
400,000-500,000	8	1	5	0	0	0	5
>500,000	4	0	3	0	0	0	3
Total	700	98	529	57	13	37	370

Table I-11 Water Source vs Diseases

Water Source	Nos. of Households	Not affected	Affected	Malaria	Typhoid	Cholera	Dysentry	Others
River	211	19	192	169	15	5	15	111
(%)	100%	9%	91%	80%	7%	2%	7%	53%
Hang dug well	55	3	52	46	4	1	3	32
(%)	100%	5%	95%	84%	7%	2%	5%	58%
Others	17	2	15	12	1	1	1	9
(%)	100%	12%	88%	71%	6%	6%	6%	53%
Ministry	156	32	124	107	25	2	6	87
(%)	100%	21%	79%	69%	16%	1%	4%	56%
Community	261	42	219	195	12	4	12	131
(%)	100%	16%	84%	75%	5%	2%	5%	50%
Total	700	98	602	529	57	13	37	370
(%)	100%	14%	86%	76%	8%	2%	5%	53%

Table I-12 Refuse Disposal

Town	Nos. of Households	Garden	Pit	Burning	others
Chogoria	100	88.0%	20.0%	2.0%	4.0%
Chuka	100	88.0%	19.0%	8.0%	1.0%
Isiolo	100	43.0%	33.0%	27.0%	2.0%
Maua	100	81.0%	13.0%	3.0%	4.0%
Meru	100	91.0%	10.0%	3.0%	2.0%
Nkubu	100	58.0%	40.0%	7.0%	2.0%
Tigania	100	87.0%	13.0%	2.0%	1.0%
Total	700	76.6%	21.1%	7.4%	2.3%

Table I-13 House Type vs Sanitary Facilities

House Type	Pit Latrine	Septic tank	Others	Not replied	Total
Permanent	14.3%	0.1%	0.9%	0.8%	0.1%
Semipermane	14.3%	0.0%	0.0%	0.0%	0.0%
Temporary	14.3%	0.0%	0.0%	0.0%	0.0%
Total	100.1%	0.0%	0.0%	0.0%	0.0%

FIGURES

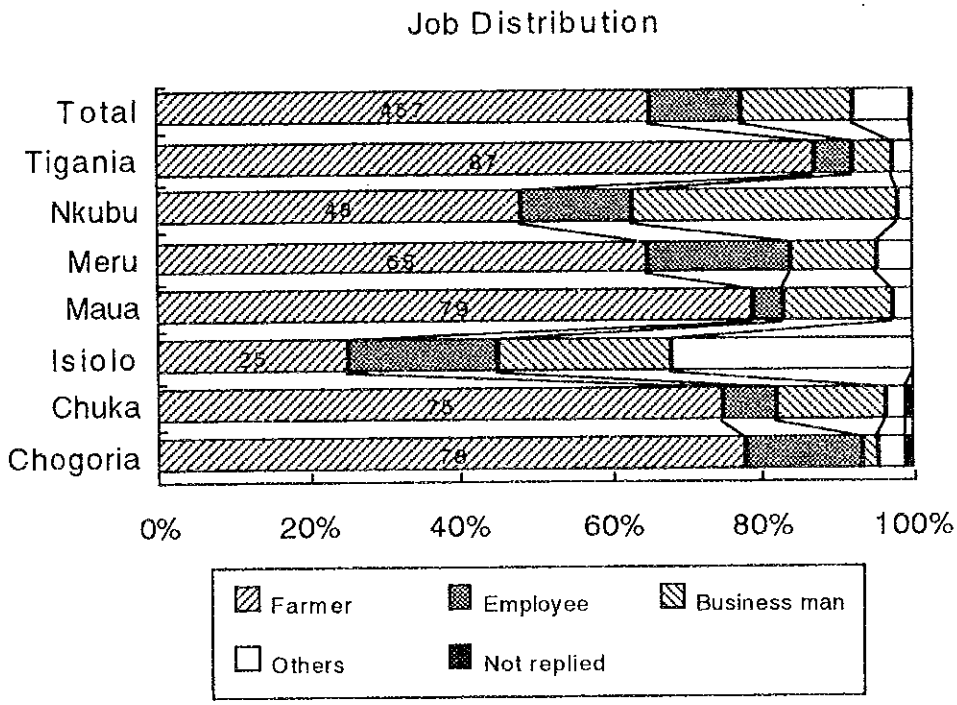


Table JOB

Town	Farmer	Employee	Business man	Others	Not replied	Total
Chogoria	78	15	2	4	1	100
Chuka	75	7	14	3	1	100
Isiolo	25	20	23	32	0	100
Maua	79	4	14	3	0	100
Meru	65	19	11	5	0	100
Nkubu	48	15	35	2	0	100
Tigania	87	5	5	3	0	100
Total	457	85	104	52	2	700
(%)	65.3%	12.1%	14.9%	7.4%	0.3%	100.0%

THE STUDY ON
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Figure I-1
Job Distribution

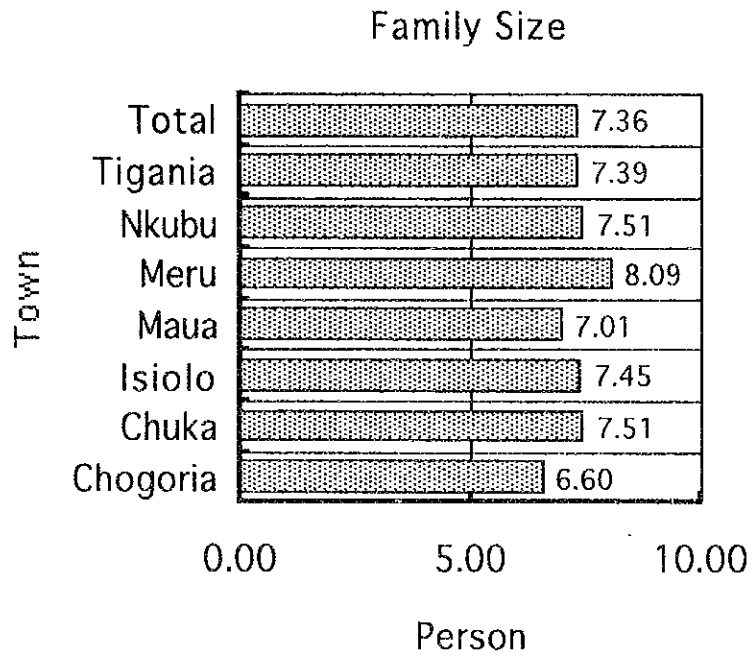

Table AVERAGE FAMILY SIZE

Town	Nos. of Samples	Nos. of Members	Ave. Family Size
Chogoria	100	660	6.60
Chuka	97	728	7.51
Isiolo	99	738	7.45
Maua	98	687	7.01
Meru	98	793	8.09
Nkubu	100	751	7.51
Tigania	100	739	7.39
Total	692	5,096	7.36

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Figure I-2
Family Size

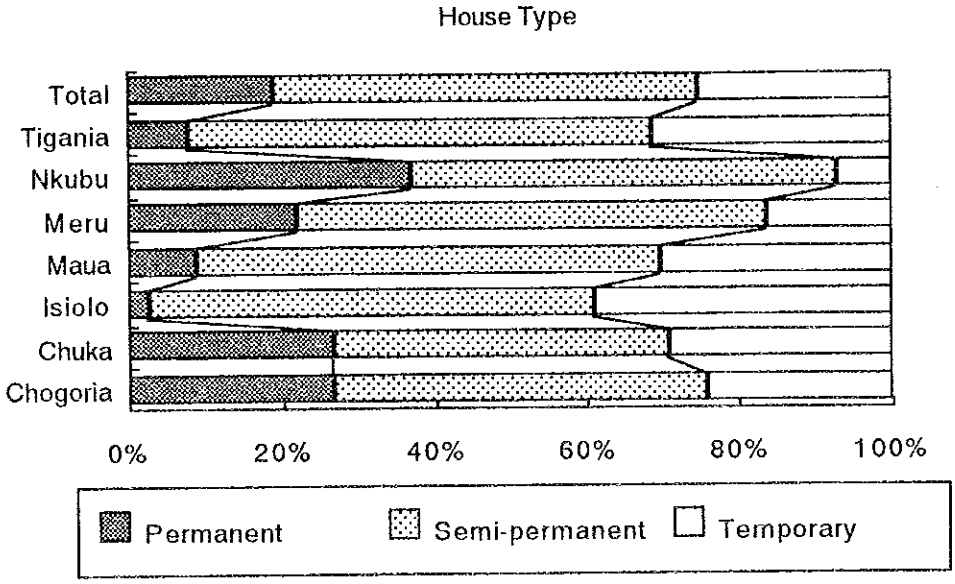

Table HOUSE TYPE

Town	Permanent	Semipermanent	Temporary	Total
Chogoria	27	49	24	100
Chuka	27	44	29	100
Isiolo	3	58	39	100
Maua	9	61	30	100
Meru	22	61	16	99
Nkubu	37	56	7	100
Tigania	8	61	31	100
Total	133	390	176	699

THE STUDY ON THE WATER SUPPLY FOR SEVEN TOWNS IN EASTERN PROVINCE IN THE REPUBLIC OF KENYA	Figure I-3 House Type
JAPAN INTERNATIONAL COOPERATION AGENCY	

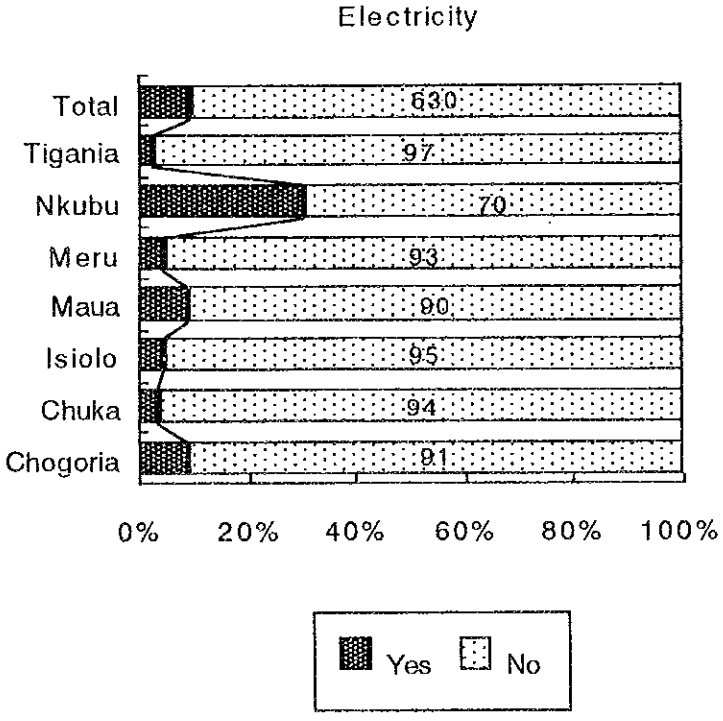

Table ELECTRICITY & TELEPHONE

	ELECTRICITY		TELEPHONE		
Town	Yes	No	Yes	No	Total
Chogoria	9	91	8	92	100
Chuka	4	94	1	96	98
Isiolo	5	95	4	96	100
Maua	9	90	3	96	99
Meru	5	93	5	93	98
Nkubu	30	70	11	89	100
Tigania	3	97	3	97	100
Total	65	630	35	659	695

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Figure I-4

Electricity & Telephone

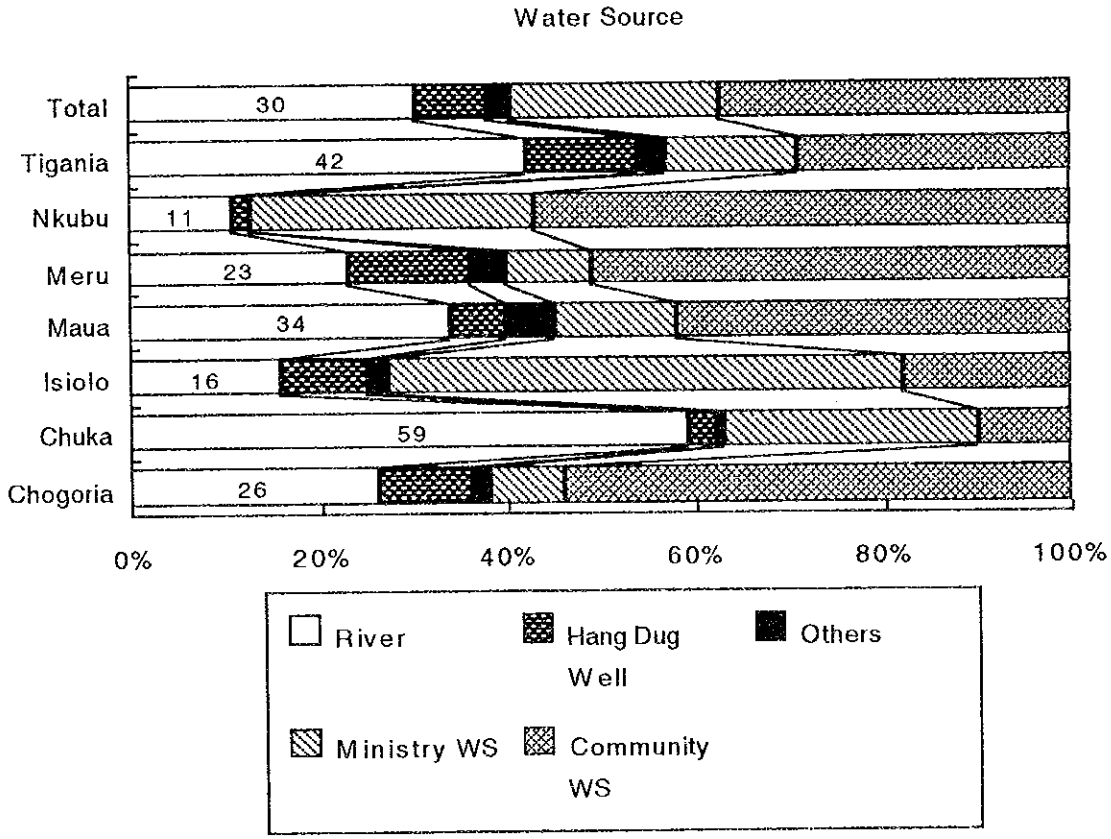

Table WATER SOURCE

Town	River	Hang Dug Well	Others	Ministry WS	Community WS	Total
Chogoria	26	10	2	8	54	100
Chuka	59	3	1	27	10	100
Isiolo	16	9	2	55	18	100
Maua	34	6	5	13	42	100
Meru	23	13	4	9	51	100
Nkubu	11	2	0	30	57	100
Tigania	42	12	3	14	29	100
Total	211	55	17	156	261	700
(%)	30.1%	7.9%	2.4%	22.3%	37.3%	100.0%

THE STUDY ON
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Figure I-5

Water Source

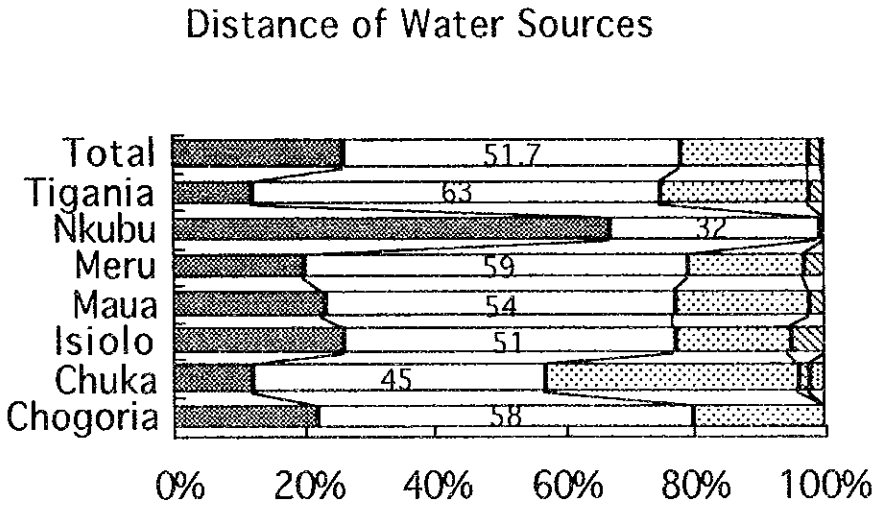

Table DISTANCE OF WATER SOURCES

Town	Immediately	less than 0.5km	0.5-2.0km	2.0-4km	more than 4km	Total
Chogoria	22	58	20	0	0	100
Chuka	12	45	39	2	2	100
Isiolo	26	51	18	5	0	100
Maua	23	54	21	2	0	100
Meru	20	59	18	3	0	100
Nkubu	67	32	1	0	0	100
Tigania	12	63	23	2	0	100
Total	182	362	140	14	2	700
(%)	26.0%	51.7%	20.0%	2.0%	0.3%	100.0%

THE STUDY ON
THE WATER SUPPLY FOR SEVEN TOWNS
IN EASTERN PROVINCE IN THE REPUBLIC OF KENYA

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Figure I-6

Distance of
Water Sources

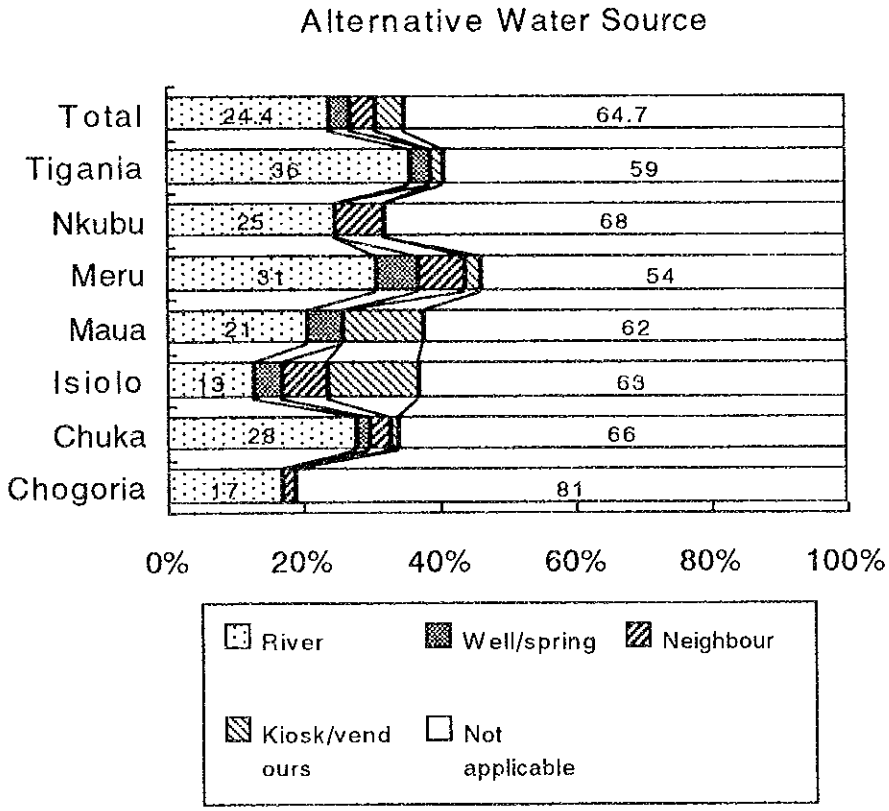

Table ALTERNATIVE SOURCE

Town	River	Well/spring	Neighbour	Kiosk/vendours	Not applicable	Total
Chogoria	17	0	2	0	81	100
Chuka	28	2	3	1	66	100
Isiolo	13	4	7	13	63	100
Maua	21	5	0	12	62	100
Meru	31	6	7	2	54	100
Nkubu	25	0	7	0	68	100
Tigania	36	3	0	2	59	100
Total	171	20	26	30	453	700
(%)	24.4%	2.9%	3.7%	4.3%	64.7%	100.0%

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Figure I-7
Alternative
Water Sources

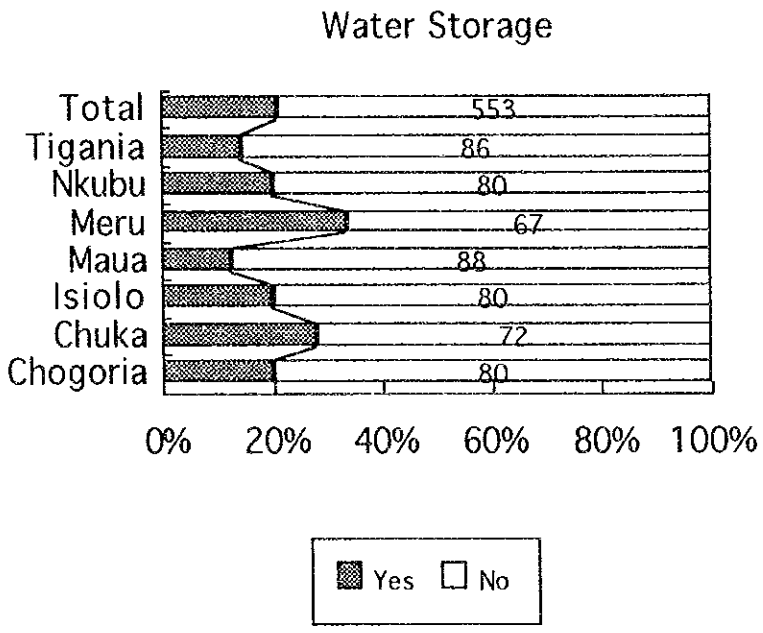

Table WATER STORAGE

Town	Yes	No	Total
Chogoria	20	80	100
Chuka	28	72	100
Isiolo	20	80	100
Maua	12	88	100
Meru	33	67	100
Nkubu	20	80	100
Tigania	14	86	100
Total	147	553	700

THE STUDY ON
THE WATER SUPPLY FOR SEVEN TOWNS
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Figure I-8
Water Storage

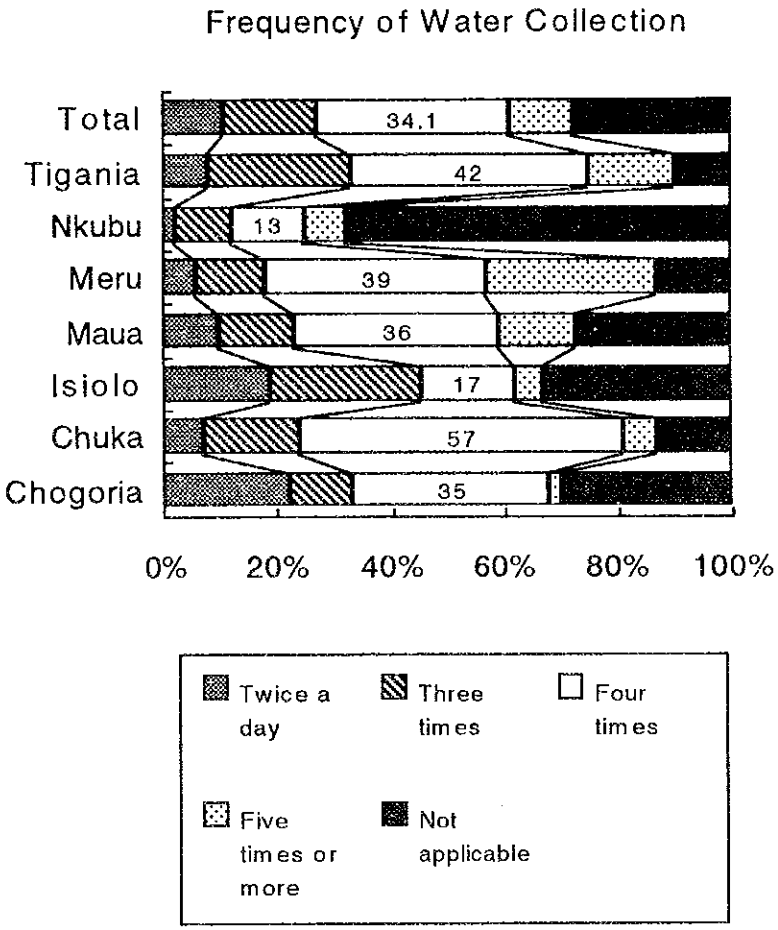

Table FREQUENCY OF WATER COLLECTION

Towm	Twice a day	Three times	Four times	Five times or more	Not applicable	Total
Chogoria	22	11	35	2	30	100
Chuka	7	17	57	6	13	100
Isiolo	19	26	17	5	33	100
Maua	10	13	36	14	27	100
Meru	6	12	39	30	13	100
Nkubu	2	10	13	7	68	100
Tigania	8	25	42	15	10	100
Total	74	114	239	79	194	700
(%)	10.6%	16.3%	34.1%	11.3%	27.7%	100.0%

THE STUDY ON
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Figure I-9
Frequency of
Water Collection

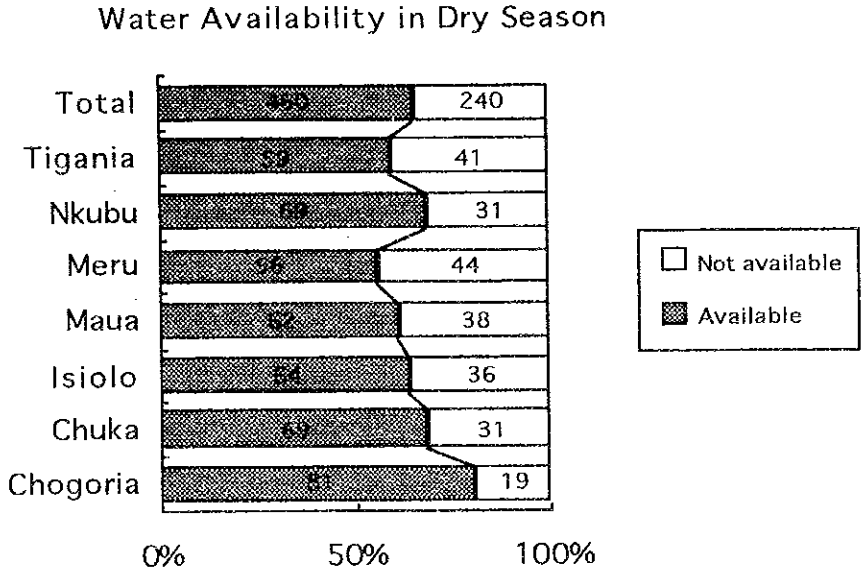

Table WATER AVAILABILITY IN DRY SEASON

Town	Available	Not available	Total
Chogoria	81	19	100
Chuka	69	31	100
Isiolo	64	36	100
Maua	62	38	100
Meru	56	44	100
Nkubu	69	31	100
Tigania	59	41	100
Total	460	240	700
(%)	65.7%	34.3%	100.0%

Table WATER SOURCE RELIABILITY IN DRY SEASON

Water Source	Yes	No	Total
River	83%	17%	100%
Hang Dug Well	64%	36%	100%
Others	47%	53%	100%
Ministry WS	58%	42%	100%
Community WS	57%	43%	100%
Total	66%	34%	100%

THE STUDY ON
THE WATER SUPPLY FOR SEVEN TOWNS
IN EASTERN PROVINCE IN THE REPUBLIC OF KENYA

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Figure I-10

Water Availability
in Dry Season

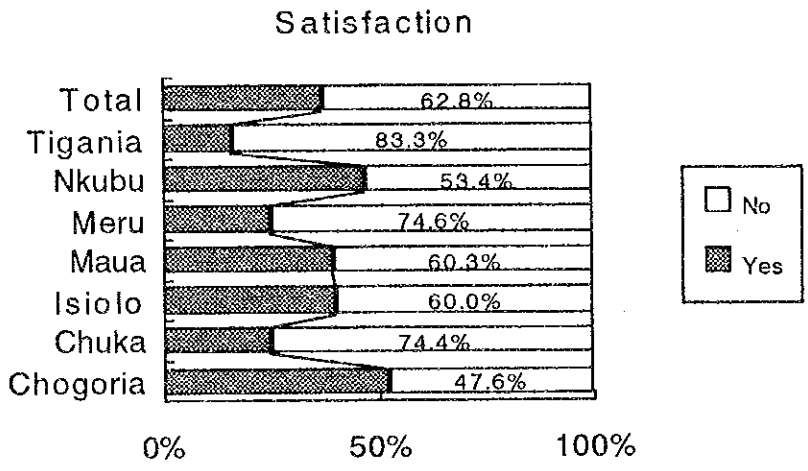

Table SATISFACTION FOR WATER SERVICES

Town	Yes	No	Total
Chogoria	52.4%	47.6%	100%
Chuka	25.6%	74.4%	100%
Isiolo	40.0%	60.0%	100%
Maua	39.7%	60.3%	100%
Meru	25.4%	74.6%	100%
Nkubu	46.6%	53.4%	100%
Tigania	16.7%	83.3%	100%
Total	37.2%	62.8%	100%

THE STUDY ON
THE WATER SUPPLY FOR SEVEN TOWNS
IN EASTERN PROVINCE IN THE REPUBLIC OF KENYA

JAPAN INTERNATIONAL COOPERATION AGENCY

Figure I-11

Satisfaction for Water Services

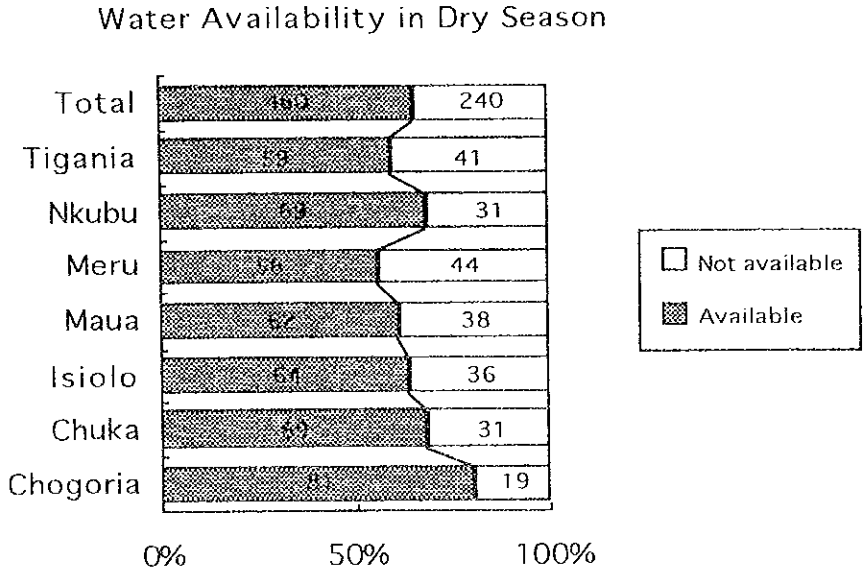

Table WATER AVAILABILITY IN DRY SEASON

Town	Available	Not available	Total
Chogoria	81	19	100
Chuka	69	31	100
Isiolo	64	36	100
Maua	62	38	100
Meru	56	44	100
Nkubu	69	31	100
Tigania	59	41	100
Total	460	240	700
(%)	65.7%	34.3%	100.0%

Table WATER SOURCE RELIABILITY IN DRY SEASON

Water Source	Yes	No	Total
River	83%	17%	100%
Hang Dug Well	64%	36%	100%
Others	47%	53%	100%
Ministry WS	58%	42%	100%
Community WS	57%	43%	100%
Total	66%	34%	100%

THE STUDY ON
THE WATER SUPPLY FOR SEVEN TOWNS
IN EASTERN PROVINCE IN THE REPUBLIC OF KENYA

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Figure I-10

Water Availability
in Dry Season

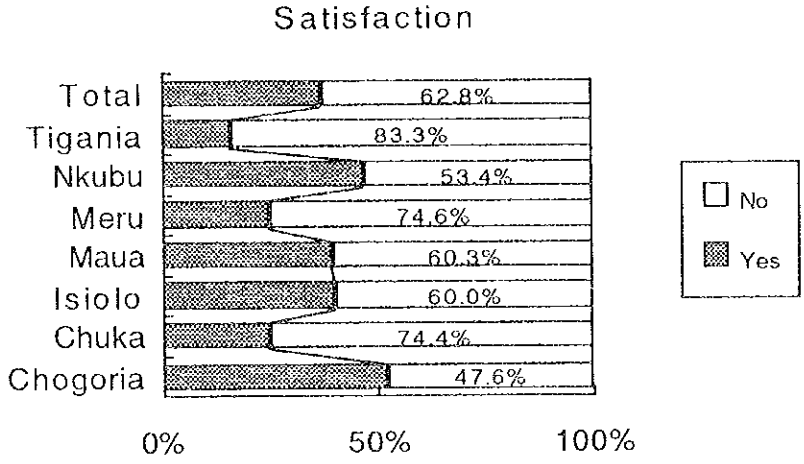


Table SATISFACTION FOR WATER SERVICES

Town	Yes	No	Total
Chogoria	52.4%	47.6%	100%
Chuka	25.6%	74.4%	100%
Isiolo	40.0%	60.0%	100%
Maua	39.7%	60.3%	100%
Meru	25.4%	74.6%	100%
Nkubu	46.6%	53.4%	100%
Tigania	16.7%	83.3%	100%
Total	37.2%	62.8%	100%

THE STUDY ON
THE WATER SUPPLY FOR SEVEN TOWNS
IN EASTERN PROVINCE IN THE REPUBLIC OF KENYA

JAPAN INTERNATIONAL COOPERATION AGENCY

Figure I-11

Satisfaction for Water Services

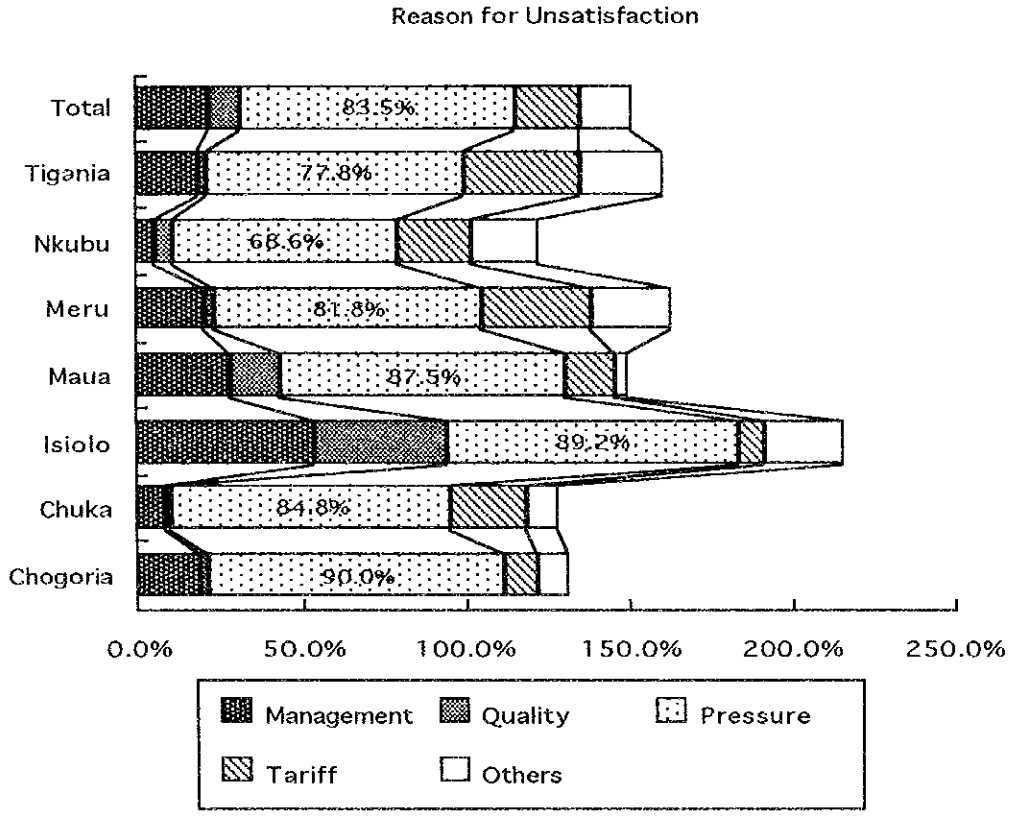


Table Reasons for Unsatisfaction

Town	Nos. of Replies	Management	Quality	Pressure	Tariff	Others
Chogoria	50	10	1	45	5	5
(%)		20.0%	2.0%	90.0%	10.0%	10.0%
Chuka	46	4	1	39	11	4
(%)		8.7%	2.2%	84.8%	23.9%	8.7%
Isiolo	37	20	15	33	3	9
(%)		54.1%	40.5%	89.2%	8.1%	24.3%
Maua	48	14	7	42	7	2
(%)		29.2%	14.6%	87.5%	14.6%	4.2%
Meru	33	7	1	27	11	8
(%)		21.2%	3.0%	81.8%	33.3%	24.2%
Nkubu	35	2	2	24	8	7
(%)		5.7%	5.7%	68.6%	22.9%	20.0%
Tigania	36	7	1	28	13	9
(%)		19.4%	2.8%	77.8%	36.1%	25.0%
Total	285	64	28	238	58	44
(%)		22.5%	9.8%	83.5%	20.4%	15.4%

THE STUDY ON THE WATER SUPPLY FOR SEVEN TOWNS IN EASTERN PROVINCE IN THE REPUBLIC OF KENYA	Figure I-12 Reasons for Unsatisfaction
JAPAN INTERNATIONAL COOPERATION AGENCY	

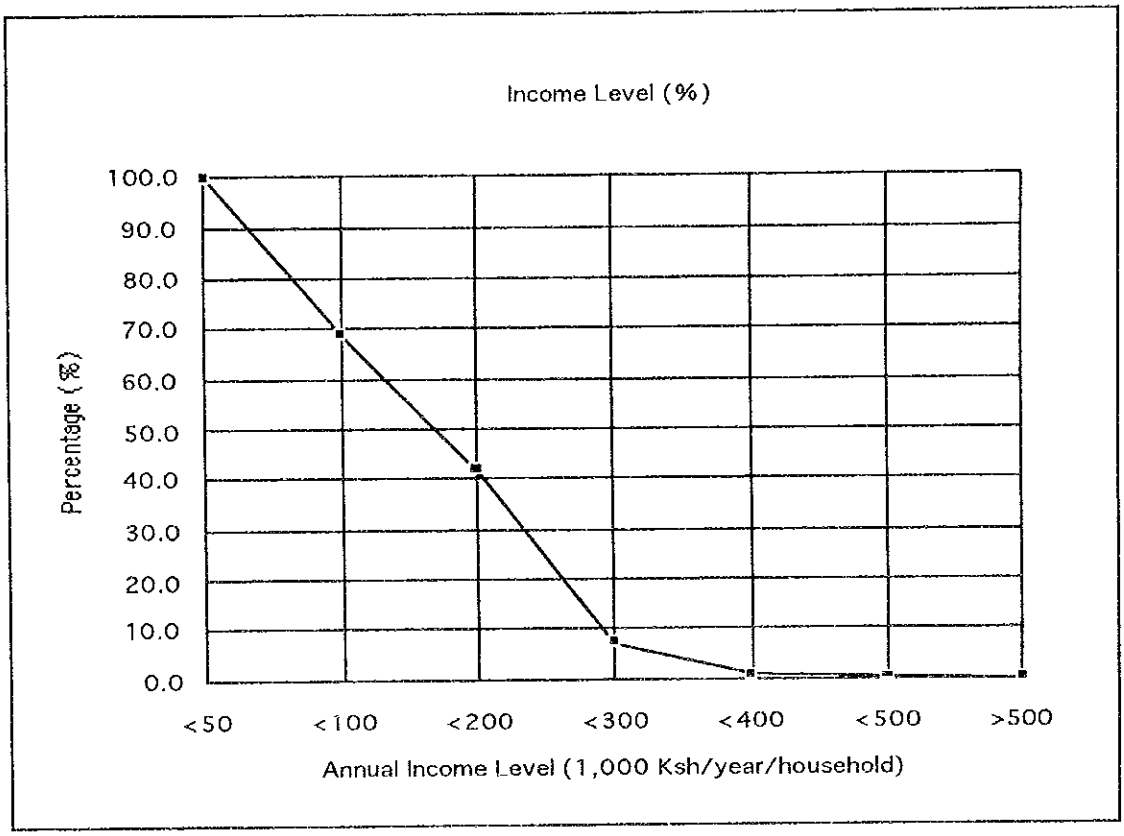


Table INCOME LEVEL (1,000Ksh/year)

Town	<50	50 - 100	100 - 200	200 - 300	300 - 400	400 - 500	>500	Total
Chogoria	24	30	41	5	0	0	0	100
Chuka	27	31	35	7	0	0	0	100
Isiolo	42	17	32	6	1	1	1	100
Maua	36	26	31	5	0	2	0	100
Meru	23	28	42	7	0	0	0	100
Nkubu	19	30	40	10	1	0	0	100
Tigania	49	26	21	4	0	0	0	100
Total	220	188	242	44	2	3	1	700
(%)	31.4%	26.9%	34.6%	6.3%	0.3%	0.4%	0.1%	100.0%

Table INCOME LEVEL ACCUMULATED PERCENTAGE

	<50	<100	<200	<300	<400	<500	>500
Average (%)	100.0	68.6	41.7	7.1	0.8	0.5	0.1

THE STUDY ON
THE WATER SUPPLY FOR SEVEN TOWNS
IN EASTERN PROVINCE IN THE REPUBLIC OF KENYA

JAPAN INTERNATIONAL COOPERATION AGENCY

Figure I-13

Income Level

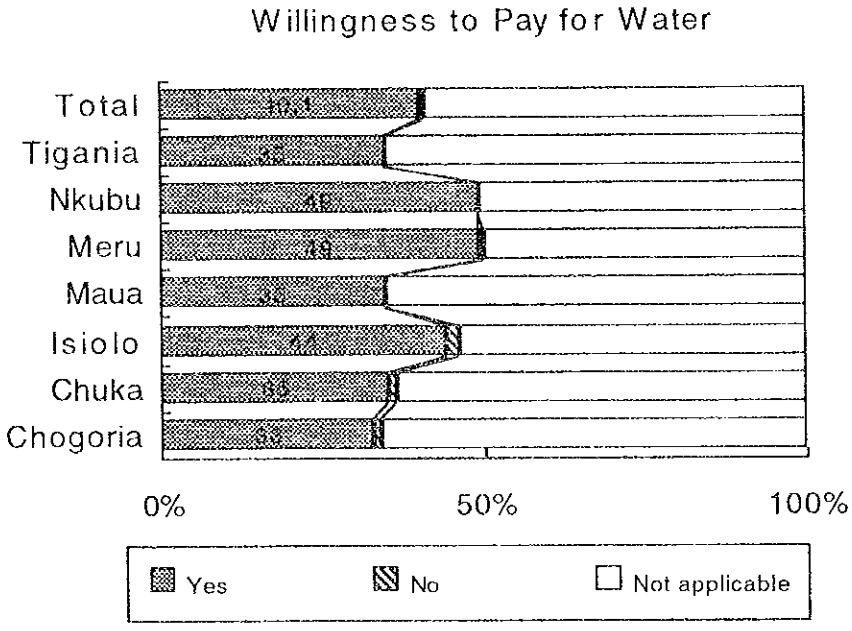


Table WILLINGNESS TO PAY FOR WATER

Town	Yes	No	Not applicable	Total
Chogoria	33	1	66	100
Chuka	35	1	63	99
Isiolo	44	2	54	100
Maua	35	0	65	100
Meru	49	1	50	100
Nkubu	49	0	51	100
Tigania	35	0	65	100
Total	280	5	414	699
(%)	40.1%	0.7%	59.2%	100.0%

Note: 'Not applicable' implies consumers' satisfaction for water services or no reply.

THE STUDY ON
THE WATER SUPPLY FOR SEVEN TOWNS
IN EASTERN PROVINCE IN THE REPUBLIC OF KENYA

JAPAN INTERNATIONAL COOPERATION AGENCY

Figure I-14

Willingness to Pay for Water

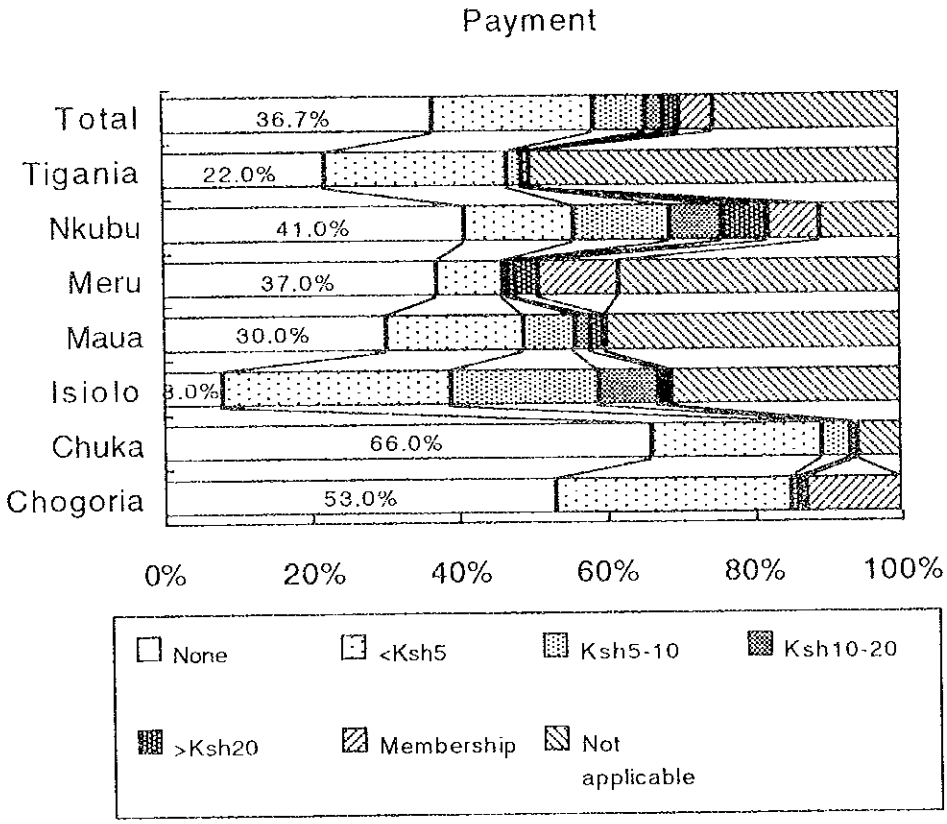


Table PAYMENT (KSH/DAY)

Town	None	<ksh5	<Ksh10	<Ksh20	>Ksh20	Member-ship	Not applicable	Total
Chogoria	53.0%	32.0%	1.0%	0.0%	1.0%	13.0%	0.0%	100.0%
Chuka	66.0%	23.0%	4.0%	1.0%	0.0%	0.0%	6.0%	100.0%
Isiolo	8.0%	31.0%	20.0%	8.0%	1.0%	1.0%	31.0%	100.0%
Maua	30.0%	19.0%	7.0%	2.0%	2.0%	0.0%	40.0%	100.0%
Meru	37.0%	9.0%	1.0%	1.0%	3.0%	11.0%	38.0%	100.0%
Nkubu	41.0%	15.0%	13.0%	7.0%	6.0%	7.0%	11.0%	100.0%
Tigania	22.0%	25.0%	2.0%	0.0%	0.0%	1.0%	50.0%	100.0%
Total	36.7%	22.0%	6.9%	2.7%	1.9%	4.7%	25.1%	100.0%

THE STUDY ON
THE WATER SUPPLY FOR SEVEN TOWNS
IN EASTERN PROVINCE IN THE REPUBLIC OF KENYA

JAPAN INTERNATIONAL COOPERATION AGENCY

Figure I-15

Payment for Water

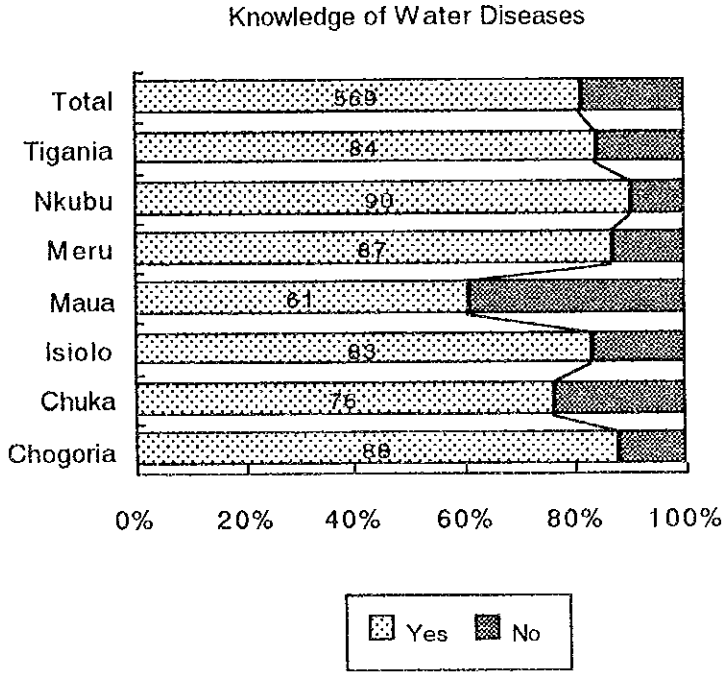


Table KNOW OF WATER DISEASES

Town	Yes	No	Total
Chogoria	88	12	100
Chuka	76	24	100
Isiolo	83	17	100
Maua	61	39	100
Meru	87	13	100
Nkubu	90	10	100
Tigania	84	16	100
Total	569	131	700
(%)	81.3%	18.7%	100.0%

THE STUDY ON
THE WATER SUPPLY FOR SEVEN TOWNS
IN EASTERN PROVINCE IN THE REPUBLIC OF KENYA

JAPAN INTERNATIONAL COOPERATION AGENCY

Figure I-16

Knowledge of Water Related Diseases

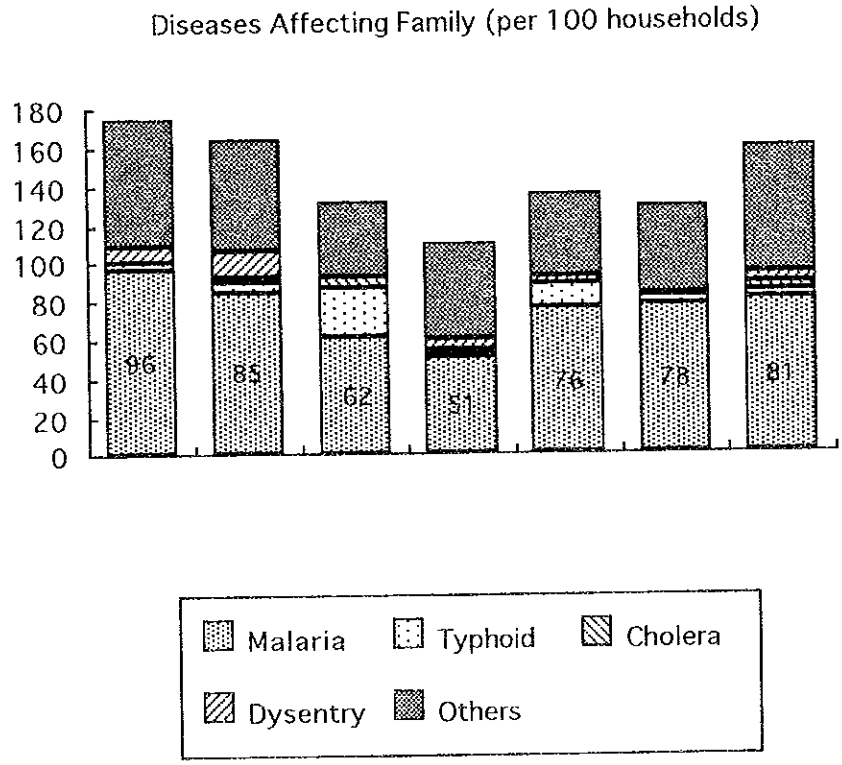


Table Diseases affecting families

Town	Malaria	Typhoid	Cholera	Dysentry	Others	None
Chogoria	96	5	0	8	66	1
Chuka	85	5	3	13	58	9
Isiolo	62	25	5	0	40	23
Maua	51	2	2	5	50	28
Meru	76	13	0	3	44	14
Nkubu	78	4	0	1	46	18
Tigania	81	3	4	6	66	5
Total	529	57	14	36	370	98

THE STUDY ON
THE WATER SUPPLY FOR SEVEN TOWNS
IN EASTERN PROVINCE IN THE REPUBLIC OF KENYA

JAPAN INTERNATIONAL COOPERATION AGENCY

Figure I-17

Diseases Affecting Family

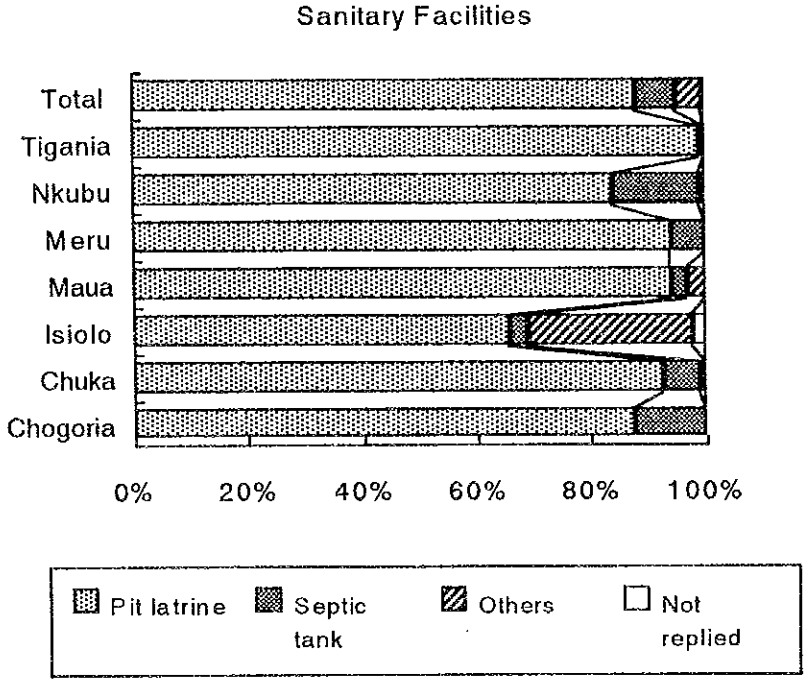


Table SANITARY FACILITIES

Town	Pit Latrine	Septic tank	Others	Not replied	Total
Chogoria	88	12	0	0	100
Chuka	93	6	1	0	100
Isiolo	66	3	29	2	100
Maua	94	3	3	0	100
Meru	94	6	0	0	100
Nkubu	84	15	1	0	100
Tigania	99	1	0	0	100
Total	618	46	34	2	700
(%)	88.3%	6.6%	4.9%	0.3%	100.0%

THE STUDY ON
THE WATER SUPPLY FOR SEVEN TOWNS
IN EASTERN PROVINCE IN THE REPUBLIC OF KENYA

JAPAN INTERNATIONAL COOPERATION AGENCY

Figure 1-18
Sanitary Facilities

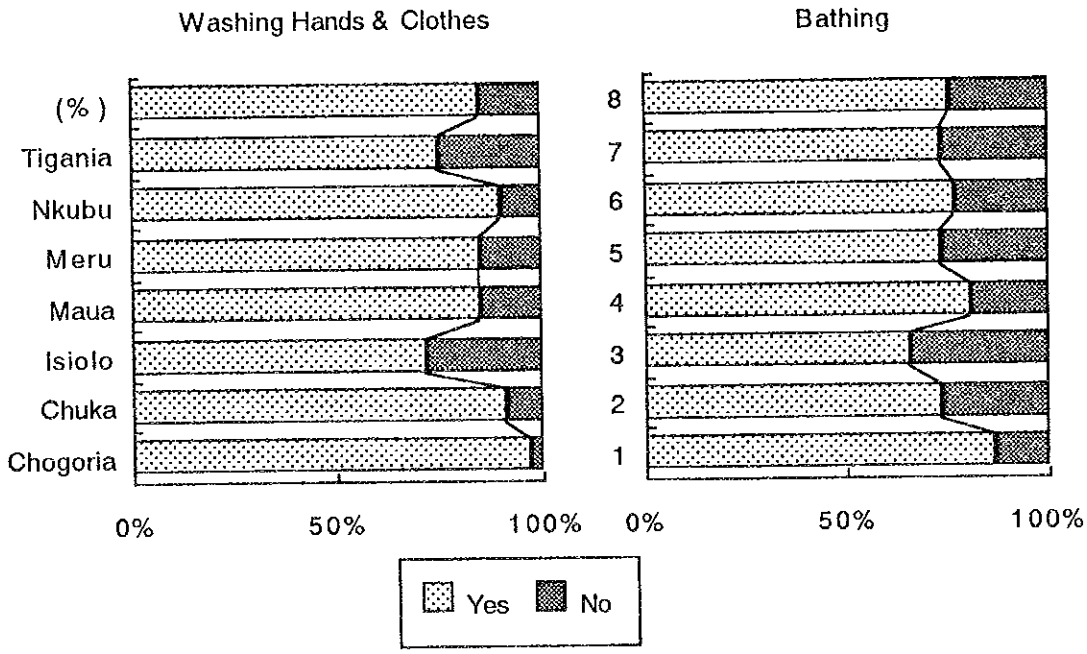
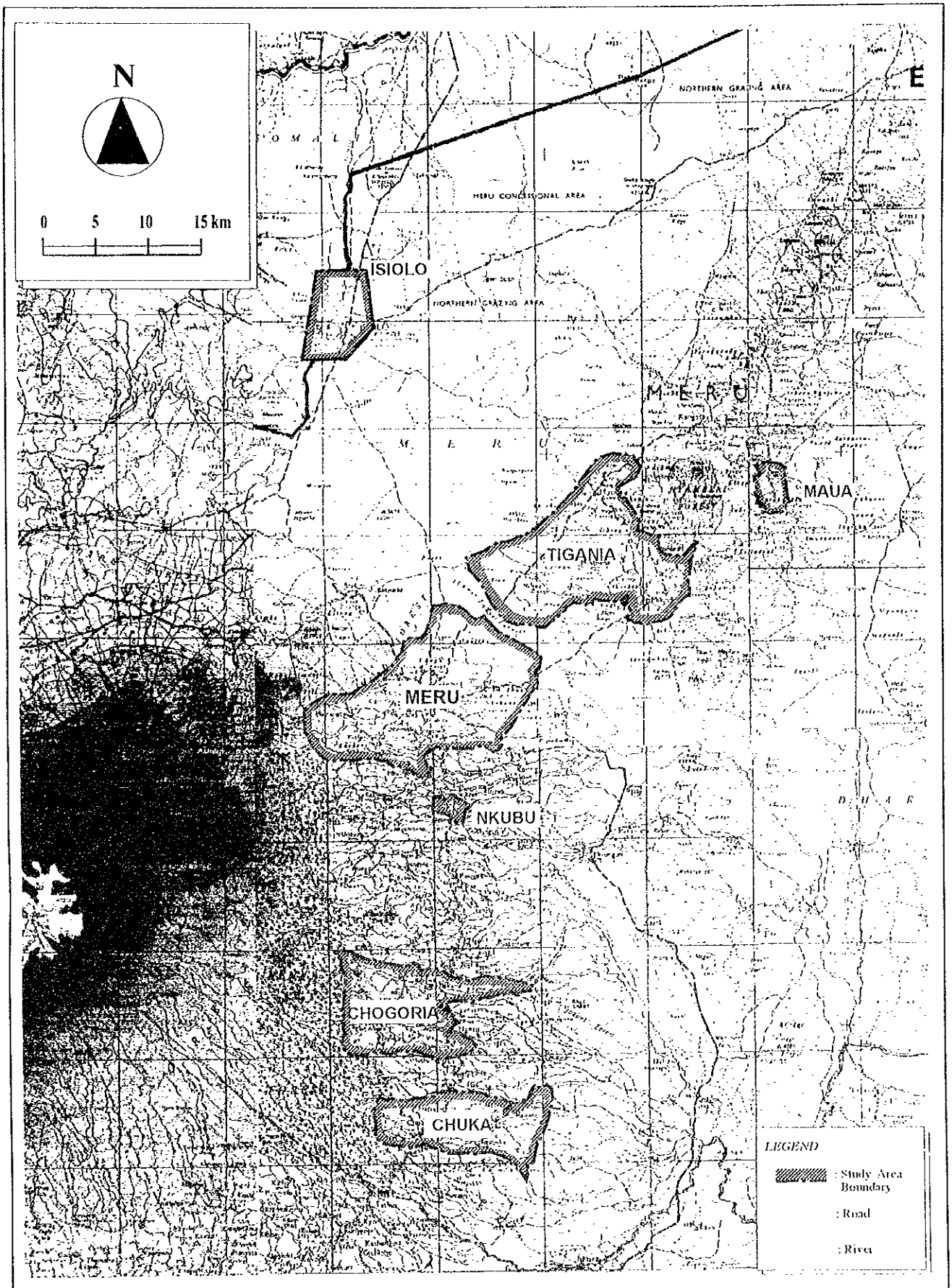


Table WATER USE PRACTICE

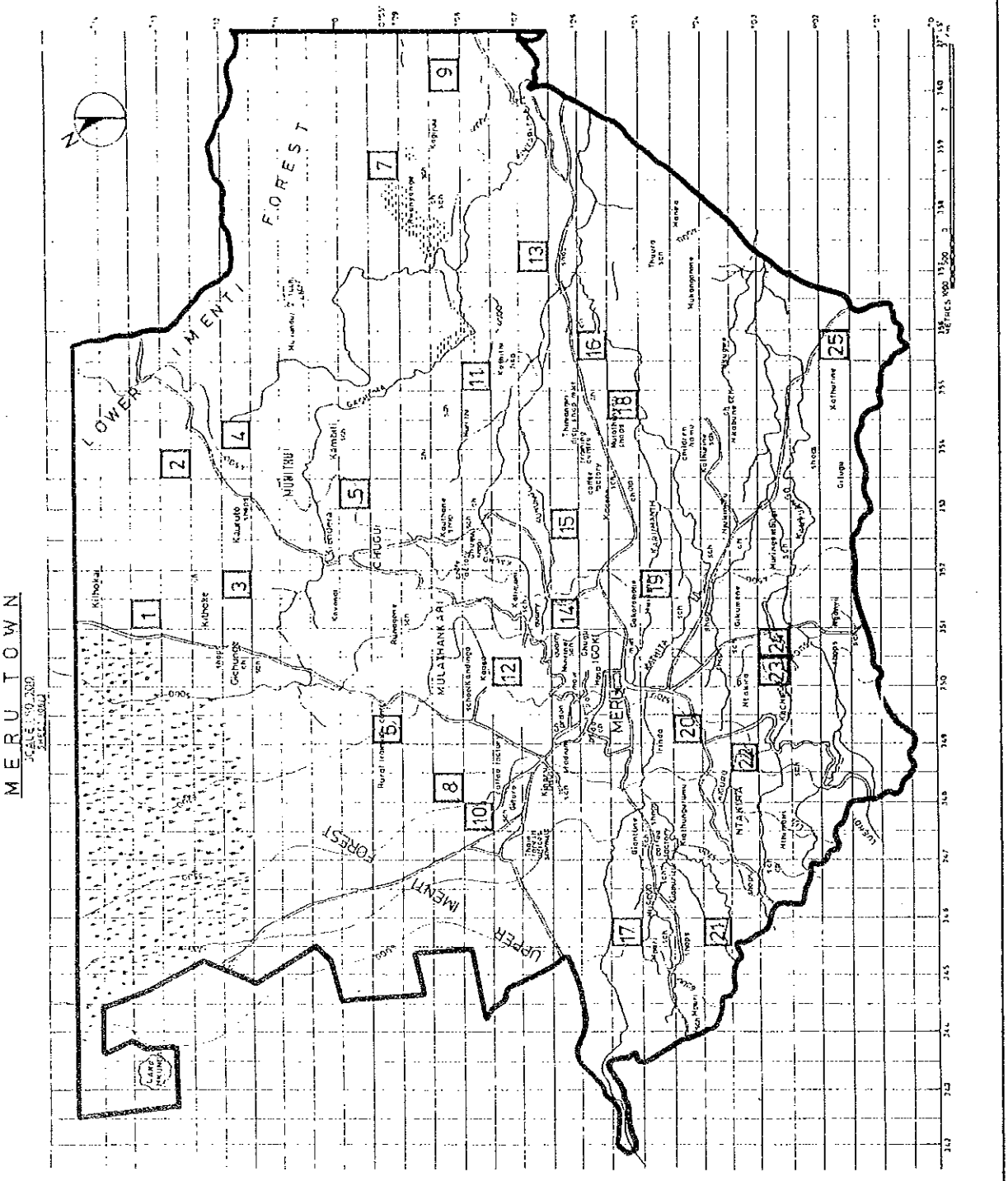
Town	Nos. of Samples	Washing Hands Yes	Washing Hands No	Washing Clothes Yes	Washing Clothes No	Bathing Yes	Bathing No
Chogoria	99	96	3	96	3	86	13
Chuka	99	90	9	90	9	73	26
Isiolo	100	72	28	72	28	66	34
Maua	99	84	15	84	15	80	19
Meru	100	85	15	85	15	74	26
Nkubu	100	90	10	90	10	77	23
Tigania	100	75	25	75	25	74	26
Total	697	592	105	592	105	530	167
(%)		84.9%	15.1%	84.9%	15.1%	76.0%	24.0%

THE STUDY ON THE WATER SUPPLY FOR SEVEN TOWNS IN EASTERN PROVINCE IN THE REPUBLIC OF KENYA	Figure I-19 Water Use Practice
JAPAN INTERNATIONAL COOPERATION AGENCY	

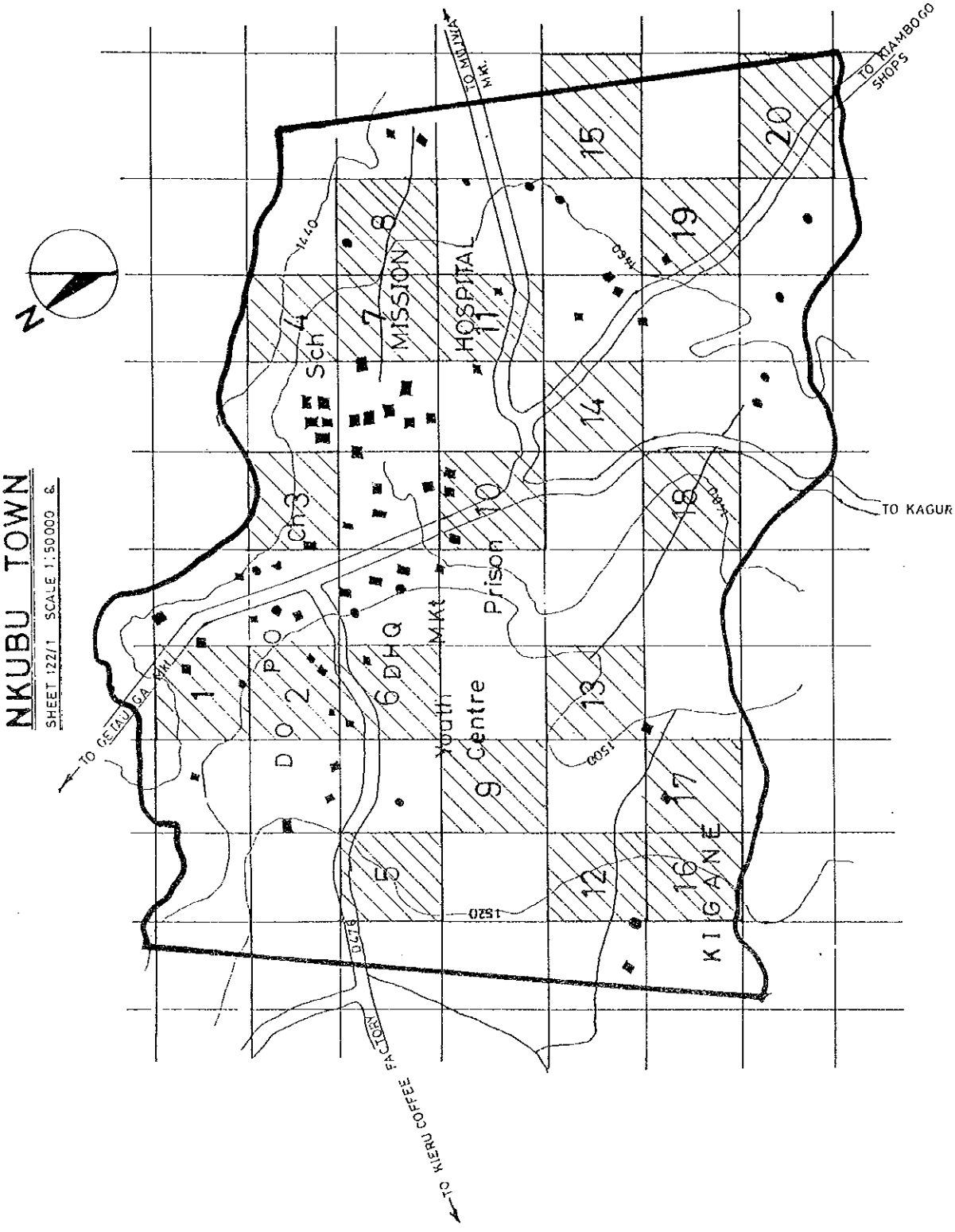
ATTACHMENT - 1
SURVEY AREA



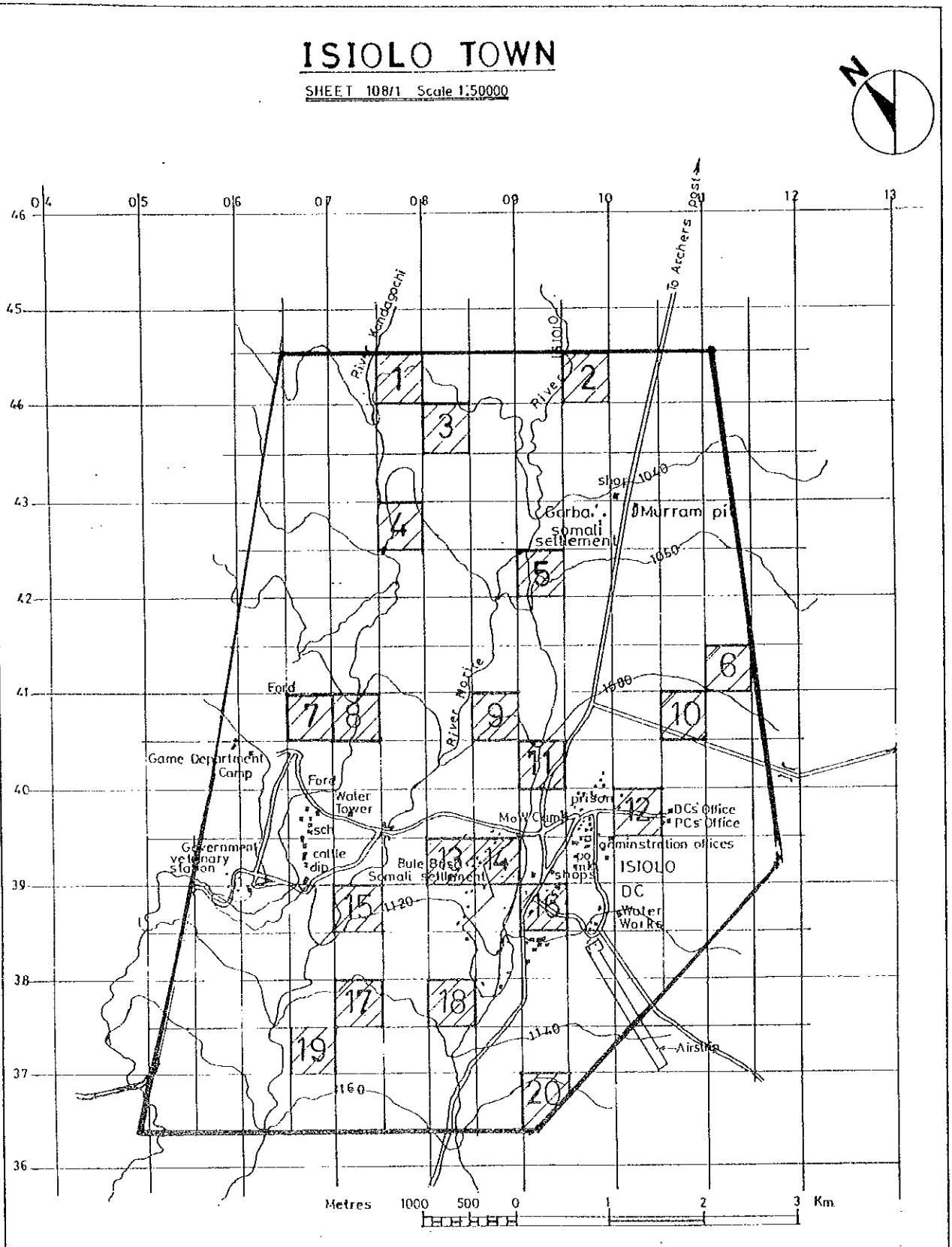
THE STUDY ON THE WATER SUPPLY FOR SEVEN TOWNS IN EASTERN PROVINCE IN THE REPUBLIC OF KENYA JAPAN INTERNATIONAL COOPERATION AGENCY	**Figure I-20** Location Map of Study Area



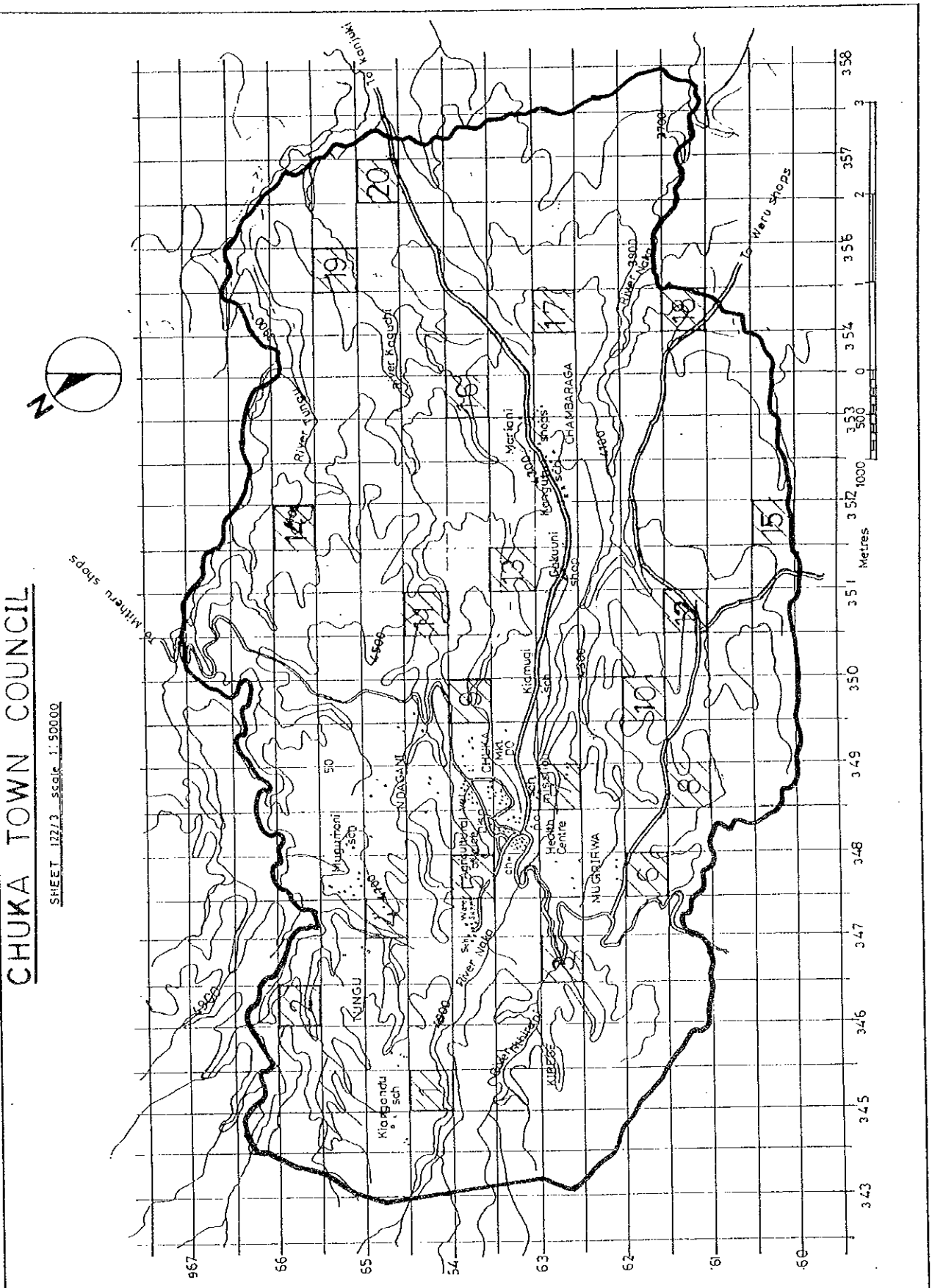
THE STUDY ON THE WATER SUPPLY FOR SEVEN TOWNS IN EASTERN PROVINCE IN THE REPUBLIC OF KENYA JAPAN INTERNATIONAL COOPERATION AGENCY	**Figure I-21** **Meru Survey Area**



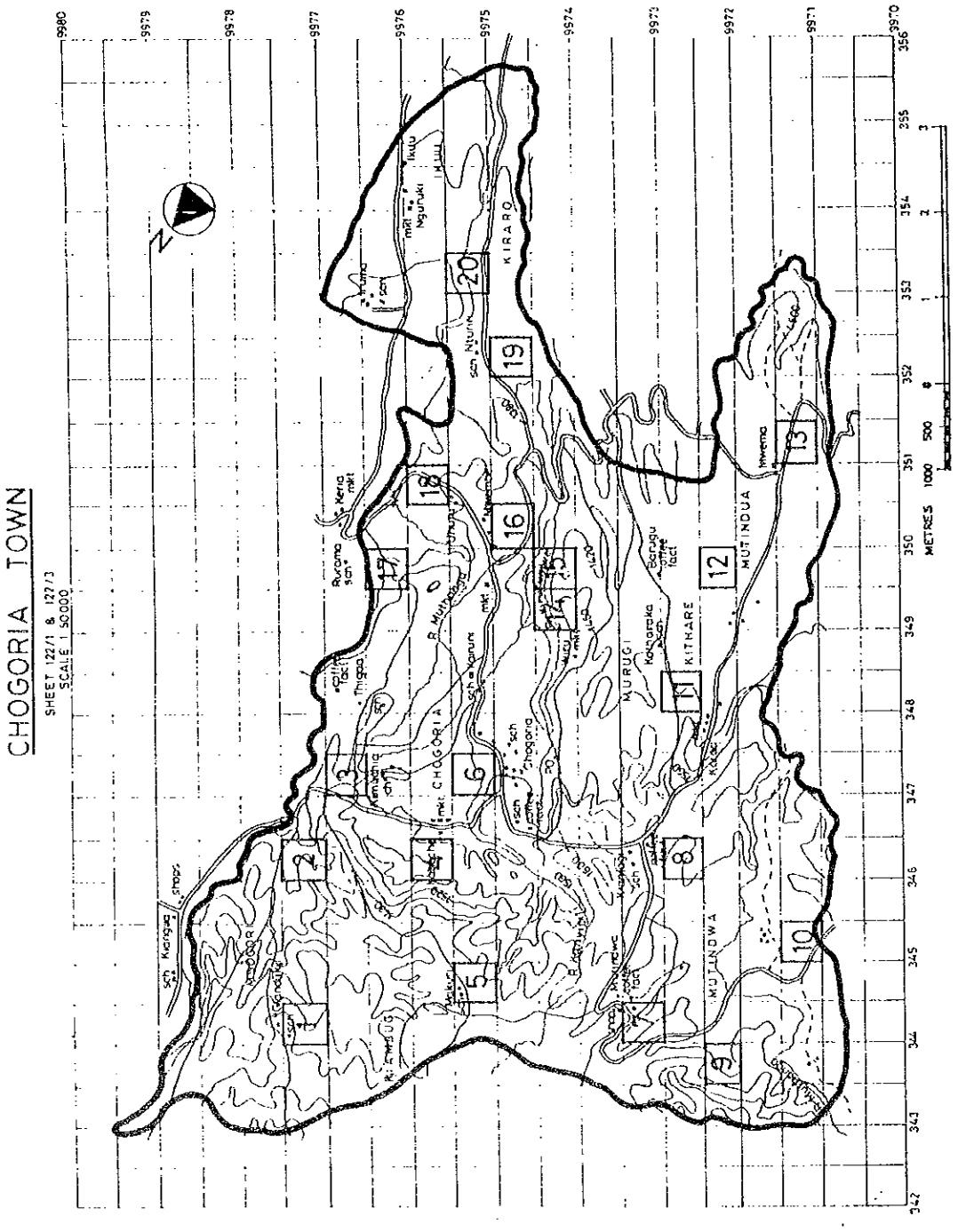
THE STUDY ON THE WATER SUPPLY FOR SEVEN TOWNS IN EASTERN PROVINCE IN THE REPUBLIC OF KENYA JAPAN INTERNATIONAL COOPERATION AGENCY	**Figure I-22** **Nkubu Survey Area**



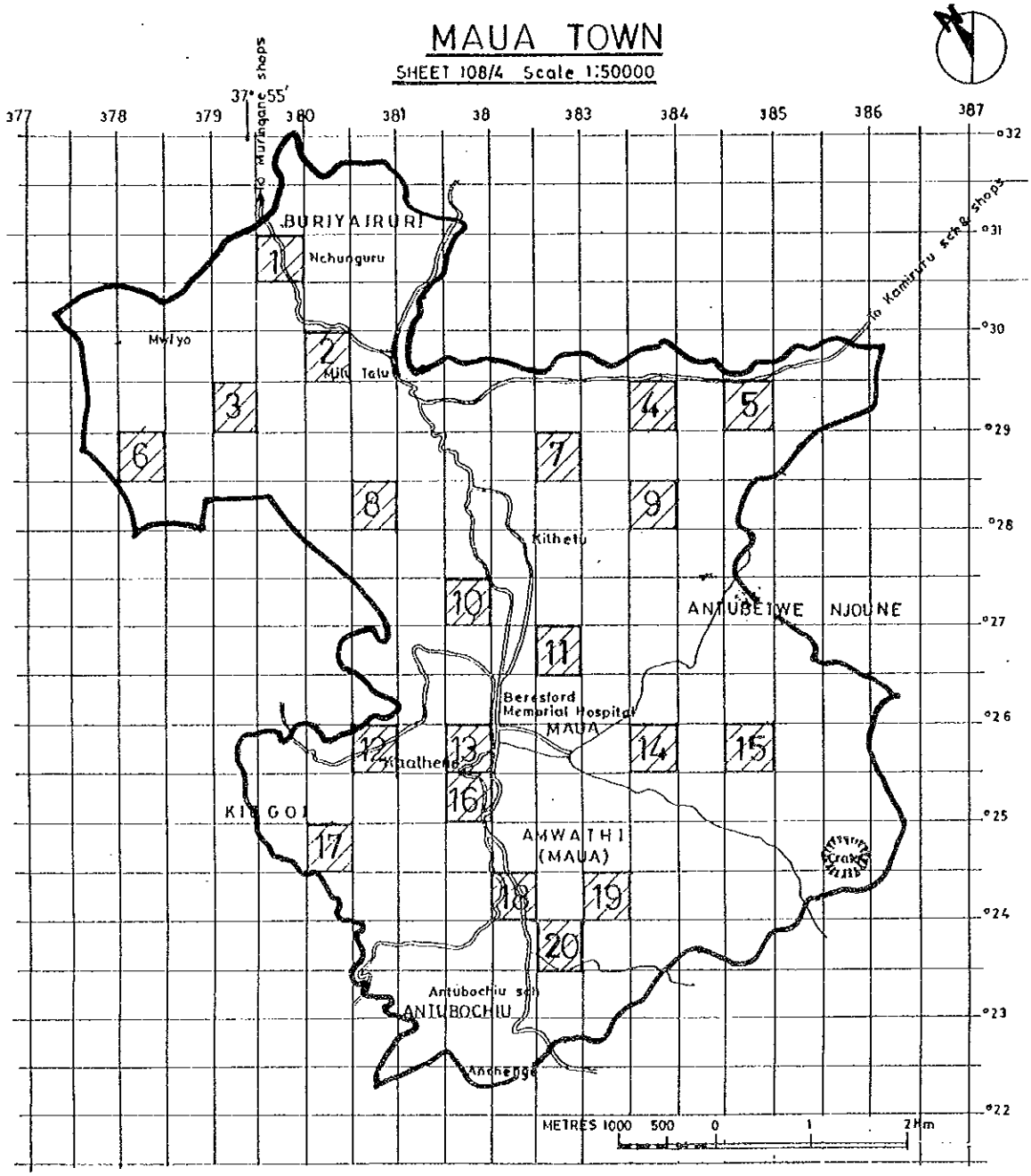
THE STUDY ON THE WATER SUPPLY FOR SEVEN TOWNS IN EASTERN PROVINCE IN THE REPUBLIC OF KENYA JAPAN INTERNATIONAL COOPERATION AGENCY	**Figure I-23** **Isiolo Survey Area**



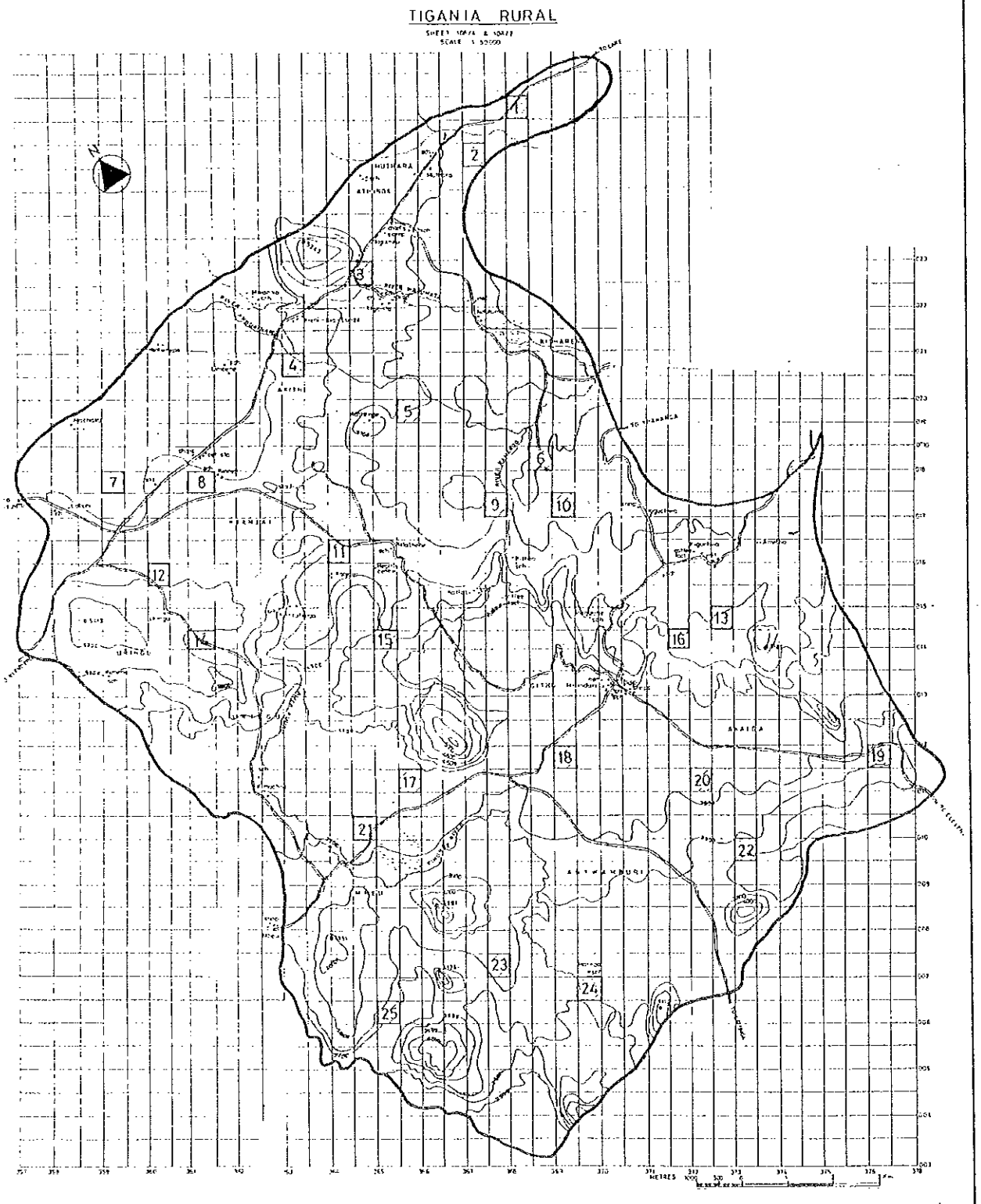
THE STUDY ON THE WATER SUPPLY FOR SEVEN TOWNS IN EASTERN PROVINCE IN THE REPUBLIC OF KENYA JAPAN INTERNATIONAL COOPERATION AGENCY	**Figure I-24** **Chuka Survey Area**



THE STUDY ON THE WATER SUPPLY FOR SEVEN TOWNS IN EASTERN PROVINCE IN THE REPUBLIC OF KENYA JAPAN INTERNATIONAL COOPERATION AGENCY	**Figure I-25** **Chogoria Survey Area**



THE STUDY ON THE WATER SUPPLY FOR SEVEN TOWNS IN EASTERN PROVINCE IN THE REPUBLIC OF KENYA JAPAN INTERNATIONAL COOPERATION AGENCY	**Figure I-26** **Maua Survey Area**



THE STUDY ON THE WATER SUPPLY FOR SEVEN TOWNS IN EASTERN PROVINCE IN THE REPUBLIC OF KENYA JAPAN INTERNATIONAL COOPERATION AGENCY	**Figure I-27** **Tigania Survey Area**

ATTACHMENT - 2
QUESTIONNAIRE FORM

Town:	MERU
No.:	-
Interviewer:	
Date:	/Sep/'96

QUESTIONNAIRE ON PRESENT WATER USE AND LIVING ENVIRONMENT

SEPTEMBER, 1996

Purpose: The survey was organized under the Japan International Cooperation Agency (JICA), the Government of Japan, in close cooperation with the Ministry of Land Reclamation, Regional and Water Development (MLRRWD), the Government of Kenya. It intends to clarify present living environment and water use practiced by the people. Results are all valuable information for formulation of the Long Term Water Supply Development Plan in the study area. We wish your support and cooperation on this survey.

1. Family members living with you: ☐ members

2. What do you do for a living?

☐ 1) Farmer

☐ 2) Employed in an office (including teachers, priest, tea factory, etc.)

☐ 3) Business man (including hawkers, food vendors, traders, etc.)

☐ 4) Others (_____)

3. Where do you get water for your daily consumption?

	Drinking & Cooking	Others
1) Piped water (☐ by Ministry ☐ by Community)		
- Individual connections	☐	☐
- Yard standpipe	☐	☐
- Kiosk/Communal water points	☐	☐
- Neighbour supply	☐	☐
2) River water	☐	☐
3) Hand dug well	☐	☐
4) Rain Water Harvesting	☐	☐
5) Others (_____)	☐	☐

In case you use yard standpipe, how many families are using this tap? (_____) families

4. How far is it?

☐ 1) Immediately from the tap ☐ Metered ☐ Unmetered
Account No. (_____)

☐ 2) 0 – 1/2km (less than 30 minutes)

☐ 3) 1/2 – 2km (30 min – one hour)

☐ 4) 2 – 4km (one hour – two hours)

☐ 5) 4km or more (more than two hours)

5. How many times a day do you collect water and by what means?

☐ 1) twice a day or less By means of (_____)

☐ 2) three times a day By means of (_____)

☐ 3) four times a day By means of (_____)

6. How many days in a month do you miss water from your water source?

☐ 1) less than 7 days

☐ 2) less than 14 days

☐ 3) 21 days or more

7. Do you get water from your source in dry season?

☐ 1) yes

☐ 2) no

If no, where do you get? (_____)

8. Do you have storage facilities?

☐ 1) yes

☐ 2) no

If yes, let me see the type?

Type: (_____) Volume: (_____) m^3

(Following quiries 9 and 10 are valid for those who get water from pipe water system including Kiosks, Communal Water Points and Neighbour Supply)

9. How much do you pay for water per day or per month?

☐ 1) no payment

☐ 2) less than Ksh 5 per day (less than Ksh 150/month)

☐ 3) Ksh 5 – 10 per day (Ksh 150 – 300/month)

☐ 4) Ksh 10 – 20 per day (Ksh 300 – 600/month)

☐ 5) Ksh 20 per day or more (Ksh 600/month or more)

10-1 Are you satisfied with water supply services?

☐ 1) yes

☐ 2) no

If yes, go to Question No. 11.

10-2 If no, what reasons?

☐ 1) poor management

☐ 2) poor water quality

☐ 3) low water pressure/less water available

☐ 4) high water tariffs

☐ 5) others

10-3 If above problems are solved, will you be willing to pay for water services?

☐ 1) yes

☐ 2) no

If no, give reasons. (_____)

11. How big is your land?

☐ 1) landless/squatters

☐ 2) less than 2 acres

☐ 3) 2 acres – 5 acres

☐ 4) 5 acres or more

12. What crops do you grow?

☐ 1) coffee

☐ 2) tea

☐ 3) miraa

☐ 4) maize & beans

☐ 5) others

13. Which of the following animals do you keep?

- ☐ 1) dairy cows (_____) nos.
- ☐ 2) zebu cattle (_____) nos.
- ☐ 3) shoats (_____) nos.
- ☐ 4) camel & donkeys (_____) nos.
- ☐ 5) others (_____) nos.

14. How many of your children are in schools?

(_____) in kindergarten
(_____) in primary school
(_____) in secondary school
(_____) in post second education

15. How do you dispose your refuse?

- ☐ 1) thrown in the garden
- ☐ 2) rubbish pits
- ☐ 3) burning
- ☐ 4) others

16. What kind of sanitary facilities do you have?

- ☐ 1) pit latrine
- ☐ 2) septic tank
- ☐ 3) town sewerage system
- ☐ 4) others

17. Do you know water related diseases?

- ☐ 1) yes
- ☐ 2) no

18. Which of the diseases have your family members suffered in the last one year?

- ☐ 1) none
- ☐ 2) malaria
- ☐ 3) typhoid
- ☐ 4) cholera
- ☐ 5) dysentry
- ☐ 6) others

19. Is there enough water every day for;

1)	washing hands	☐	yes	☐ no
2)	taking bath	☐	yes	☐ no
3)	washing cloths	☐	yes	☐ no

20-1 Interviewr's Observation

1) House type

- ☐ Permanent
- ☐ Semi-permanent
- ☐ Temporary

2) Electricity? & Telephone?

☐ yes	☐ yes
☐ no	☐ no

20-2 Comments from interviewer

ATTACHMENT - 3
CODE BOOK

VARIABLE	DESCRIPTION	CODE
1	BLOK NO.	1 - 20/25
2	SAMPLE NO.	1 - 4/5
3	FAMILY MEMBERS	ACTUAL NO
4	JOB	
	FARMER	1
	EMPLOYEE	2
	BUSINESS MAN	3
	OTHERS	4
5	WATER SOURCE	
	RIVER	2
	HAND DUG WELL	3
	RAIN WATER HARVESTING	4
	OTHERS	5
	PIPED WATER BY MINISTRY	6
	PIPED WATER BY COMMUNITY	7
	PIPED WATER BY MINISRTY - INDIVIDUAL CONNECTION	8
	PIPED WATER BY MINISTRY - YARD STANDPIPE	9
	PIPED WATER BY MINISTRY - KIOSK/COMMUNAL WATER POINT	10
	PIPED WATER BY MINISTRY - NEIGHBOUR SUPPLY	11
	PIPED WATER BY COMMUNITY - INDIVIDUAL CONNECTION	12
	PIPED WATER BY COMMUNITY - YARD STANDPIPE	13
	PIPED WATER BY COMMUNITY KIOSK/COMMUNAL WATER POINT	14
	PIPED WATER BY COMMUNITY NEIGHBOUR SUPPLY	15
6	WATER USES	
	PIPED WATER BY MINISRTY - INDIVIDUAL CONNECTION - DRINKING	1
	PIPED WATER BY MINISRTY - INDIVIDUAL CONNECTION - OTHERS	2
	PIPED WATER BY MINISRTY - INDIVIDUAL CONNECTION - DRINKING + OTHERS	3
	PIPED WATER BY MINISTRY - YARD STANDPIPE - DRINKING	4
	PIPED WATER BY MINISTRY - YARD STANDPIPE - OTHERS	5
	PIPED WATER BY MINISTRY - YARD STANDPIPE - DRINKING + OTHERS	6
	PIPED WATER BY MINISTRY - KIOSK/COMMUNAL WATER POINT - DRINKING	7
	PIPED WATER BY MINISTRY KIOSK/COMMUNAL WATER POINT - OTHERS	8
	PIPED WATER BY MINISTRY KIOSK/COMMUNAL WATER POINT - DRINKING + OTHERS	9
	PIPED WATER BY MINISTRY - NEIGHBOUR SUPPLY - DRINKING	10
	PIPED WATER BY MINISTRY - NEIGHBOUR SUPPLY -OTHERS	11
	PIPED WATER BY MINISTRY - NEIGHBOUR SUPPLY - DRINKING + OTHERS	12
	PIPED WATER BY COMMUNITY - INDIVIDUAL CONNECTION - DRINKING	13
	PIPED WATER BY COMMUNITY - INDIVIDUAL CONNECTION - OTHERS	14
	PIPED WATER BY COMMUNITY - INDIVIDUAL CONNECTION - DRINKING + OTHERS	15
	PIPED WATER BY COMMUNITY - YARD STANDPIPE - DRINKING	16
	PIPED WATER BY COMMUNITY - YARD STANDPIPE - OTHERS	17
	PIPED WATER BY COMMUNITY - YARD STANDPIPE - DRINKING + OTHERS	18
	PIPED WATER BY COMMUNITY - KIOSK/COMMUNAL WATER POINT - DRINKING	19
	PIPED WATER BY COMMUNITY - KIOSK/COMMUNAL WATER POINT - OTHERS	20
	PIPED WATER BY COMMUNITY - KIOSK/COMMUNAL WATER POINT - DRINKING + OTHERS	21
	PIPED WATER BY COMMUNITY - NEIGHBOUR SUPPLY - DRINKING	22
	PIPED WATER BY COMMUNITY - NEIGHBOUR SUPPLY - OTHERS	23
	PIPED WATER BY COMMUNITY - NEIGHBOUR SUPPLY - DRINKING + OTHERS	24
	RIVER WATER - DRINKING	25
	RIVER WATER - OTHERS	26
	RIVER WATER - DRINKING + OTHERS	27
	HAND DUG WELL WATER - DRINKING	28
	HAND DUG WELL WATER - OTHERS	29
	HAND DUG WELL WATER - DRINKING + OTHERS	30
	RAIN WATER HARVESTING - DRINKING	31
	RAIN WATER HARVESTING - OTHERS	32
	RAIN WATER HARVESTING - DRINKING + OTHERS	33
	OTHER SOURCES OF WATER - DRINKING	34
	OTHER SOURCES OF WATER - OTHER USES	35
	OTHER SOURCES OF WATER - DRINKING + OTHERS	36
7	DISTANCE TO SOURCE	
	IMMEDIATELY FROM THE TAP	1
	0-1/2KM(LESS THAN 30 MINUTES	2
	1/2-2KM(MOMIN - ONE HOUR)	3
	2-4KM(ONE HOUR - TWO HOURS)	4
	4KM OR MORE(MORE THAN TWO HOURS)	5
8	METERED	
	NO METER	2
	REFUSED TO SHOW THE METER	3
	DONT KNOW	4
	NOT APPLICABLE	5
	ACCOUNT NUMBER	AC NO.
	WATER CONSUMPTION	M3/MONTH
9	FREQUENCY OF WATER COLLECTION PER DAY	
	TWICE A DAY OR LESS	1
	THREE TIMES A DAY	2
	FOUR TIMES A DAY	3
	MORE THAN FOUR TIMES A DAY	4
	NOT APPLICABLE(STRAIGHT FROM TAP)	5
10	MEANS OF COLLECTING WATER	
	HUMAN POTERAGE	1
	ANIMALS	2
	VEHICLES/BICYCLES/WHEELBARROWS	3
	NOT APPLICABLE	4
11	MISSING WATER	
	LESS THAN 7 DAYS	1
	LESS THAN 14 DAYS	2
	21 DAYS OR MORE	3
12	AVAILABILITY OF WATER DURING DRY SEASON	
	AVAILABLE - YES	1
	NOT AVAILABLE - NO	2
	NOT APPLICABLE	3

VARIABLE	DESCRIPTION	CODE
13	ALTERNATIVE SOURCE(IF UNAVAILABLE)	
	RIVER/STREAM	1
	WELL/SPRINGS	2
	NEIGHBOURS	3
	KIOSK/VENDOURS	4
	NOT APPLICABLE	5
14	STORAGE FACILITIES	
	DRUM	1
	TANK	2
	NOT APPLICABLE	3
15	VOLUME OF STORAGE FACILITY IN M3	VOL(M3)
16	PAYMENT OF WATER PER DAY/MONTH	
	NO PAYMENT	1
	LESS THAN KSH 5 PER DAY(LESS THAN KSH 150/MONTH)	2
	KSH 5 - 10 PER DAY(KSH 150-300/MONTH)	3
	KSH10-20 PER DAY(KSH 300-600/MONTH)	4
	KSH20 PER DAY OR MORE(KSH 600/MONTH OR MORE)	5
	MEMBERSHIP FEES	6
	NOT APPLICABLE	7
17	WATER SUPPLY SATISFACTION	
	SATISFIED = YES	1
	NOT SATISFIED = NO	2
	NOT APPLICABLE	3
18	REASONS FOR NOT BEING SATISFIED	
	POOR MANAGEMENT	1
	POOR WATER QUALITY	2
	LOW WATER PRESSURE/LESS WATER AVAILABLE	3
	HIGH WATER TARIFFS	4
	OTHERS	5
	NOT APPLICABLE	6
19	WILLINGNESS TO PAY FOR WATER - PROBLEMS SOLVED	
	WILLING = YES	1
	NOT WILLING = NO	2
	NOT APPLICABLE	3
20	REASONS FOR NOT BEING READY TO PAY	
	NOT APPLICABLE	1
	POVERTY	2
	APATHY	3
	OTHERS	4
21	LAND SIZE	
	LANDLESS/SQUATTERS	1
	LESS THAN 2 ACRES	2
	2 ACRES - 5 ACRES	3
	5 ACRES OR MORE	4
22	CROPS	
	COFFEE	1
	TEA	2
	MIRAA	3
	MAIZE/BEANS	4
	OTHERS	5
	COFFEE + TEA	6
	COFFEE + MIRAA	7
	COFFEE + MAIZE/BEANS	8
	COFFEE + OTHERS	9
	TEA + MIRAA	10
	TEA + MAIZE/BEANS	11
	TEA + OTHERS	12
	MIRAA + MAIZE/BEANS	13
	MIRAA + OTHERS	14
	MAIZE/BEANS + OTHERS	15
	COFFEE + TEA +MIRAA	16
	COFFEE + TEA + MAIZE/BEANS	17
	COFFEE + TEA + OTHERS	18
	COFFEE + MIRAA + MAIZE/BEANS	19
	COFFEE + MIRAA + OTHERS	20
	COFFEE + MAIZE/BEANS + OTHERS	21
	TEA + MAIZE/BEANS + OTHERS	22
	TEA + MIRAA + MAIZE/BEANS	23
	TEA + MIRAA +OTHERS	24
	MIRAA + MAIZE/BEANS + OTHERS	25
	COFFEE + MIRAA + MAIZE/BEANS + OTHERS	26
	COFFEE + TEA + MAIZE/BEANS + OTHERS	27
	COFFEE + TEA +MIRAA + MAIZE/BEANS	28
	TEA + MIRAA + MAIZE/BEANS + OTHERS	29
	ALL	30
	NONE	31
23	ANIMALS	ACTUAL NO.
	DAIRY COWS	
	SEBUS	
	SHOATS	
	CAMEL/DONKEY	
	OTHERS	
24	SCHOOLING CHILDREN	ACTUAL NO.
	KINDERGARTEN	
	PRIMARY	
	SECONDARY	
	TERTIARY	

VARIABLE	DESCRIPTION	CODE
25	REFUSE DISPOSAL	
	GARDEN	1
	PIT	2
	BURNING	3
	OTHERS	4
	GARDEN + PITS	5
	GARDEN + BURNING	6
	GARDEN + OTHERS	7
	PITS + BURNING	8
	PITS + OTHERS	9
	BURNING + OTHERS	10
	GARDEN + PITS + BURNING	11
	GARDEN + PITS + OTHERS	12
	PITS + BURNING + OTHERS	13
26	SANITARY FACILITIES	
	PIT LATRINE	1
	SEPTIC TANK	2
	TOWN SEWARAGE SYSTEM	3
	OTHERS	4
27	KNOWLEDGE OF WATER RELATED DISEASES	
	KNOWS = YES	1
	DOESN'T KNOW = NO	2
28	DISEASES AFFECTING FAMILY	
	NONE	1
	MALARIA	2
	TYPHOID	3
	CHOLERA	4
	DYSENTRY	5
	OTHERS	6
	MALARIA + TYPHOID	11
	MALARIA + CHOLERA	12
	MALARIA + DYSENTRY	13
	MALARIA + OTHERS	14
	TYPHOID + CHOLERA	15
	TYPHOID + DYSENTRY	16
	TYPHOID + OTHERS	17
	CHOLERA + DYSENTRY	18
	CHOLERA + OTHERS	19
	DYSENTRY + OTHERS	20
	MALARIA + TYPHOID + DYSENTRY	21
	MALARIA + CHOLERA + DYSENTRY	22
	MALARIA + DYSENTRY + OTHERS	23
	TYPHOID + CHOLERA + DYSENTRY	24
	TYPHOID + CHOLERA + OTHERS	25
	CHOLERA + DYSENTRY + OTHERS	26
	MALARIA + TYPHOID + OTHERS	27
	MALARIA + TYPHOID + DYSENTRY + OTHERS	28
	ALL	29
	MALARIA + TYPHOID + CHOLERA	30
29	ENOUGH WATER FOR THE FOLLOWING	
	WASHING HANDS	
	AVAILABLE = YES	1
	NOT AVAILABLE = NO	2
	TAKING BATH	
	AVAILABLE = YES	1
	NOT AVAILABLE = NO	2
	WASHING CLOTHS	
	AVAILABLE = YES	1
	NOT AVAILABLE = NO	2
30	HOUSE TYPE	
	PERMANENT	1
	SEMI-PERMANENT	2
	TEMPORARY	3
31	ELECTRICITY	
	AVAILABLE = YES	1
	NOT AVAILABLE = NO	2
32	TELEPHONE	
	AVAILABLE = YES	1
	NOT AVAILABLE = NO	2