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A WATER CONSUMPTION SURVEY IN MBEZI VILLAGE, DAR ES SALAAM REGION

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20/-

Contents

Note: This paper was originally written as a chapter of the Water Master Plan for Coast Region, prepared by C.B.A. Engineering Ltd.

1. Introduction

The design criteria used by MAJI for rural piped water schemes officially stand at 30 liters per capita per day and 45 liters per day as a future target. There is little factual basis for such criteria. Few attempts have been made to obtain accurate estimates of the per capita water consumption in different environments. The studies that have been done have been based on small samples, on questioning people rather than on measuring, and have concentrated on unimproved water supplies. The results point to very low per capita consumption in rural areas (see below).

No studies have been done of water consumption under "optimum" conditions, i.e. once a properly functioning supply system with an adequate number of outlets has been installed. Yet it is very important for design purposes to know how much water people will use under optimum conditions. Especially when as many people as possible have to be supplied with good water at a minimal cost.

The purpose of this report is to contribute to filling this gap by providing data on the water consumption in a village with a reasonably good piped water scheme.

2. Results of previous research on per capita water consumption.

D. Warner (1969) has done comparative research in nine villages in three districts of Tanzania (Pare, Kilimanjaro and Morogoro). His sample sizes ranged from 8 to 33 households per village (18% to 40% of total). With few exceptions the watersources were unimproved water holes and streams.

In the three villages in Pare district the overall average found was 4.3 liters per capita per day. Long distances to watersources (about 3.5 km) appeared to be the explanation of this low rate of consumption.

In the four villages in Kilimanjaro an overall average was found of 9 liters per capita per day, whereas in the two Morogoro villages the average was 13.2 liters.

G. Ferster (1970) calculated the per capita consumption in eleven villages in Nzega district. His samples ranged from 4 - 17 households per village. As the size of the villages is not given it is not possible to know the percentage of coverage. Between villages the average found ranged from 3.5 to 20 liters per capita. But the overall average daily consumption per capita was 12.6 liters.

White, Bradley and White (1972) give data on water consumption from 19 places in Kenya and Tanzania, all without domestic connections. The range is 4.4 - 20.8 liters per capita, with an average of 11.2 liters. (Drawers of Water, p.119).

These findings have been summarized in table 1. Obviously a large number of variables all have an effect on the per capita water consumption. These have been discussed in most detail by White, Bradley, White(p. 120 ff.) The most important factor is whether water is piped into the house or has to be carried. Other factors are the size, and age and sex composition of the household; the cost of water in terms of money or energy expended, which is determined by the availability of water and the distance between the supply point and the home; the level of material wealth, as it affects the cultural standards, the household composition, and the position of the women; the type of container used to fetch water. The relative importance of such factors is still incompletely known and varies from one community to the other, although distance and household size are found to be of more general significance. Individual idiosynorasies cause large differenc es in water use between households in otherwise similar circumstances.

Table 1 - Summary of previous data on daily per capita water consumption

Source	Area	No.of villages	No. of house-holds in sample	Aver.HH size	Aver.cons/cap./day	Range between villages
Warner	Pare	3	63 (28 %)	7.2	4.3 liters	3.6 - 5.2 liters
	Kilimanjaro	4	51 (20 %)	6.2	8.9 liters	8.4 - 10.8 liters
	Morogoro	2	61 (23 %)	4.3	13.2 liters	13.2 - 13.2 liters
Ferster	Nzega	11	99 (?)	7.4	12.6 liters	3.5 - 20. liters
White/Bradley/ White	East Africa	19*	411 (?)	?	11.2 liters	4.4 - 20.8 liters

*) Includes 6 urban areas.

3. Methodology

There are two ways of obtaining data on water consumption:

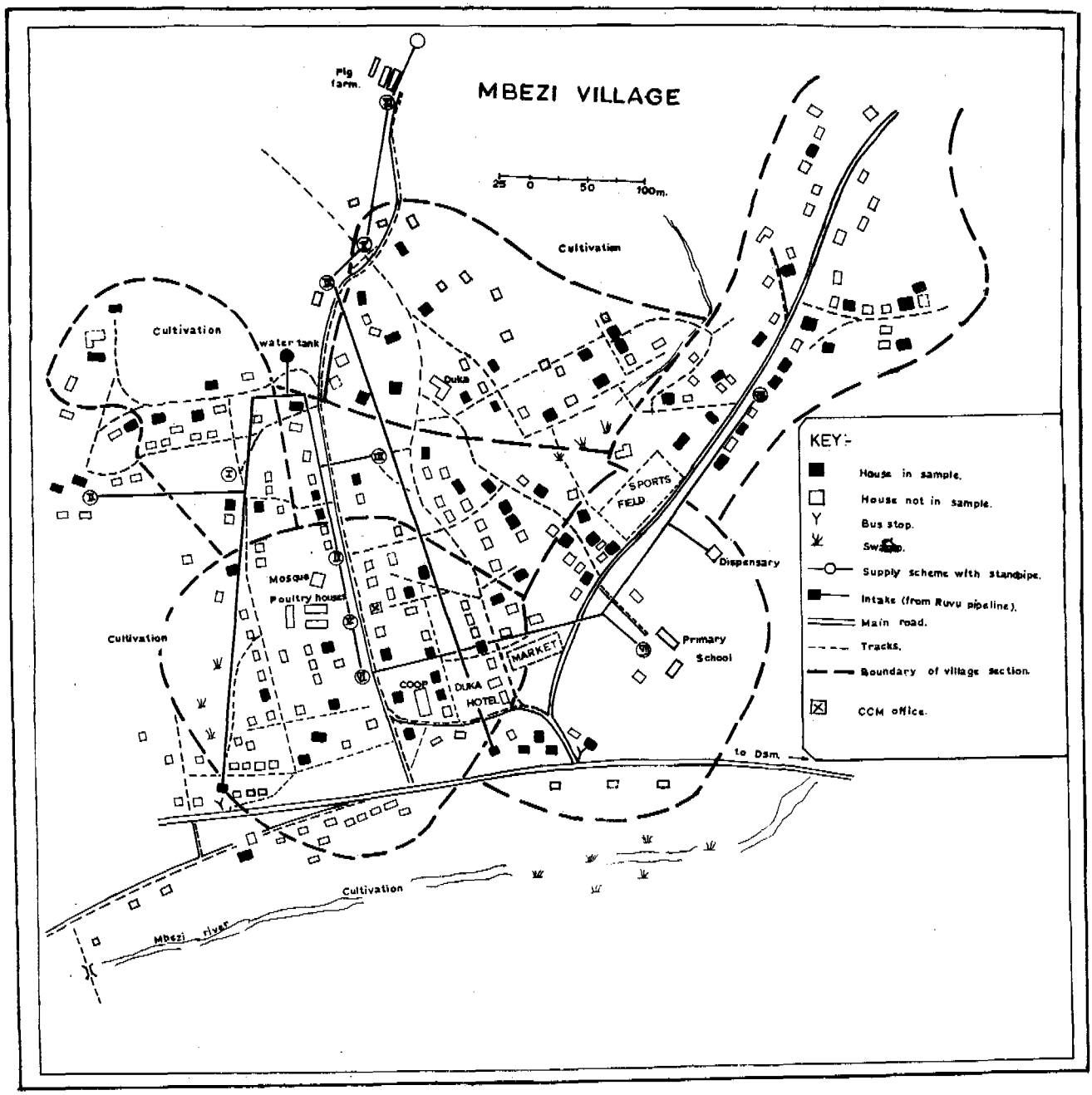
A. by interviewing the consumers on their water use habits, and

B. by measuring the actual amount of water used.

Both methods have their advantages and disadvantages. Questioning people leaves one free to choose a convenient sample, but introduces the bias of the informants' subjective responses. However, this bias can be largely overcome by making repeat visits over a number of days to the same households, asking the women to state the actual number of buckets drawn. The survey period should include a proportion of peak days. Waterconsumption tends to be higher on and just before weekends and holidays. From this an average daily consumption per household can be calculated. It is felt that this method is far more accurate than that of single interviews, which record what people think they use rather than what they actually use.

Measuring the amount of water consumed can only be done at the outlets. It would be an easy task if meters are available, but when they are not (as in our case) one has to proceed by counting the number of containers over a reasonably long period of time. This is therefore a very labour-intensive method. To keep every outlet under observation from early morning till late evening a large number of observers would be needed.

Moreover one faces the problem that a water supply system and the population it serves rarely present a closed system of convenient size. As has been pointed out elsewhere (Bantje 1978) in almost all cases people use water from streams and water holes in addition to that from the standpipes. In practice it would be almost impossible to keep all possible sources under observation. At the same time there may be an influx from people living several kilometers away who also use water from the scheme. If one had to include all those people the sample area would become uncomfortably large. Finding a study area of suitable size where the whole process of drawing water is relatively easy to observe is therefore vital to the success of the study.


MBEZI VILLAGE
Pig farm.
25 0 50 100m.
Cultivation
Cultivation
water tank
Duka
SPORTS FIELD
Dispensary
Mosque
Poultry house
Cultivation
MARKET
Primary School
COOP
DUKA
HOTEL
to Dsm.
Cultivation
Mbezi river
KEY:-
House in sample.
House not in sample.
Bus stop.
Swamp.
Supply scheme with standpipe.
Intake (from Ruvu pipeline).
Main road.
Tracks.
Boundary of village section.
CCM office.

In the present case it was decided to use both the interview and the direct observation method, so as to compare the results obtained by both and to assess their workability.

4. Selection of the study area

From the list of piped water schemes in the Coast Region a number were chosen which appeared of suitable size and were presumable in good working condition. At closer examination all these had to be discarded, because they were either out of order, or of difficult access, or presented too many disturbing factors.

In the end a village close to Dar es Salaam was chosen because of its convenient setting, the fact that it obtains water from the main Ruvu pipeline so that a regular supply is ensured, whereas no other sources were apparently used which could disturb the test situation. Even here the conditions were not ideal, because on some days no water came out of the pipes for several hours.

5. Mbezi village

Mbezi village is situated 11 km. from Ubungo on the Morogoro road. It is the first true village one encounters after leaving the Kinara suburban area. It consists of a densely settled village centre of some 235 households(1335 people) surrounded by a wide area of farmland with scattered households (approx. 150 hh.; 800 people).

The village centre occupies a system of low ridges just North of the Morogoro road, and fans out over the surrounding hillsides. (see map). The majority of the houses in the village have zinc roofs. Walls are made of poles and mud or mudbricks. Only a handful of houses are built of cement blocks. The land in and around the village is heavily cultivated with the typical coastal crop mixture including: rice, cassave, bananas, maize, sweet potatoes, gungo peas, a few coconut trees, pawpaw, pineapples, orange and mango trees, and of course cashewnuts. The larger fields are further away from the centre, some as far as 6-8 kilometers. A certain land shortage is experienced by the villagers. This may be partly due to the fact that many residents from Dar es Salaam have shambas in this area.

The overall impression of the village is fairly prosperous. The standard of living is obviously higher than average. This is due to the proximity of the Dar es Salaam market, which allows for easy disposal of crops and purchase of consumer goods. Moreover, a certain number (17%) of villagers are engaged in wage employment, mainly in Dar es Salaam. (Table 2). Also a number of people retired from employment have settled down on farms in the village or are preparing to do so, whereas several townspeople own pigfarms in the area. On weekdays one observes many townspeople coming and going by bus to work their farms and to collect farmproduce, whereas on Sundays the more wealthy come up with their cars to inspect their farms.

Originally Mbezi was a very small village, but is was greatly expanded in the years 1974 - 1976*) and now consists of a mixture of people with very different origins. (see tables 3 & 4). It is registered as an Ujamaa village. Communal activities consist of communal shambas to a total of 70 acres, run by the joint effort of some 150 villagers, 3 poultry houses and a cooperative shop. A tractor is rented from the district authorities. The village also owns a cart and 4 donkeys.

Table 2: - Occupation of heads of households in sample

farmer	91	82%
labourer	5	
artisan	8	
watchman	2	
teacher	1	18%
shopkeeper	1	
veterinary ass.	1	
taxi driver	1	
clerk	1	
Total	111	

*)(75% of the households settled in the last 4 years).

Table 3: - Length of residence of heads of households in sample

before 1960	6	
1960 - '69	7	
1970	5	
1971	1	
1972	7	
1973	3	
1974	31	74%
1975	26	
1976	10	
1977	8	
1978	7	
Total	111	

Table 4: - Tribal origin of heads of households in sample

Zaramo	37	
Coastal tribes	22	(Ngindo, Ndengereko, Matumbi, Rufiji, Pogoro & Makonde)
Gogo + Hehe	12	
Luguru	8	
Yao, Ngoni, Nyakyusa	7	
Kwere + Zigua	6	
Sukuma + Nyamwezi	6	
Others	11	
unknown	2	
Total	111	

The social amenities include a primary school, a dispensary, a cooperative and a private shop, a tearoom, a few market stalls. There is of course a CCM office, and a godown to store the produce from the communal shamba.

6. The watersupply system.

The village is served by two separate water supply systems, which both branc off from the main Ruvu - Dar es Salaam pipeline (see map). The first one consists of 8 communal standpipes located in the village centre, numbered I - VIII on the diagram. The other primarily serves a large pigfarm owned by somebody in Dar es Salaam. But it also includes one public standpipe as well as one private outlet which may be used by the villagers. These pipes are numbered IX and X on the diagram.

An unexpected complication was that the pressure in the first supply system frequently decreased in the course of the day. Often during the daytime from 10.00 - 14.00 only pipes I and III have water, whereas all the others go dry. Ocassionally the period is longer and may last for a day or more. The small water tank which is part of the system does not hold any water at all. Leaks in the system may be partly responsible for this loss of pressure, but it appears that some other defect is also responsible.

The second supply system does not have such problems and provides water at all times. When the other taps go dry the village can at least fall back on pipe number X in the second scheme.

In the diagram the standpipes have been numbered and the corresponding village sections indicated. Pipe no. II is out of order and has been omitted from the survey. Only a few surrounding households fetch water there. No. IV mainly serves the mosque, and nr. V the poultry scheme. These have been added to nr. VI to make one section. Nr. VII also serves a certain number of households further away to the south. In the waterconsumption table a 40% deduction has been made to account for those.

From the diagram it may be seen that the distances between houses and standpipes are almost always short. For very few households the distance is more than 200 meters; those are mainly found in section VIII. Pipe nr. VIII is also the one that fails first, as it is the highest in the system. People here would have to walk much further to reach any of the other pipes. This is the part of the village that

has real water problems in case of pipe failure. Originally a further extension of the scheme in this direction had been envisaged. To make it worthwhile general improvements to the system would be required first.

The outlying areas of the village are much less well served than the centre. There are a few more public standpipes as well as some private outlets which the villagers are allowed to use. Others have to depend on wells. Complaints were heard about the water supply situation in these parts. But since our research was limited to the centre of the village no comments will be made on these outlying areas.

One exception has to be made however, regarding a water source close to the centre. That is where the households in the S.W. corner of the map draw their water. In a rice field a steel water pipe of about 1 ft. diameter sticks vertically out of the ground. It holds water in the bottom and people let down small tins on a rope to draw out the water. It is thought that this pipe is part of an older, now adandoned, main pipeline.

7. Sampling and Data Collection

A sketchmap of the village was drawn, showing the location of households and waterpoints. The village was then arbitrarily divided in 5 areas of roughly the same size. In these areas a sample survey on 111 HH was carried out by 5 teams of 2 surveyors. For this purpose ten students from the University of DSM had been hired.

Afterwards the households were grouped in 6 sections, according to the standpipes where they draw their water habitually. A few households had to be discarded from the sample because they did not fall into any of these sections. The remaining sample consists of 96 households, representing 41% of the total number of households in the survey area. The sampling density varied from 24% to 68% in the various sections. (see Table - 5).

Table 5 - Summary of sample

pipe no.	no. of HH served	no. of HH in sample	% sample coverage	population sample HH	aver. HH size	estimate total pop.
I	25	6	24%	37	6.2	155
X	35	11	31%	58	5.3	185
III	25	17	68%	105	6.2	155
IV,V,VI	70	23	33%	144	6.2	440
VII	20	11	55%	70	6.3	125
VIII	60	28	47%	130	4.6	275
Total	235	96	41%	544	5.7	1335

Of the sample households an inventory was made, showing number, age and sex of the household members, as well as level of education and occupation. A short questionnaire was used to cover various aspects of water use. These sample households were followed up with daily visits for five days, and each time the women were asked how much water they had drawn since the previous visit. (see forms in appendix).

Mbezi offers a relatively controlled research situation. People from outlying areas use water sources just outside the village centre. In the village centre there are no wells and few alternative waterpoints. The seasonal Mbezi river was flowing due to the rains. A few people are said to use this stream for bathing. A few people also bathe at night at the standpipes, but due to the density of settlement most people bathe at home. A few children were observed to draw water from a cistern on the main pipeline, which has a leaking valve at the bottom. But these are very marginal sources of water. The only seriously disturbing factor might be the collecting of rain water from the zinc roofs; but also this is not practised on a large scale. Only on one house gutters were seen for the collection of rain water. 25% of the sample HH. indicated that they sometimes use rainwater for bathing and washing clothes.

The questionnaires were filled in on Monday and Tuesday, and repeat visits made daily until Saturday morning. The survey thus covered 5 full days. As the village is predominantly Muslim, the Friday is taken as a holiday. Waterconsumption markedly increased on Thursday afternoon and Friday morning, because people bathe themselves and wash their clothes before going to the mosque. This particular week was just before Easter and the Friday therefore also a public holiday.

The rains had started just a few days before the research. In the first week there were a few rainstorms at night and some light rain in the afternoons. The second week was much drier, with only a brief but heavy shower on Tuesday. There was no obvious effect of the weather conditions on the amount of water drawn, except for some collection of rainwater.

During the first week the pressure in the pipes dropped on most days, so that there was no water flowing from the higher pipes between 10.00 and 14.00 hrs. On Tuesday there was no water between 09.00 and 17.00 hrs. and more intensive use of the remaining water points was observed on Tuesday evening. During the second week no pipe failures took place, so that the actual measurements were not influenced.

8. Disturbing factors

Apart from the possible collection of rainwater there are a few other factors which may influence the results.

1. Small containers used by children. Women generally only mention the buckets they draw themselves and forget about the small amounts drawn by children. It was found that these account only for 5% of the total amount of water drawn.
2. Amounts used at the standpipe. Every woman takes about half a liter of water to rinse out her bucket before filling it. Occasionally the outside is also washed. Furthermore people passing by may stop to wash their hands, feet and face, or to have a drink of water. For the latter purpose a cup hangs in a tree near some of the standpipes. It is hardly possible to

account for such small amounts, and some allowance should be made for them. They do not exceed a few percent of the amount drawn in buckets.

3. A more seriously disturbing factor may be the mobility of the population. People go and spend some days with relatives, others receive visitors. Those working in town consume water while at work and those going to the fields may either carry a jug of water or use water from a well near the fields. It is clear that all these movements must have an effect on the amount of water consumed in the village. But it would require an extremely detailed investigation to get data on all the movements of people and their implications for water consumption. Moreover, they partly cancel each other (e.g. those who go visiting against the visitors), and partly are so permanent (water consumed while at work) that they may be excluded from the village water consumption pattern.

9. Drawing water

Drawing water is women's work. Girls are trained for it almost as soon as they can walk and take a big share in the work before they are ten. But single men do have to draw themselves and some do so as professional water carriers (only one in this village). It is interesting that they have a different style of carrying from the women. They use a jerrycan carried in the hand, or two buckets on a stick over the shoulder, or four debes on a small cart. In households without daughters young boys also make an important contribution to the task of carrying water. Women carry water on the head.

The standard vessel used in this village is the zinc bucket which can hold 15 liters. Young girls may not fill it completely, so as to reduce the weight. Some people have smaller buckets. Very few use debes (kerosine tins) or plastic buckets which hold 20 liters. Old people andchildren use sufurias, tea kettles and one gallon oil tins.

For our calculations the containers have been divided in four categories:-

debes and plastic buckets	20 liters
zinc buckets	15 liters
small buckets + large sufurias	10 liters
all small containers	4 liters

Water in mainly drawn between sunrise and 9 a.m., and again between 5 and 7 p.m. This is related to the main periods of water use in the home as well as to the wish to avoid heavy work in the heat of the day. Moreover many people are away to their fields in the daytime. It was observed that there is a great rush on the pipes in the last few minutes before dark, i.e. at 7 p.m. Throughout the day people and especially children do come to fetch water, but at large intervals. The total amount drawn during the day is certainly much less than that drawn during peak hours.

Waiting times

Normally it takes between half a minute and two and a half minutes to fill a bucket. That means that when four or five people are at the pipe, as happens from time to time, the waiting time does not exceed 10 - 15 minutes. No crowding at the pipes was observed during the survey. However, when the pressure in the pipes goes down waiting times may be extended to up to two hours, as it may take up to half an hour to fill a bucket from a merely dripping pipe. If the water supply fails on several days in succession it may well be that long waiting times become the rule. 65% of the households reported that long waiting times do occur, the estimates varying from half an hour to two hours.

Storage

At home the water may be used directly from the buckets, or stored in various types of containers. It was realised in the course of the survey that the total volume of these containers determines the households ability to bridge periods of pipe failure. Unfortunately no question had been included to cover this aspect. But few households can last more than a day without fetching new water.

From a public health point of view it is important that in most cases water is stored in open containers, which are mainly kept inside the house. Depending on the size they are cleaned daily or twice a week. The type of storage is shown in table 6.

Table 6: Type of storage container used

bucket	55	38 %
earthen pot	57	40 %
metal drum (small)	29	20 %
debe or plastic can	3	2 %
	144 *)	

*) Several households use various types of containers at the same time.

Use of water

Because the water from the Ruvu pipeline is treated there is no real need to boil it. However, the publicity around the cholera epidemic may have induced a number of people to boil their drinking water all the same, or otherwise to say that they were doing so. 47% of the households stated that they boil their drinking water.

Water for washing clothes is mostly brought to the home, although some people take their clothes to the standpipe to wash, and a few do so at the river. Water used for washing at the standpipes has been included in the calculations as far as possible. People do not wash directly under the tap, but fetch water in a bucket and wash in the bucket.

Table 7: Place for washing clothes

at home	100	75 %
at standpipe	27	20 %
at river	6	4.5 %
	133 *)	

*) Some women mentioned several possibilities.

No doubt due to the density of settlement bathing is generally done at home (90%), although some boys and men may bathe at the standpipes after dark. Nobody stated that they used the river for bathing, although there is some reason to believe that those living nearby do so.

10. Waterconsumption as calculated from the questionnaires

The amounts of water which were stated by all households over the five day period were added up and divided by five. (Table 9 col. 2). This figure was then divided by the number of people per household to obtain the average daily consumption per capita. (Table 9 col. 3). This was found to be 11.4 liters, with a range of 4 - 33 liters/capita (see diagram III).

From this figure the total daily consumption of all households has been estimated. (Table 9 col. 4).

11. The direct measurement of water consumption

In the questionnaire it was asked where households habitually draw their water, so that it was possible to divide the village in sections according to the waterpoint used. Once the number of households served by a certain waterpoint was more or less accurately known it became meaningful to measure the amount of water drawn from that point, and then divided it by the number of households, or people, served.

Eight taps were kept under continous observation on three successive morning and evening peak periods, i.e. from 6.30 - 09.00 a.m. and from 16.00 - 19.00 p.m. The actual amounts calculated from counting the number of containers has been shown in table 8. In one case (pipe no. VII) a correction had to be made, as 40% of the containers went to an unsurveyed group of households across the main road.

Pipes IV, V and VI were joined in one section, because they are close together and some people alternatively use one or the other tap.

An estimate had to be made of the amount of water drawn in the intervening period (09.00 a.m. - 14.00 p.m.) and the early hours of the night. On the basis of ad hoc observations this amount was estimated at 50% of the amount drawn during peak periods.(Table 9 col.6)

The per capita consumption was then calculated by dividing the measured amount + 50% by the number of individuals in each section. (Table 5)

A very close correspondence between the averages found by questioning and by measuring was found in all sections except one. Whereas in all other sections the difference between the two measurements is about half a liter, in the one case (pipe IX) it is 6.2 liters. There is no explanation for this finding. A major error in the amounts measured is unlikely, as the observers were rotating over the different outlets. Errors by the initial survey team are more likely.

However, even the large discrepancy in one section cannot obscure the very close resemblance between the results found with both methods. If this section is left out the averages found are 11.1 and 10.9.

Table 8: Waterconsumption measured in Mbezi village, 28-31 March 1978

Pipe number	Tuesday 16-19	Wednesday 6.30 - 9	Wednesday 16 - 19	Thursday 6.30 - 9	Thursday 16-19	Friday 6.30-9	Total
I	630	415	510	320	450	495	2820
X	395	535	370	440	370	500	2610
III	525	655	700	525	750	755	3910
IV	255	300	375	280	200	430	1840
V	390	275	195	70	425	410	1765
VI	1240	800	1330	780	870	1100	6120
VII	740	510	735	545	1240	590	4360
VIII	975	960	935	810	1150	1110	5930
Total	5150	4450	5140	3770	5455	5390	29355

Table 9: Summary of findings by questionnaire and measurement

(1) pipe no.	(2) daily cons sample HH	(3) average c.cap.d.	(4) estim.cons. all HH	(5) measured daily cons.	(6) +50%	(7) aver./ capita
I	318	8.6	1333	940	1410	9.1
X	764	13.2	2442	870	1305	7.0
III	1348	12.8	1984	1300	1955	12.6
IV V VI	1665	11.6	5104	3240	4860	11.0
VII	771*)	11.0	1375	872	1308	10.5
VIII	1321	10.2	2805	1976	2965	10.8
Total	6187	11.4	15219	9198	13800	10.3

*) 40% of the actually measured amount has been subtracted because it was drawn by households outside the survey area.

12. Waterconsumption and household size

The total waterconsumption per household of course increases with the size of the household. This relationship has been shown in Diagram II. Yet it can also be seen that the relationship is not exactly linear. A household of two uses 40 liters a day on the average. But a household of four does not use twice as much, but only 62 liters on the average. And a household of eight does not use 4 x 40 = 160 liters, but only about 70 liters on the average. Therefore there is a rapid decrease in per capita consumption with increasing size of the household. This has been shown more clearly in Diagram III.

The most likely explanation of this phenomenon is that there is an "economy of scale" at work. One can easily see that in cooking, cleaning and washing for more people at a time water is used more efficiently, and therefore less is needed per capita.

Other factors that may play a part are that larger households usually contain a larger proportion of small children, and also that in large households there is a greater likelyhood that one or more members of the household are temporarily absent.

There is no evidence from our research that labour is a constraining factor. In the larger households there are always more carriers available. And in any case the distances to the standpipes are so short that labour is hardly a significant factor.

This finding shows that sample choice is an important factor on calculating water consumption. In previous research the representativeness of the samples has not always been clear, and the diverging average household size found may itself contribute to the variations on per capita consumption (cf. table 1).

13. Conclusion

The average per capita consumption in Mbezi village has been found to be about 11 liters per day. This result was obtained independently by two different methods (questioning people and direct measurement) and the results with both methods were very similar. For future research the method of taking a questionnaire and making repeat visits over a number of days (preferably a whole week) is recommended. It has advantages from the point of view of sampling, can be carried out at more convenient times, and presents fewer mathematical complications.

The amount of 11 liters per day fits in very well with previous research findings (see table 1). In fact the present finding is an important confirmation of those data, as it is based on a large sample and obtained by a rather elaborate method.

What may surprise is to find such a low average under the given circumstances. Our research was designed to measure consumption under optimal conditions. And indeed, Mbezi has a relatively good water supply system with short walking distances and almost no crowding. The village is close to the capital and the standard of living is relatively high. Yet the per capita consumption is no higher than in a remote village with only unimproved watersources. Apparently the mechanism of carrying water from source to home, even over short distances, is the decisive constraining factor. Only when water is provided through domestic connections does the per capita consumption rise rapidly. (Drawers of water p. 118).

This does not mean to say that the rate of water-consumption should be expected to be more or less the same everywhere. White, Bradley and White's sample is much diversified and Warner has also found quite different amounts in different areas. In the Coast Region there is some evidence that the rate of water consumption is much higher along the Rufiji river. Sandberg (1974, p.39), talking about the Rufiji delta, remarks: "Most families in the delta enjoy proximity to the river ... and maintain a high hygienic standard with a bath every morning and evening. This also means easy access to drinking water ....."

A calculation on storage tanks on the upper Rufiji by CBA has indicated an average consumption of about 29 liters per capita. While this may be an overestimate, it nevertheless points to a much higher consumption than in Mbezi village.

The finding that the per capita consumption is much influenced by the size of the household deserves to be tested in other areas. In different samples quite different household sizes have been found (see table 1) and one wonders in how far the results have been influenced by this difference. Researchers should state their sampling techniques more clearly, as well as the proportion of their sample to the total population.

References

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Sandberg, A. (1974) - Socio-economic survey of the lower Rufiji floodplain (BRALUP research paper no. 34)

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White, G. F., Bradley D. J., White, A. U. (1972) - Drawers of water.

VILLAGE: TRIBE: NAME OF STUDENT:

BALOZI: CAME TO THIS VILLAGE IN:

HOUSENUMBER: BEFORE THAT LIVED IN:

NAME	RELATION TO HHH	AGE	SEX	EDUCATION OCCUPATION
HHH				

APPENDIX

HOUSEHOLD QUESTIONNAIRE

1. Make sure the inventory sheet is filled in properly.

2. From which standpipe does this household draw its water? (take number from village map) _____

3. Do you ever take water from any other place? yes / no
   If yes, from which place? _____

4. Do you ever use rainwater? yes / no

5. Do you sometimes have to wait for your turn at the pipe? yes / no
   If yes, for how long? _____

6. At which time(s) of the day do you usually draw water ? (specify hour is possible) _____

7. Which members of the household are involved in drawing water? (specify name and age from household inventory)

   _____

8. How is the water stored in the house? pot / drum / debe / other

9. Is that container ever emptied and cleaned? How often? _____

10. Do you boil your drinking water? yes / no

11. Which type of container is used for drawing water?
    debe / plastic bucket / zinc bucket / sufuria / earthen / oil tin

12. Where do the members of the household bathe?

	at home	standpipe	stream	pond	other
men					
women					
boys					
girls					
babies					

HOUSEHOLD CONSUMPTION SHEET

	TIME	20 liters debes	plastic buckets	15 liters zinc buckets	10 liters sufuria	oil tins	4 liters pots	other
1st day	asubuhi							
	mchana							
	jioni							
2nd day	asubuhi							
	mchana							
	jioni							
3rd day	asubuhi							
	mchana							
	jioni							
4th day	asubuhi							
	mchana							
	jioni							
5th day	asubuhi							
	mchana							
	jioni							