

INSTITUTE OF RESOURCE ASSESSMENT

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RESEARCH PAPER 1

DOMESTIC WATER SUPPLIES IN TANZANIA

A BIBLIOGRAPHY WITH EMPHASIS ON SOCIO-ECONOMIC RESEARCH

Prepared for
the Institute of Resource Assessment
for Domestic Water Supply

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Research Paper 1

DOMESTIC WATER SUPPLIES IN TANZANIA
A bibliography
with emphasis on socio-economic research

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Preface

This bibliography has been prepared as a tool for the development of the project "Domestic water supplies: a vital component in Tanzania's rural development. A consumer-orientated study of selected water schemes in four regions" carried out by Ingvar Andersson and Carolyn Hannan-Andersson. The project is financed by a research grant from SAREC, the Swedish Agency for Research Cooperation (9.49/u-forsk), and involves research cooperation between the Institute for Resource Assessment (formerly BRALUP) at the University of Dar es Salaam and the Department of Social and Economic Geography, University of Lund, Sweden.

Since the emphasis is on the consumer and the micro-level the bibliography mainly covers socio-economic aspects of the development of rural water supplies for domestic use. References on sanitation are included but no attempt has been made to completely cover this field. The bibliography includes references on the development of domestic water supplies in developing countries in general, as well as material with specific reference to Tanzania.

The inventory of literature will continue throughout the project. In this bibliography important works may have been omitted. Any suggestion as to relevant works to be included will be gratefully received.

At the conclusion of the project an attempt will be made to prepare a partially annotated bibliography. Copies of abstracts already available on any of the works included could be forwarded to the project members at the Institute for Resource Assessment. It is hoped that the authors of works included in the bibliography can contribute abstracts of their own work.

Dar es Salaam

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INTRODUCTION: DEVELOPMENT OF DOMESTIC WATER SUPPLIES IN TANZANIA

1. Introduction

If for some reason water was not available in Tanzania for more than 2 to 3 days, the entire population of over 18 million would not survive. That the population survives is a clear indication that there is water. However, it is generally neither found in adequate quantity or quality. Therefore human intervention in these two areas is the corner stone of improving domestic water supplies. This intervention is the essence of development, for its main goal is to ensure that all people have greater security and well-being from life than bare survival. In this bibliography we have attempted to present the process and the impact of human intervention needed to meet the challenge of ensuring a convenient water supply for domestic use. Even the term "domestic use" is open to interpretation - for instance it can be narrowed down to water for drinking. However it should include water needed for washing and perhaps even water for animals. The narrowing down of concepts in itself does not promote development.

2. The Bibliography

The bibliography itself is divided into two parts. The first part deals with general studies, reflecting that Tanzania is but one of many countries in the third world striving to overcome a problem of staggering dimensions. The second part focuses on studies undertaken in Tanzania and which deal more specifically with the situation within the country.

The question may well arise as to why a bibliography at all, for it is easy to presume that they are not "read" and are of little value. This is a fallacy! While it is true that they can be an end in themselves, the fact that they continue to be produced and published, in some cases in more than one volume, is a clear indication that they are of value. The academic and research community is one group whose work literally begins with the assemblage of "who has done what?". Closely related to this question is the corollary "Where can one get the information?" One of the authors of this volume found through consulting bibliographies produced by WHO, IRC, IDRC and even the World Bank, that, out of the thousands of studies

techniques. Subjects are seldom dealt with critically and there seems to be a fear of being innovative. (Feachem et al, 1978). The persistence of scholars, sometimes spanning several decades, is fascinating to follow. For instance, Bradley's work contained in Tschannerl (1971) has obviously gone through several refinements. This is evident in his contribution to Water, Wastes and Health in Hot Climates (Feachem et al, 1978). The ideas and concepts begin to reveal the options and the problems in a much clearer manner. Ideas like good wine require time to mature.

Three factors become very evident in the general study. Firstly, the problem of rural water supply is of staggering magnitude. Secondly, if the water problem has been approached from many different angles, it is precisely because it cannot be tackled by one group or one discipline. The subject moves from the domain of the hydrological engineer to a host of other disciplines. Finally, because water is so basic the participation of the consumers and their attitudes are important components. However, the involvement of the consumers by itself cannot improve the situation unless it is accompanied by integrated development inputs in all sectors.

3. Bibliography at the National Level

At the national level a bibliography fulfills several functions. For researchers it provides an overview - the possibility to see the problem as a whole and eliminate the risk of "not seeing the forest for the trees". Of 137 studies emerging from within Tanzania, over half of them originate from the University of Dar es Salaam, nearly 90% of them from BRALUP. Notwithstanding the fact that such statistics mask other realities, for instance that comparisons cannot be made between a study covering a few pages with another that covers 10 volumes of data and technical information such as are found in the Water Master Plans, nonetheless they do reflect that there has been a considerable interest in the topic. What has been written by scholars and presented here in the bibliography is a measure of the stimuli - response situation. It gives a measure of the way in which researchers have been influenced by outside factors and of how, in turn, they have influenced developments. The bibliography will also help chart some of the main trends in the field of water development and to match these against policies and expectations.

If there seems to be a bias towards the role of academics, it is not by accident. As mentioned earlier, nearly half the studies were produced

on water, only a fraction were on sanitation and of these, less than 10 actually dealt with waste disposal in the tropical countries. Interestingly, one of the 10 studies was conducted in Tanzania, funded by IDRC through the Tanzanian National Scientific Research Council and coordinated by a Tanzanian medical doctor. If there has been so little work done on sanitation, the WHO/UNICEF policy document, despite its attempt to emphasize sanitation, will be difficult to implement because little is known about the realistic options and the operational factors. Thus even at the global level bibliographies enable policy makers to realize the gaps in knowledge and the need for research. Obviously this applies equally at the national level as will be elaborated later.

In preparation for and subsequent to any major international conference, there is a harvest of articles, books and other publications which come into circulation. In the field of water the landmarks are the UN Conference on Human Settlements in Vancouver (1975), the UN Water Conference at Mar del Plata (1977), the WHO Conference on Primary Health Care at Alma Ata (1978), the endorsement by WHO Assembly of water and sanitation as part of Primary Health Care (1979), the UN Declaration that 1980-90 should be a Water Development Decade, and the UN Interregional Seminar on Rural Water Supply in Uppsala (1980). The main value of these international meetings is that there is some concerted effort to obtain information which otherwise would not have been made available. The data generated is not necessarily the best, nor can it always be used in an operational sense, but they do reflect the magnitude of the problems and consequently do assist the setting of goals and priorities. Thus, a group at the Habitat meeting was, with right, vocal about the poor conditions existing in rural areas of most third world countries. The Mar del Plata Conference which also took up this issue, concentrated attention on the status of water supply and water availability in member countries and the need to plan the use of this resource. At Alma Ata and Geneva, water and its role in health was emphasized and the decade introduced to promote changes in water supply.

Implementation brings to light the reality of the costs of overcoming problems and the search for new ideas. The latter can emerge endogenously or can be transferred. The value of local institutions at once becomes apparent. They form the base for concepts to develop and for ideas to mature in the realities of the local context. Commercial consultants and international agencies are not geared to generate new methods and

at the University of Dar es Salaam's Bureau of Resource Assessment and Land Use Planning. In addition, it is likely that an even larger proportion of the next generation of decision-makers will come from the University as will the teachers at the various technical schools and other institutions. Therefore, in the words of Biswas, "Equally important is the urgent necessity to ensure that the current developments are easily available to practitioners and academics all over the world so that they do not spend scarce resources in reinventing the wheel." (Biswas, 1981). Many practitioners in Tanzania will not have the time to read all that is published but they will at least know what is available and where.

Water projects and water schemes will have to be multidisciplinary so that major decisions will be taken on the basis of information from several disciplines. Practitioners in the various disciplines "should themselves become increasingly aware of the relevance of findings of others working in different fields, but who are equally involved in a total human situation." (Warren and Rubin, 1968). Thus it is important for them to have easy access to different sources. Few will debate the importance of interdisciplinary studies but there are problems of interpretation and even the basic difficulty of knowing where to look for information in other disciplines.

4. General Analysis of Material on Tanzania

Bibliographies have yet another value. They simply tell us what is available and how much has been done. Within Tanzania there has been a steady increase in the number of studies produced. Taking the intervals between the years 1965, 1975 and 1980, the number has risen from 27 to 34 and 46 respectively. In other words, the number of studies has almost doubled in 15 years. In the coming period there are signs of an acceleration in the production of material. This means more information and hopefully, better planning and a general improvement in the conditions of living.

The real landmarks in Tanzania are 1969 and 1971 when the proceedings of a workshop and a conference were published. Suddenly the market was flooded with ideas to test. Nearly half of the papers generated in 1969 came from the workshop. However, equally impressive was the work that was going on in the background and which would later be published by BRALUP. The aftermath of the conference (Tschannerl, 1971) similarly generated

considerable attention to the topic of rural water supply.

Since the proto Ministry of Water was the Water Development and Irrigation Department (WD & ID) of the Ministry of Agriculture, it was only logical that its initial interests would be heavily biased towards water needs of the farming communities rather than to water for domestic use. The Ministry as such, continued to think in terms of exploring for water, extending pipelines and constructing dams. Its emphasis was also on the collection of basic data. Although the collection of such data was expensive there was a realization that, without it, no serious plans could be undertaken. Thus, Jackson (1970) has more than 60 items listed in his contribution, Data Collection Programmes - Meteorological Data in Berry et al, (1970). Similarly there seems to have been a determined effort to get involved with projects rather than to raise questions which could delay projects. In this respect a relatively large programme, for its time, existed to explore the river basins and other large schemes, and there were numerous project studies. BRALUP itself was involved in several studies, especially in Nzega, Morogoro, etc. Other general topical studies ranged from rates of water use to water filters and from floods to health research.

A decade later, the conclusions of a report presented in 1970 continue to be appropriate. In the field of domestic water supply some basic work had been done but research tended to be incomplete, discontinuous and only available to a limited number of people. Such work as was available all too often suffered from duplication and lack of full knowledge of previous studies. (Berry et al, 1970). The data which was collected even then was not fully utilized. Past experience reflected that projects can be executed more fully if they are backed by engineering, natural resources investigations and socio-economic appraisal of the area. Finally, on the role of research itself, the review concluded by stating:

"For research to play a significant role it must be planned on a long term basis, it must be related to the needs and possibilities of the development programme and there must be an effective mechanism for feeding the research findings into the implementation mechanism. Up to now these criteria could not be met in full but their objective should be attainable in the near future on most aspects of the water programme. (Berry et al, 1970)

5. Establishing a base line

The workshop in 1969 and the conference in 1971 were watersheds in the whole issue of rural water supply in Tanzania. To begin with, both the governments of Kenya and Tanzania were committed to spending large sums of money for rural water supply. Therefore the two meetings give us the past trends and future preoccupations. The workshop brought together 43 participants representing 30 organizations from all over East Africa. Apart from representatives from the three governments and member colleges in Kenya, Uganda and Tanzania, there were representatives from the UN bodies, the East African Community, religious organizations and commercial firms. The workshop which was well organized had four aims:

1. To acquaint the participants with the various existing programmes of research and implementation of rural water supplies in East Africa.
2. To identify common problems faced by the participants.
3. To compare ideas and experiences dealing with these problems.
4. To set out the major issues for deliberation at the 1970 East African Conference on Rural Water Supply.

The preoccupation of the participants could be roughly divided into six fields. First was the concern about the type of research and methodology to be used in rural water supply. Most researchers and planners considered that there was a need for accurate baseline information detailing inventories of water resources and supply facilities under local conditions. A related interest was to study the actual benefits resulting from the additional labour time available.

The second concern was the relationship of rural water supply to improved health. Two questions came to the fore. Was it possible to determine change in public health as a result of improved water supply? Were special water quality standards needed for judging rural water supply? Three features of interest emerge. It was recommended that there was a need for medical expertise to be integrated into planning and design of rural water supply in order to stop any negative impact; research was needed to show the relationship between improved water supply and health and finally, in addition to chemical analyses, routine bacteriological analysis should be undertaken automatically.

The third area of interest was the technical aspects of providing better water supply. The two issues which were centred around this problem were the type of technical innovations which could best promote rural water supply and the type of technical training which is most needed in East Africa. Even at that stage it was considered that what was most needed was not simply additional technology but a reappraisal of the equipment needed and the correct choice of techniques. On the training of personnel, there seemed to be a need for immediate in-service training of the lower and middle cadre, and at a higher level to interest East Africans in the engineering profession.

On the task of implementation, the role of the non-governmental agencies was raised, as well as the question whether self-help and various types of contributions should come from the villagers in small scale water projects. Since the government alone could not be expected to meet all rural water supply needs, it was obvious that in certain types of projects the non-governmental organizations had proved to be more efficient. Since there were conflicting claims on self-help schemes, this was a researchable area. There was the vital necessity of one organization in each country acting as a clearing house for all activities in rural water supply.

The fifth area of concern was whether water supplies acted as a stimulus for community development. It was uncertain whether water supply acted as a catalyst and whether private individuals and non-governmental organizations should promote community development projects. The evidence suggested that water supply alone was insufficient to guarantee development. The research issue was what complementary investments were necessary.

The sixth area of interest was the whole question of planning for rural water supply. There were very divergent views whether the large amount of money spent on water was a social or an economic investment and closely related to this was the question of long-term goals for rural water supply. Therefore in planning there was the need to have at least the rule of the thumb on project selection and the type of institutions necessary to speed up decision making. Since the social and economic benefits were uncertain, additional research was necessary.

The remarkable feature about the Water Conference was that there was very little overlap with the workshop and a great deal of complementarity. Although the conference was to a large extent confined to Tanzania,

120 delegates participated. Topics were discussed from a variety of viewpoints. The conference focused on 4 main themes: planning and policy, health, hydrology and meteorology, and design and implementation. The planning theme generated so much interest that there were three subsections - master plans, planning procedures and the broader aspect of planning.

A returning scholar marvelled that within two years there was a marked change in the commitment, organization and knowledge by water resource planners and this was matched by, among other factors, a ministerial reorganization (creation of a separate ministry of water rather than an appendage of the Ministry of Agriculture), an applied research programme yielding data and understanding which was unique for a developing country.

While, on the whole, there was support for masterplans, some caution was expressed, particularly by Kates (1971). There was a plea for flexibility, that the extension of the planning horizon should mean the master plans could benefit from the widest experience of comprehensive water resource planning and that there was a need for Tanzanians to choose according to the circumstances. The need for data was stressed, as was the necessity for integration in planning. The ministry stressed that water master plans had to focus on quantity, quality and location for different water uses. Socio-economic and political factors were not to be decided by the planning teams. On policy issues it was argued that in the initial stages water was a social and health issue and government investment was necessarily high in the initial stages, but as incomes rose the beneficiaries should be able to finance further investments. For this purpose it was imperative that impact studies be undertaken. There were various procedures suggested for planning

Since doubt was expressed about the health benefits from communal water supplies, it was recommended that the impact of water on health be studied at the village level. More on the nature of infrastructural support, the need for collecting data on hydrology and meteorology was stressed. Finally, on the design and implementation side various examples of ways of lowering costs were suggested. The newly appointed Minister of Water and Power, W Chagula, stressed that implementation ultimately depended on political decision and for this reason there had to be a dialogue between politicians and planners/researchers. (Chagula, 1970).

6. The Quest for Data and Information on Water Resource

If the political and social demand for rural water supply were strongly articulated, the implementation process demonstrated the need for investigating costs, benefits and sometimes even the feasibility of providing water. This made it imperative to collect data and implement a research programme. For instance, at the national level there was only one publication in existence on groundwater resources, (Coster, 1954). Similarly, the only comprehensive report on surface hydrology was the remarkably useful work of Gillman, completed in 1940 without the aid of a single gauging station, and therefore inadequate for any serious planning. Fortunately the WD & ID published two volumes of records covering the period 1950-59 and 1960-65. The coastal areas covering the Pangani, Wami and Ruvu basins were well covered. The Rufiji basin was more comprehensively surveyed and the information made available in several volumes published by FAO (1961). However, out of the 13 river basins only 4 were reasonably known. The whole of SW Tanzania was virtually unknown territory and the hydrometrological information available on the Kagera basin and Lake Victoria was minimal. With such poor data one could hardly really plan for rural water supply. It is frequently not appreciated that the data needs of the hydrologist or technician are not the same as those of a planner involved in designing or implementing rural water supply projects. Data has to be turned into information. It must emerge from the confines of a dusty file into general circulation.

There was a lull between 1975 and 1977 when there was a drop in the output of material published. During this period there was only a solitary report from BRALUP. There seems to have been a weariness in the bureau and the senior researchers did not get involved in any research on water. Research projects in Handeni District, Mwanza, Coast and Dodoma regions had to be abandoned, and a valuable contact and working relationship with the Ministry of Water was lost. Renewed interest followed the Director of BRALUP's secondment to the WHO/UNICEF to work on policy aspects of water and sanitation as part of primary health care. Since 1977-78 there has been an increase in material to emerge from BRALUP, largely because of contacts at the international level, and also because of the emphasis on primary health care. BRALUP studies had already begun to develop along these lines (Ståhl, Sachak & Mkusa, 1979) and added to this was support from NORAD, Danida, SIDA and the Royal Netherlands government. Far more

important, and indicative of a healthy trend, is the fact that the work coming out of BRALUP is matched by numerous other technical studies and reports, mainly from Ministries and donor agencies. There is little overlap as yet. The studies complement each other, with the latter getting more involved with the basic data on technical matters. Thus the socio-economic component of the Coast, Iringa, Rukwa, Kigoma, Ruvuma and Mbeya regions have been contracted to BRALUP. This brings one to the all important question, what the emerging trends really are.

7. Trends of Studies

The early studies in BRALUP reflected the mandate which established the institute. The first directors of BRALUP who were geographers, continued the scholarly tradition of Gillman (1944) by appreciating the significance of water - for without water there could be no life. As a transient resource, it cuts across the various sectors on which life depends. One of the earliest seminars in BRALUP quickly came to the conclusion that it was necessary to see the relationship between water and settlements. Still others looked at the anomalies as to why settlements were not located in places where water was in abundance, in contrast to the settlements where water was scarce. These early studies put most of their emphasis on the impact of the development of water on people and their environment. With experience the studies became more specific.

Two years after the creation of BRALUP a critical review of research on water development was undertaken (Berry et al 1970). At the time when the review was started the Ministry of Water and Power had not come into existence and the Water Development and Irrigation Division (WD & ID) of the Ministry of Agriculture, Food and Cooperatives was responsible for rural water supply. The review tried not to duplicate three related but complementary activities: the Workshop on Rural Water Supply (Warner, 1969); the findings and recommendations of a Subcommittee on Water and Power, National Research Plan (DEVPLAN, 1970); and a survey of water uses in East Africa to be published as Drawers of Water: Domestic Water Use in East Africa (White, Bradley and White, 1972). Nationally it was a time of consciousness-raising, especially to the fact that water had to be recognized as a major resource. Politically it was stressed that provision of clean water for people was a developmental goal. There was no real discussion of cost because it was assumed that this was not of

significance. Implicit too was that over the next few decades it was necessary to develop the water resources for livestock, for large and small scale irrigation and, above all, for power. The Ministry that was created to handle all of these goals was the Ministry of Water and Power. The comments in the review are pertinent.

"In some areas these development aims will be separated and water will be harnessed for one purpose only, drinking water for people - or storage for hydro-electric power generation. But often there will be several different needs to be fulfilled in any one area... water for livestock, water for irrigation and water for power may be thought of separately for some purposes - all of these programmes deal with one vital resource and a coordinated development of this resource is necessary." (Berry et al, 1970)

8. Specific Information on Domestic Water Use

If the data base on water as a resource was poor, the situation was even worse regarding domestic water use. Considerable progress has been made by the intervention of social scientists, notably geographers, economists and anthropologists. In the 1960s steps were initiated to complement data on use to match information on water as a resource.

Thus great efforts were made to design a more general methodology for collecting data on water use and problems in water development in Tanzania. Concepts and techniques for quickly obtaining information were developed and tested in Kilosa (Berry and Claeson, 1969), Handeni (Tschannerl et al, 1971) and Nzega District (Ferster, 1970). Another study in the Economic Research Bureau was similarly geared to find out the impact of rural water supply and use before and after water schemes were installed. This comprehensive survey covered 26 villages in 10 districts (Warner, 1970). The work in BRALUP was more detailed and will be described below. Together these studies were to provide information on the planning and designing of future water supply distribution systems and related issues to the newly established Ministry of Water and Power.

One of the most thorough studies to be undertaken during this period (1969-70) was Ferster's work in Nzega. In 6 reports covering over 250 pages, he has left one of the most comprehensive records of water use in one rural area of Tanzania. The collection of water data was essential for two purposes. First to produce evidence on the functions of the pipeline system in existence so that such data could be used for expanding the pipeline.

Beyond this it would generate general information for rural water supplies in the semi-arid belt and in other parts of Tanzania. Secondly, the purpose was to find how an expanded water supply distribution would affect the farming system. Most of the material generated pertains to the first question and unfortunately there was little time to complete the study focusing on the second question. Briefly, Ferster's study generated information about variation in water use and problems encountered in different geographic areas; the seasonality factor; the amount of water collected and used; the concept of the average household profile; and thirteen sets of variables related to water use; the relationship between water use characteristics among geographic sub-areas; the reliability of water supplies; and low cost methods of obtaining information.

The rule of thumb gave way to a considerable amount of material for planners to use. For instance in Igunga there was a built-in mechanism to ensure that there were no conspicuous peak hours for water collection and this has significance in design of storage capacity. This raised the issue of the right type of investment packages. In addition it was found that the WD & ID estimate of 45 litres per household, irrespective of the area, was on the high side. As a consequence this was reduced from 45 to 30 litres in June 1970. Finally there was a caution that in the delivery system special care would have to be taken to study local factors including the soils of the areas, rather than to assume average conditions for Tanzania.

Warner's study which was equally important, had significantly lower figures for water use than Ferster's. Here, one is confronted with the problem of semantics with terms like "water needs", "Water demands", "water collected" and "water used". They still continue to be used loosely.

The question which arises is what impact did these early studies have on the development of planning for rural water supply in Tanzania? Ferster's studies, for instance, did not have the direct impact that they should have had for several reasons. To begin with his work was not "sold" simply because the client (Maji - Dar es Salaam) was new. Decentralisation of Government Ministries was still under discussion and interest in BRALUP was swinging to participation and local level planning. Interestingly, exploration into people's participation in rural water supply in Tanzania came a decade before the concept became fashionable. Indirectly, one can point to the workshop in 1969 and the conference in 1970 which were both strongly supported by the Ministry of Water and Power and the results of which were used in decision making.

9. Water and Health

One dimension of rural water supply which has received much support and which continues to be an important aspect of study, is the link between water and health. Both the workshop and the conference had several papers including one by the eminent authority, David Bradley. In the workshop there were seven papers on health-water related topics. Initial studies of the health-water equation moved from the hospitals to field investigations, exemplified by the work of Bradley (19), Kreysler (1968), Sturrack (19) and the classical work Drawers of Water: Domestic Water Use in East Africa (White, Bradley and White, 1972). Parallel to these efforts was the on-going work at the East African Medical Research Institute at Mwanza and related centres. Unfortunately the collapse of the East African Community has had negative impacts which will take time to correct. While the workshop and the conference tried to get the medical practitioners to participate, real cooperation between the water and health personnel will take time to concretize. In the meantime it is necessary that both sides become aware of the work that is going on. Therefore, a review of water and health specifically on the repercussion of man made lakes is to be found in Mascarenhas, O. (1978) and additional work specifically exploring various intervention methods to reduce health risks are contained in several forthcoming studies. (Mascarenhas, O and Mascarenhas, A. forthcoming).

Following the World Health Assembly's deliberations on water and sanitation as part of primary health care (UNICEF, 1979) there will be increased interest. Studies and findings will be used to justify expenditure on water projects. A whole big area requiring research is the socio-cultural aspects of sanitation and this needs to be matched by technical aspects in the same field. Unfortunately, without the active support of the medical profession and general improvement in other sectors, water alone will not bring health benefits.

Even the transient nature of water has a bearing on health. Increased water supply, especially immediately after the rains which create puddles and other accumulations of surface water increases morbidity due to a dramatic increase in insect pests, not to mention pollution of water when the drainage and sanitation is poor. In contrast, in the dry season the mineral content of many water resources also increases rapidly. Indirectly small-scale irrigation schemes could affect health by making available fruits and vegetables to offset mineral and vitamin deficiencies. Research into the health aspects of water is far from complete. Its direction will be geared towards preventative and

into health aspects of water is far from complete. Its direction will be geared towards preventive and developmental rather than pathological aspects.

10. Trends In The 1980s

There have been no major water conferences or workshops which had comprehensive , inter-sectoral agendas in the early 1980s, upon which to draw the overall trends. However, the situation is far from dormant and there have been several specific topical workshops. One is therefore forced to look at the accomplishments, use whatever clues and trends which presently exist to chart the future course, or at worse, speculate on the future trends.

There is a need to briefly state some of the topical issues which have recently merited attention. A promotional campaign to go the shallow well way was initiated in 1980, at a workshop in Morogoro. This was soon followed by a request to BRALUP to undertake research on the effectiveness of shallow wells. Part of the project on Morogoro was completed and the in-depth study in Shinyanga is nearing completion. A workshop on the findings on shallow wells indicated that the development was far from satisfactory - wells were located close to the traditional sites; frequently they were a long way from the users (2 km or more); the queueing time was long because there were few water points. (Kauzeni and Konter, 1981) A workshop was held on community participation . Most future efforts in this field will be directed towards testing various methodologies to promote community participation, as has been the case in Rukwa, Iringa and Ruvuma. There have been other initiatives in sanitation and low cost urban waste disposal activities and on the flourine content of water.

The accomplishments in Tanzania are significant. Horizons have been lowered from a 40 year perspective to a 10 year horizon and this has led us to another 10 year perspective. If water for all was not within the realms of possibility in 1980s, the question arises whether we will be any closer on the 1990s. What will emerge is probably new forms of organization. The centre will coordinate, the decentralized organs, possibly even going to the village level, will implement.

There is now very little debate about the benefits of rural water supply to health but the research interest will continue. How can one maximize on the health benefits? Sanitation is becoming a catch word, probably to be

followed by soap, and treatment of water and disposal of waste and environmental sanitation. Research will be interactive - between the medical profession, the engineer and the social scientist. Water has to be considered in a development context. Therefore questions are bound to be raised - can something be done to provide small scale energy units?; should water be provided for cattle or for nurseries needed for afforestation. The debate on water and health will be less vicious and since the health sector and personnel are already over-stretched, there will be a need for a new type of personnel to be trained and other professions will enter in fields which in the past were the domain of the medical doctor. The "bare-foot" doctor, the community development officer and others have begun to emerge. Social scientists are trying to understand the mystery of diseases and their agents, and engineers are trying to face the reality of communities and their needs. Medical Research Institutes which had almost come to a standstill are being revamped but it will take time before they can play an effective role.

Most regions now have a Master Plan, and despite their varying quality, it is an impressive achievement. However, several tasks still remain. How does one reconcile so many different approaches to get a meaningful national water master plan? What are the major differences between the plans and did these arise because of methodology, changing circumstances or was it simply experience in planning? How can the master plans be most effective and how will they be affected by the regional integrated development plans? The list can be made long thus demonstrating that the production of water master plans for the regions is just the first step in the process of rural water supply.

Concern about the financial aspects of rural water supply will enter into a period of revival. The great interest expressed by international consulting firms just at the time when there was an apparent abundance of financial resources from the peak of the petroleum era is now waning. Therefore the expectations will have to be lowered and local institutions will have to explore ways of cutting down costs. Already in the 1970s Kenya was finding it 25-30% cheaper to hire an expatriate and get a project done than to use consultancy firms. Socialistic Tanzania has no choice but to see that those it trained play a major role in rural water supply.

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INSTRUCTIONS FOR USE

Presentation

The references have been presented in two sections:

1. General
2. Tanzania

The general section includes a selection of the most relevant works on the development of rural water supplies and sanitation in developing countries in general.

The section on Tanzania includes all the known references on the development of rural water supplies and sanitation in Tanzania. The quality of the works in this section has not been taken into account. The main objective was to present an inventory of what has been produced on Tanzania to date.

Numbered alphabetical order

The references are presented alphabetically according to author. Each reference is numbered since the bibliography is indexed.

Format

Standard catalogue-card format has been used in presenting the references in order that they may be cut out and pasted onto cards.

Indexes

1. Authors: This includes all authors.
2. Conferences/workshops/seminars: This index includes information on conferences, workshops, seminars from which papers have been presented in the bibliography.
3. Institutions/organizations/consulting agencies: This index includes corporate authors, publishers or other bodies taking responsibility for a reference.

4. Periodicals/irregular serials: The titles of periodicals and irregular serials from which articles have been taken, are presented here. The publisher and place of publication are also included in the index as this information is not given when each individual article is presented in the list of references.

How to find a reference using the indexes

If the AUTHOR is known consult the author index.

If papers produced or presented at CONFERENCES/WORKSHOPS/ SEMINARS are required consult the conferences/workshops/seminars index.

If the INSTITUTION/ORGANIZATION/CONSULTING AGENCY acting as corporate author or publisher is known, consult the institution/organization/consulting agency index.

If the PERIODICAL/IRREGULAR SERIAL in which an article was published is known consult the periodical/irregular serials index.

Appendices

1. Bibliographies and state-of-the-art reviews

A list of useful bibliographies on water supplies in developing countries in general and on Tanzania is presented.

2. Projects in progress in Tanzania

This includes information on projects which are currently in progress in Tanzania on different aspects of the development of rural water supplies for domestic use. Information is given on researchers, funding agencies, location in Tanzania, objectives, etc.

3. Abbreviations

This list includes all abbreviations used in the bibliography.

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APPENDIX 2Projects in progress in Tanzania1. Community mobilization for participation in the rural water development programme

Aim: To mobilize villagers to actively participate in water development programmes and to impart knowledge on health and sanitation.

Researcher: A. S. Kauzeni

Area: Pilot project involving 5 villages in Rukwa Region

Funding: NORAD

Research institutions: Institute for Resource Assessment, in cooperation with
Community Development Department, Ministry of Health
Adult Education Section of the Ministry of Education
Norconsult
UWT

Forthcoming papers: 1 report on community participation
1 report on health and sanitation

Duration: until end of 1983

2. Domestic water supplies: a vital component in Tanzania's rural development. A consumer-orientated study of selected water schemes in four regions.

Aim: To investigate aspects relevant to the development of domestic water supplies in rural areas through studies of existing schemes. An attempt is made to obtain the kind of precise information necessary for understanding the impact of supply (or non-supply) at the village level, in order to be able to determine what factors contribute to the success or failure of improved water schemes.

Researchers: I. Andersson and C. Hannan-Andersson

Area: Kilimanjaro, Shinyanga, Singida and Mwanza Regions

Funding: SAREC

Research institutions: Institute for Resource Assessment, in cooperation with
Department of Social and Economic Geography, University
of Lund, Sweden.

Forthcoming papers: Women, water and development in a Pare Village, Tanzania
(C. Hannan-Andersson)

A map-study of water supply in Lembeni Ward
(I. Andersson)

Duration: until end of 1983

3. Health, sanitation and health education

Aim: To focus on the interrelationships between improved water supply, sanitation, and health education in any permanent improvement of the health situation. The impact of environmental health education programmes will be evaluated.

Researcher: B.S. Kapinga

Area: Iringa, Mbeya and Ruvuma Regions

Funding: DANIDA

Research Institutions: Institute for Resource Assessment, in cooperation with Centre for Development Research, Copenhagen.

Duration: until end of 1983

4. Modernization and improvement of traditional irrigation in Tanzania

Aim: To study the traditional small-scale irrigation which existed in many areas of Tanzania and to investigate the role an expanded, improved small scale irrigation technique could play in the development of agriculture in Tanzania's rural areas.

Researchers: I Andersson and J. Ngana

Area: Kilimanjaro and Coast regions

Research Institution: Institute for Resource Assessment

Duration: until March 1983

5. Problems of existing water supplies

Aim: To investigate whether the problems confronting schemes are technical, thus requiring technical solutions, or if they are of a non-technical nature and require other solutions than the ones currently considered.

Researcher: M. Mujwahuzi

Area: Iringa Region

Funding: DANIDA

Research Institutions: Institute for Resource Assessment, in cooperation with Centre for Development Research, Copenhagen

Duration: until December 1982

6. Problems of involvement of local communities in water supply implementation

Aim: Continued monitoring and analysis of the processes of initiation and organization of village participation in planning, construction, operation and maintenance.

Researcher: M. Mujwahuzi

Area: Iringa, Mbeya and Ruvuma regions

Funding: DANIDA

Research institutions: Institute for Resource Assessment, in cooperation with Centre for Development Research, Copenhagen

Duration: until March 1983

7. Project for the development of a community participation component in the Tanzanian rural water supply programme

Aim: a) To analyze all aspects of the existing water and hygiene situation in the village in order to identify improvement desired by the villagers.
 b) To plan, implement and evaluate specific activities for such improvements with a representative village group.
 c) To learn from the preceding and on-going experiences in what ways the introduction of a technical water project can be linked to the development of the community in a wider sense.

Researchers: Alister White, C. van Wijk-Sijbesma and M. Kirimbai.

Area: Shinyanga and Morogoro regions

Funding: ~~WHO/IRC~~ DGIS. ← connection with sent 11/2/84

Research institutions: WHO/IRC and Prime Minister's Office

8. Wells and handpumps: the Shinyanga experience

Aim: To study the development of the shallow wells programme in Shinyanga region and to attempt to identify the main problems faced in using this technology type.

Researcher: I. Andersson

Area: Shinyanga region

Research institution: Institute for Resource Assessment

Forthcoming publications: Wells and handpumps - experience of low-cost technology in Shinyanga region. (a report)

Wells and handpumps - the Shinyanga experience
 (A seminar paper)

9. Water and other basic needs in the present labour economy

Aim: To study the organization and division of labour within peasant households, including the allocation of the labour time of household members to different tasks at different times of the year and satisfying different needs, in order to assess the time use for so-called productive activities (crop production, etc) compared with other basic needs, such as water, firewood, housing, etc and with social obligations and leisure and their possible substitutability. Alternative external interventions to support improved time use will also be studied and evaluated.

Researcher: J. Boesen

Area: Iringa, Mbeya and Ruvuma regions

Funding: DANIDA

Research institutions: Institute for Resource Assessment, in cooperation with Centre for Research Development, Copenhagen

Duration: until the end of 1983

10. Water Master Plans as planning tools

Aim: Attempts to answer the question: Are the Water Master Plans appropriate tools for planning the development of the Tanzanian rural water sector. The project will investigate the organization of the planning process, people's participation in the plan content and the problems arising from the one-sector scope of a Water Master Plan as compared to multi-sector (integrated) planning.

Researchers: O. Therkildsen and M. Mujwahuzi

Area: Iringa, Mbeya and Ruvuma regions

Funding: DANIDA

Research institutions: Institute for Resource Assessment, in cooperation with Centre for Development Research, Copenhagen

Duration: until end of 1983

11. Women's participation in water supply projects

Aim: To analyze the sex-difference in participation in view of identifying obstacles preventing women from equal participation with men in water projects and ways in which they might be removed. The impact of increased female participation on the service level as well as the reliability of rural water supplies will be studied.

Researcher: K. Laubjerg

Area: Iringa, Mbeya and Ruvuma Regions

Funding: DANIDA

Research institutions: Institute for Resource Assessment, in cooperation with Centre for Development Research, Copenhagen

Duration: until end of 1983

APPENDIX 3Abbreviations used in the bibliography

ADAB	Australian Development Assistance Bureau
BRALUP	Bureau of Resource Assessment and Land Use Planning
CARE	Cooperative for American Relief Everywhere
DANIDA	Danish International Development Agency
ERB	Economic Research Bureau
IBRD	International Bank for Reconstruction and Development
IHP	International Hydrological Programme
IRA	Institute for Resource Assessment
IRC	International Reference Centre for Community Water Supply and Sanitation
IWRA	International Water Resources Association
JCHP	Joint Committee on Health Policy
NORAD	Norwegian Agency for International Development
OECD	Organization for Economic Cooperation and Development
RWS	Rural Water Supply
SIDA	Swedish International Development Authority
SWECO	Swedish Engineering Company
TISCO	Tanzanian Industrial Studies and Consulting Organization