

REHYDRATING THE EARTH IN ARID AND SEMI - ARID LANDS (REAL)

Work Package 2 (UoN) Report for the year 2003

**DELIVERABLE D4B 2
WATER SOURCE MANAGEMENT AND USE**

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PROJECT BACKGROUND

Introduction

Soil and water conservation is a high priority in Sub-Saharan Africa, especially in the drier areas. Storage of water from the rainy season to the dry season or even from wet years to dry years is highly important. Surface reservoir storage has drawbacks, such as high evaporation rates, contamination danger and taking valuable land out of production. Using the sub-surface to store water is another option. Through the application of ground water dams, which obstruct the flow of groundwater and store water below the ground surface, existing aquifers can be replete or new, shallow aquifers can be created. Many projects and policies have been implemented to improve the condition of land and water in the areas, but much failed because they did not recognise the location specificity of conservation problems and solutions in Sub-Saharan Africa and in applicability of imported methods without adaptation. In response to this failure, approaches that do try to take into account local conditions (material and immaterial) have come to the front, but in general these approaches have been limited to the level of individual farms (focusing on cultivation), using communities as medium for exchange or theoretical level, giving ample debates on how to do it without actual results in the field.

The general objective of the REAL project is to:

Clarify the relations between local practices and theoretical approaches, by focusing on the design, management and performance of small groundwater retaining structures on a communal level in semi-arid regions in the two African countries, Kenya and Tanzania, linking both the individuals and community as well as theory and practice, resulting in guidelines for participatory design of small water retaining structures in semi-arid regions worldwide.

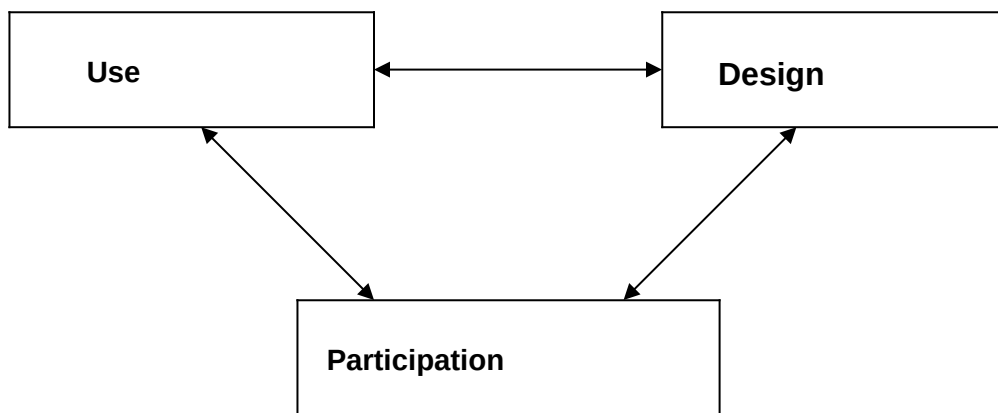
The project will investigate the different parameters of success of the Kenyan systems, with respect to technological possibilities sustained by social, economic, organizational and managerial factors of the communities and local government. The outcome is tested parallel in other Kenyan and Tanzanian areas. Results in all areas will lead to the production of a manual for design, operation and maintenance of small water retaining structures, with focus on local management and community participation. Attention points for spin off and diffusion, applicable to semi-arid areas to stimulate implementation on wider scale.

Specific Scientific and Technological objectives

- (1) Clarification and further implementation of the participatory design, construction and management approach for small water retaining structures in research areas;
- (2) Clarification of the performance of small water retaining structures including aspects concerning hydraulics, hydrology, water use and health;

- (3) Development of a system perspective on design, management and performance of small water retaining structures in semi-arid areas;
- (4) Development of participatory design approach applicable in other regions for comparable small water structures;
- (5) Education and training of staff, students and local communities through exchanges in workshops, field visits, formal education and networks;
- (6) Dissemination of the project results through a manual (Scientific Book) a number of Scientific papers and conference proceedings.

The set-up of the REAL project is concentrated on the interrelationship between water use (including non-human use) design of structures and community participation as depicted below



The project is executed through four work packages, each focusing on a particular aspect of the above triangle.

- Work package 1 integrates the findings and develops the methodology;
- Work package 2 focuses on water and participation; and its consequences for design. It provides for work WP2 and 4
- Work package 3 focuses on the effects of dams and ways to consider that in new designs. It provides input for WP4.
- Work package 4 provides the test case in which all aspects mentioned are taken into account.

Work package II is using a participatory research design on water use and quality evaluation and management. The project used a case study approach in three communities that represent the various conditions in the area. (Testing of water quality at various points from source to cup and in a sufficiently large sample to warrant conclusions.) The assessment of management and water use patterns was done through a participatory study. Gender issues are considered as central variables to the study. Existing categories of user groups were selected to participate in the research.

Specific Goals; Work Package2

- 1) To assess the quality of the water at all points from source to cup.
- 2) To investigate the water handling and source management practices for domestic and agricultural use and relate these to the water quality conditions found through testing
- 3) To determine any improvements achieved in comparison with previous conditions of management and use.

OBJECTIVES OF THE STUDY

The general objective of the study was to generate information leading to enhanced knowledge of the water sources and their management with a view to draw conclusions on progress achieved in the construction of sand dams and identify possible areas for further development. The specific objective for deliverable D4b 2 was to;

- Evaluate the management and use of the existing sand dams

In accomplishing this task, the following pertinent aspects have been considered:

- Management of the dams
- Safe use of the water
- Experiences of women, men, poor, rich and in-between, with respect to quantity, reliability, accessibility and control *of water source*.
- The economic purposes for which the water gains are used.

METHODOLOGY

METHODOLOGY FOR PARTICIPATORY ASSESSMENT (MPA)

This study utilized the MPA methodology (Methodology for Participatory Assessment). This methodology was considered necessary since the construction of a sand dam lends itself to participatory methodologies. These are methodologies that are less extractive and promote exchange of information between the researchers and the researched.

The MPA is a methodology to help communities, sector institutions and policy makers achieve more sustainable and equitable services. This methodology employs a scoring system to quantify data from participatory assessments. It is a methodology that is demand, gender and poverty sensitive and thus indicators for these aspects are developed together with a sequence of participatory tools to assess these indicators.

Some of the essential quality aspects of the MPA include

- The involvement of all stake holders
- Mainstreaming of gender, poverty and demand
- Self scoring system
- Visualization of the outcomes of the assessment
- Self analysis and room for action planning for improvement

- Triangulation of the data collected, between the different community members and between the implementing agencies and the community members
- Generation of both quantitative and qualitative information that is useful for all stakeholders.

SITE DESCRIPTION

The study was based in the (old) central division of Kitui district, of the Eastern province of Kenya. The district borders machakos and makueni to the west, mwingi district to the north, tana river to the east and taita taveta to the south. It covers an area of approximately 20555.74 km² including 6369.1 km² occupied by the uninhabited tsavo national park.

The study area is located in the central part of the district, herein referred to as Kitui central division. Kitui central encompasses the following locations: kyangwithya west, Kyangwithya east, Maliku, Town ship, Mulango, Katulani, Miambani and Itoleka, which have a total population of 123,742 (CBS,2000). The population density of kitui central is 153 persons per square kilometer.

Kitui central is classified as a medium agro ecological zone. The average annual rainfall is 760-1015 mm. It should be noted that such figures mean very little as there are wide fluctuations from year to year. This division experiences two main seasons; the long rains in April to may and the short rains from November to December. The dry periods are from june to October and January to march. It is common for rains to fail in one or both seasons leading to prolonged periods of drought and food shortage. Local lore states that rains fail completely at least one year in four (SASOL and maji na ufanisi, 1999).

Water, being the major development input remains the essential commodity in the entire area, thus water searching has become a significant preoccupation of every one since there are few natural water resources. Available sources dry up during prolonged drought thereby causing a lot of suffering to both human and livestock and creating stress on the environment.

The lack of water is thus a persistent problem. The climate is hot and dry for most parts of the year and is characterized by high rates of evaporation. A combination of high evaporation rates and unreliable rainfall limits intensive and meaningful land use and other related development activities.

SASOL, the development agency in the area, has constructed over 300 sand dams in the area in a bid to solve the water problem and as a response to the impact of drought in the area.

SAMPLING

In a number of REAL meetings, three communities had been selected for study in year 1 of the project. These are Tungutu , Ithumula/ Maluma, and Nzangathi. These areas are basically sub locations. The three communities and dam committees were studied.

In each of these three sub locations, 11 sand dam committees were selected for the study. This selection was guided by the topographical maps of SASOL showing the location of sand dams. In each catchment 11 sand dams were selected for observation. A total of 36 sand dam committees were covered.

For the indepth studies, local definition of a community was followed to curve out a *community* for study. Since SASOL employs the catchment approach, the definition of a community included aspects such as; sharing a common water source(s), have common community problems and engage in social activities together. Such activities include; common welfare associations, funerals, marriages and live in one catchment or one small geographical locality. In brief, the locals take a community to be a social entity that cannot be limited by administrative and political boundaries. The communities chosen for the indepth studies are Ithookwe/Mathunzini in Tungutu sub location, Mbiuni in Ithumula maluma sub locaton, and Mumbuni –Ngomango in Nzangathi sub location.

DATA COLLECTION PROCESS

The data collection period was 2 months, May and June, 2003. This was conducted by four researchers from the University of Nairobi. The researchers were paired into two, male and female. Such pairing was seen as necessary to ease communication with the sand dam committee members, who are both male and female. These teams worked under close supervision by the supervisor and the senior researcher.

The teams visited the sand dam committee members on site and initiated discussions with them. These discussions were guided by the scoring sheets and not necessarily limited to them. Additional qualitative information was also collected and recorded in note books. To facilitate exchange of information and guard against extraction, the researchers also educated the committees on certain salient aspects related to use of sand dams. This was also the case during the community workshops. Specifically, during the sand dam visits, one researcher acted as a moderator while the other was the scorer. Home visits were made to homes in each of the selected catchments to make observations on water handling and invite people for the workshop. During the community workshops, the four researchers worked as a team switching roles as necessitated by the situation. Each workshop took three days.

DATA PRESENTATION AND ANALYSIS

After data collection, information gathered was subjected to clerical editing to ensure that each and every aspect was correctly scored. Much of this clerical editing was done in the field while the information was still fresh in the researcher's mind.

The second stage involved preparation of a code book, coding of scoring sheets (*questionnaires*), and data entry. The data was analyzed using the statistical package for social scientists (SPSS-pc). This package produced descriptive statistics that were used in the presentation and analysis of the information. The quantitative information gathered was highly complemented with qualitative information.

BACKGROUND INFORMATION ABOUT SAND DAMS

The term sand dam refers to an impermeable masonry barrier across an ephemeral river. The upper side may be hidden by sand but the lower side is usually exposed either due to excavation by water when the river is flowing or by design. Sand dams are not new in Kitui district since the earliest dams were constructed during the colonial period in 1920s. Others were constructed in 1950s and several are still in existence. Construction of sand dams lends itself to participatory methodologies, where communities actively participate and contribute towards the construction. The decision to construct a sand dam in a particular site is in itself a process.

The initial phase of the process is a public meeting (*baraza*) where the community is sensitized and enlightened on the potential of sand dams in alleviating their water problems. It is during these meetings that the community is educated on the functioning of sand dams, the location (citing) and construction requirements. The project agency leaves the community to deliberate on whether or not to implement the idea. Upon acceptance, the community together with the agency's technical personnel is involved in survey and site identification. The community is requested to form a site committee. Sometimes two or more sites are under one committee. Afterwards, the community is mobilized to clear the sites, collect locally available construction materials e.g sand and stones. The actual construction follows starting with digging of the trench, laying of the rocks with the help of a trained artisan from the project agency. The community does the work of fetching water and mixing of mortar (sand and cement). They also contribute money towards purchase of foodstuffs and accommodation for the artisan. During this phase, the community contributes and prepares its own food at the site.

MANAGEMENT STRUCTURES

Before embarking on the actual construction, a sand dam committee is formed to oversee the construction process. A sand dam committee has 13 members drawn from the two gender, different educational status, religious backgrounds, political parties and socio-economic statuses. Such aspects are considered pertinent in ensuring that the interests of the various social groups in the community are represented. Gender representation in the committee is influenced by the ratio of men and women participating in the construction. In cases where women are more, the committee has more women and vice versa. For

example, in Syokaluvyu B *sand dam* in Tungutu, the committee had 9 women and only 2 men while in Kyakuthu *sand dam* in Kamale, the committee had 12 men and 1 woman. Through qualitative data, it was established that in syokaluvyu, majority of the men had migrated to towns during the construction period in search of jobs. However, in kyakuthu, women were mostly busy in the farms and men preferred to work in the sand dams.

Research findings show that there was minimal gender disparity in the committees. Thus women and men participated almost equally in overseeing the construction process and thereafter the management of the dams (Table 1).

Table 1: Distribution of respondents by gender in committees

No of persons in committee	Men	Women
None	0(0%)	2(5.6%)
1-----5	12(33.3%)	12(33.3%)
6-----10	22(61.1%)	20(55.5%)
Above 10	2(5.6%)	2(5.6%)
Total	36(100%)	36(100%)

NB: The figures are not mutually exclusive

Table 1 above shows that there is gender equity in the dam committees. To be sure, in 33.3% of the cases, the number of men in the committees equaled that of women (1—5 persons). Similarly, in an equal percentage (5.6%), the number of women and men in the committees were above 10. This scenario of gender equity in management is out-rightly exceptional when reflected from the mirror of African traditions where men always want to dominate leadership. However, such domination is not absolute since women also are involved but in lesser numbers. The presence of women in the committees is a sure reflection of the uniqueness of the Akamba community with respect to the rest of Africa. Among the Akamba there were strong women leaders whose authority was absolutely recognized by both men and women.

Nevertheless, male domination in the committees is reflected in 61.1% of the cases (with more men than women) while only 55.5% the committees were dominated by women. However, the percentage difference (of 5.6%) between the two cases is negligible. In addition, male domination is also reflected in two cases (5.6%) where all committee members were male.

On the contrary, a case was also encountered where the committee was dominated by women in both numbers and influence. It was established that in cases where dam membership was dominated by one gender, that gender also dominated the committee. This was the case in Syokaluvyu dam where the committee has only two men and in Kwa Makuthu dam where the committee had only one female. Generally, 52.8% of the males reported that committees were balanced while 50 % of the females reported the presence of gender balance in the committees (responses are not mutually exclusive). An equal number of men and women (16.7%) reported cases where there were more women than

men while a much smaller percentage of both sexes(2.8%) reported cases where committees had more men than women. At project implementation level, the issue of gender equity is well taken care of to avoid potential conflicts and eventual collapse of the project.

SOCIO ECONOMIC STATUS OF COMMITTEE MEMBERS

Regarding the socio economic status of the committee members, it was found out that in most of the committees (52.8%), the upper class is not represented, while in 25% of the cases, the lower class is not represented. In the fewer cases (36.1%) the rich are represented by one to three persons. The middle class dominates a larger majority of the committees (94.4%) than any other class. Indeed the middle class has the lowest cases of non representation (5.6%) than any other social class (Table 2).

Table 2: Distribution of committees by class representation

Representation	Upper class		Middle class		Lower class	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
None	19	52.8	2	5.6	9	25.0
1---3	13	36.1	8	22.2	8	22.2
4---6	3	8.3	12	33.3	4	11.1
7---9	-	-	4	11.1	10	27.8
10---12	1	2.8	10	27.8	5	13.9
Total	36	100	36	100	36	100

Majority of the dam committee members were from the middle class. This can be explained by the fact that majority of the community members belong to the middle class. Suffice it to note that the communities studied said that it was unethical to refer to anybody as poor. This was seen as demeaning people. The poor were defined as those who are disabled, aged and young children. This is the category of the people who have to depend on others for their survival. Thus majority of the respondents preferred to be referred as middle class people while at the same time referring to others as middle class.

Likewise, nobody likes to be classified as rich. This is because security of ones property takes first priority. If word spreads in the community that one is rich, this may attract thieves from other places thereby creating a sense of insecurity in that person's life. To get these classifications, a person was being sent out of the workshop in order to be classified in absentia. Those who did not move out of the workshop were requested to be quiet as the rest deliberated on their social class. It should be noted that, the socio economic classes referred to in this study are based on the local indicators. Thus a rich person in that community may be poor or in middle class in another community. It was also found out that the poor in some communities were given permission to go and look for casual work particularly if the dams were being constructed during famine. This was reported in Tungutu and Ithumula/Maluma Sub-locations.

In these communities, the poor are not trusted with some leadership positions as evidenced by both qualitative and quantitative data. A sensitive position of leadership like that of the treasurer is rarely entrusted with the poor. Out of the thirty six committees, only 8 treasurers were regarded as poor. The respondents asserted that the position of the treasurer cannot be entrusted with a poor person because they will have nothing to confiscate in case of misappropriation of funds. It was also established that majority of the poor shy away from leadership even when the middle and upper class people are willing to trust them with leadership. The poor have very little confidence in themselves.

Gender disparities were also noted in committee representation. Research findings show that majority of the dam committees (86.1%) had a male chairperson. However, the position of the vice chair person was almost equally shared between the sexes with women occupying 50% of the positions while men occupied 47.2%. In one sand dam committee (2.8%), the position of vice chairperson was missing. The position of the secretary was dominated by males (55.6%) while females dominated the vice secretary slot (47.2%). Some five dams (14%) did not provide for the position of a vice secretary. Strikingly, the position of the treasurer was mostly held by females (63.9%) with men occupying only 33.3% of the positions (one sand dam [2.8%] had no position of treasurer). The position of the treasurer has no assistant. This implies that women are more trusted in financial management especially in public utilities. Five sand dams had the position of a care-taker, which was dominated by men (11.1%) while women accounted for only 2.8% of the same position. In 38.9% of the dams, village elders were members of the committee. Suffice it to note that, these village elders were all males. Indeed there was no female village elder in the sand dam areas visited for this study. Three dams had a male advisor while only one dam had a female advisor (table 3).

Table 3: Distribution of committee leadership positions by gender

Committee position	Gender of position holder					
	Male		Female		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Chair person	31	86.1	5	13.9	36	100.0
Vice-chair person	17	47.2	18	50.0	35	97.2
Secretary	20	55.6	16	44.4	36	100.0
Vice-secretary	14	38.8	17	47.2	31	86.0
Treasurer	12	33.3	23	63.9	35	97.2
Caretaker	4	11.1	1	2.8	5	13.9
Village elder	14	38.8	-	-	14	38.8
Advisor	3	8.3	1	2.8	4	11.1

Evidently, there is a fair gender representation in the sand dam management committees. Nevertheless, men seem to be slightly more than women in the leadership positions of these committees except for the chairmanship position which seems to a domain of men. However, given that women are more trusted with monetary issues, they have an upper hand in controlling financial contributions and appropriation as treasurers (63.9%).

During the research, it was observed that almost all committees of dams in the filling stage are dormant. They only meet when there are pressing issues to address. In 27(75.6%) there were no changes in the committees while it is in only 9 (25%) committees where there were changes. Such changes arose in cases where some committee members passed away or migrated to other places. As such, there were no efforts made in any of the sand dams in the filling stage to overhaul the management. These committees were formed to oversee the construction process. Arguably, they are dormant for they perceive that they had finished their work. There is an urgent need to review the management of dams in the filling stage.

Monitoring system and control

Most of the committee members participated actively in monitoring, control and decision making during the construction phase. In some committees, women were particularly crucial in ensuring that members contributed the necessary dues. They were instrumental in following defaulters to recover the unpaid debts through Kithendu [taking defaulters' property for sale without his consent]. Research findings reflect the presence of frequent and effective committee meetings where most of the members attend and participate. Table 4 below has the details.

Table 4: Distribution of respondents by reported nature of committee meetings

Nature of committee meeting	Men	Women
never held	0(0%)	0 (0%)
Held occasionally for namesake, not effective in decision making	0(0%)	0 (0%)
Held regularly, effective, key members attend & participate, can be better	5(13.9%)	3 (8.3%)
Held frequently, most attend & participate, effective decision making, Can be better.	13(36.1%)	13(36.1%)
Held frequently, all attend and participate, effective decision making	18(50.0%)	17(47.2%)
Missing cases	-	3(8.3%)
Total	36(100%)	36(100%)

The results of table 4 are largely applicable if interpreted as pertaining to the construction phase. The results depict a perfect performance by the committees during this phase. As such, men reported that in 50% of the sand dams, committees held frequent meetings where all members attended and participated in deliberations. In such cases, there was effective decision making. The lower percentage of women reporting the same scenario (47.2%) is explained by the absence of women in three sand dam visits. A near perfect situation is reported in 36.1% of the sand dams by both men and women. Cases that needed urgent improvements in the management structures accounted for only 13.9% and 8.3% as reported by men and women, respectively.

Evidently, there were effective and efficient management structures during the construction phase of the sand dams. The imminent challenge as found out is that majority of these committees have become less effective after the completion of the

project. This has been as a result of a lapse in translating the construction management structures to suit the post construction period. This lapse has been aggravated by the fact that the dams need minimum maintenance and committees may not need to meet without an issue to be addressed. An urgent solution is needed.

FINANCIAL CONTRIBUTIONS AND MANAGEMENT

Study findings reveal that monetary contributions were made only during construction period. The daily contributions ranged between Ksh.5-10. In other instances people made periodical contributions of about Ksh 40 per week. All contributions were aimed at meeting food and accommodation costs for the artisan and daily food requirements for the participating community members. The secretary of the committee was charged with the responsibility of collecting the money and handing it over to the treasurer for safe keeping. Accounting for the expenditure was done by the committee. Such accounting was tabled to all participating community members at the end of the week.

Regarding the cost of dam construction, community members reported that such cost was shared between the project agency and them. Thus, according to men, this was the case in 100% of the sand dams. The responses of women (91.7%), however, exhibit a slight deviation from those of men and this is attributed to absence of women in three cases (Table 5).

Table 5: Contribution for dam construction

Nature of contribution	Men		Women	
	Frequency	Percent	Frequency	Percent
Cost sharing (agency and community)	36	100.0	33	91.7
Missing cases	-	-	3	8.3
Total	36	100.0	36	100.0

Even though the daily contributions were minimal, some members defaulted. In some cases where community members defaulted, the committee had a well set mechanism to recover the debts. Some used *kithendu* while others set stringent fines to deter people from defaulting in future. In rare occasions, repetitive defaulters were expelled. Such expulsions were put in place as deterrent measures to would be defaulters.

After completion of the construction exercise, monetary contributions ceased. This is because no immediate repairs were required on the sand dam. And since all sand dams in the filling stage had no operational off take wells (with a water lifting device), there was no immediate need for operation and maintenance contributions. It was established that in majority of the off take-wells, people used the bucket and rope as the water lifting device. It was observed that no rope and bucket were left permanently in the wells. This is due to the fact that if such a device was left at the well, children would interfere with the water or steal the bucket. In addition it would be difficult to replace the rope and bucket often. Thus, each individual household has its own water lifting device (rope and bucket) which they carry home after drawing water. This has far reaching implications on hygiene.

RULES AND REGULATIONS REGARDING WATER USE

In most projects undertaken by development partners in the rural areas, the community normally selects a committee to oversee the implementation process on behalf of the community. These committees are supposed to lead the community. Involving the community in the management and the implementation process creates a sense of ownership of the project by the community. This has a bearing on the sustainability of the project. The committees set rules that are expected to be followed by all members. The rules are also aimed at according each member equal access to the project benefits.

In sand dam construction, SASOL guides the community in formulation of the by-laws governing the participation and management of the sand dams. The by-laws cover hygiene, sanitation, and conservation of the environment around the sand dam. Those who break the set rules are supposed to be punished as per the rule set thereof.

The sand dam committees guide the members in formulation of rules and regulations, which govern the members during the construction and post construction phase. Records are kept of those who attend and disciplinary action is exercised by fining community members who fail to adhere to the rules.

In almost all the sand dams studied (97.2%), rules were set to guide the community during the construction and use of the facility after completion. Only one sand dam was found to have had no formal rules at all. It was said that construction of that dam ended at the on set of the rains and people became busy in their farms and left the sand dam issues unfinished. However, most rules covered the construction phase and were rendered irrelevant after the completion of the dam. Table 6 gives details about setting and level of adherence to the rules.

Table 6: Rules Governing the Management of Dams during construction phase

Rules status	Men	Women
No Rules	1(2.8%)	1 (2.8%)
Rules Established but not followed	6 (16.7%)	5 (13.9%)
Rules Established but only few are followed	12 (33.3%)	10 (27.8)
Rules Established, followed by most	4 (11.1%)	4 (11.1%)
Rules Established and all followed	13 (36.1%)	13 (36.1%)
Missing cases	-	3(8.3%)
Total	36 (100.0%)	36 (100.0%)

Table 6 shows that in more than a third (36.1%) of the dams there was perfect adherence to the established rules as reported by both men and women. A near perfect situation was reported in 11.1% of the dams. Disparities occurred in the responses of both men and women regarding non-adherence to rules. Thus, men reported that only few established rules were followed in 33.3% of the sand dams while women put the figure at 27.8%.

Further, men reported that in 16.7% of the sand dams, rules were not followed, while women reported that the case was so in only 13.9% of the dams.

It is clear that during construction, there was a fair trend in the adherence of rules. Cases of non-adherence were checked by imposition of fines and confiscation of the defaulters' property through *kithendu*. This presents a quite ordinary situation that is expected when people of different backgrounds and lifestyles come together to solve a common problem.

It was established that majority of the sand dam committees are less active. This makes the implementation of the by-laws governing the use of the sand dams difficult. In some instances such as at *Kwa Musyimi* sand dam in Tungutu Sub-location, those who never participated in the construction of the dam use the water without any deterrence. This is a classic case of where rules are not followed. Nevertheless, there are other instances where rules are strictly adhered to. For example, at *Syokaluvyu* sand dam, almost all dam members turned up to meet the research team when only the committee was invited. This is a demonstration of sense of ownership and responsibility to common property.

TRAINING FOR WATER SOURCE MANAGEMENT

SASOL has a policy of training community members who actively participate in the construction of sand dams. This training is done at three levels. Through participatory rural appraisal (PRA) method the community members identify the problems facing them, analyze, prioritize and come up with possible solutions. They identify the resources which are required for solving various problems listing the locally available materials and what is required from external sources. This activity is undertaken during a community *baraza* which is attended by all community members.

During the construction phase, community members are trained on community leadership and organization after which they are required to form site committees. During the study it was established that the community was trained on natural resource management around the water points, community leadership, and sand dam maintenance in 19.4 % of the sites set for the study (table 7).

Table 7: Distribution of respondents by type of training received

Type of training	Frequency	Percentage (%)
None	20	55.6
Natural resource management	2	5.6
Community leadership	3	8.3
Sand dam maintenance	2	5.6
Natural resource management/ Community leadership Sand dam maintenance.	7	19.4
Other(food security, horticulture)	2	5.6
Total	36	100%

Table 7 shows that in 44.4% of the sand dams, there was an aspect of training. In 36.1% of the cases, the training was conducted by the project agency alone while in 8.3 % of the

cases, training was done by different development partners either individually or in partnership. Such development partners included the project agency, ministries of Health, Agriculture, and Livestock development. The higher percentage of cases where there was no training is explained by various reasons. First, majority of the dams (47.2%) were constructed in the year 2000 to 2001 especially in kamale and Tungutu areas concurrently. This strained the human resource base of the agency leaving a skeleton staff to conduct trainings. Secondly, the time schedule for dam construction was so squeezed that not many people could be released from the construction work to attend training. Lastly, the response to this question needs to be treated with caution since the people's perception of training was where they had been called in a seminar or workshop setting. Thus in cases where training was done in barazas, such was not construed as training. This explains why a large majority of respondents reported cases of not having been trained. It was established from the project management that all barazas held during the construction process, are laden with training aspects.

When the process of construction is on, SASOL organizes for a community training seminar whereby each sand dam community is required to send a given number of representatives to the seminar. The members are drawn at the level of sub-location because it brings people from the same locality who shares common interests and problems. The seminar covers community leadership and organization, natural resource management and hygiene and sanitation. The trainees are supposed to share the imparted knowledge with other members of the community. The training carried out in the project area covered hygiene, sanitation, food management, natural resource management and project management and leadership.

Information on training is passed on to the community either through the local leaders, administration, or sand dam committees. In other instances, the project staff play a key role in passing this information. Research findings show that according to both gender (47.2%), a general announcement was made and there was repeated special efforts to inform the poor. Thus everyone in the community was aware of the training. Women reported that in 41.7% of the cases, all people were given equal chance to register for training, and there were special provisions for the poor and women to attend. This assertion was echoed by men in 44.4% of the cases who asserted that all were given an equal chance to opt for training (table 8 and 9).

Table 8: Responses of men and women regarding information on training

Information on training	Men		Women	
	Frequency	Percent	Frequency	Percent
No training	15	41.7	14	38.9
Only key people knew about training	4	11.1	5	13.9
General announcement made and all knew	17	47.2	17	47.2
Total	36	100.0	36	100.0

Table 9: Responses of men and women regarding opting for training

Option for training	Women		Men	
	Frequency	Percent	Frequency	Percent
No training opportunities	18	50.0	15	41.7
Training opportunities captured by elites	2	5.6	2	5.6
All got equal chance but no information to allow poor and women	1	2.8	2	5.6
Sufficient information but not easy for poor and women	-	-	1	2.8
Equal chances to all, special provisions for the poor	15	41.7	16	44.4
Total	36	100.0	36	100.0

When the sand dam construction is over, all community members are trained on environmental protection in the areas near the sand dams and their farms and in the farms. They are also advised on the suitable plants for protection of the wall and the river banks. These include; nappier grass, reeds and sugarcane. The importance of conserving the trees along the river banks is also stressed. Members are also trained on maintenance of cleanliness in the sand dam area. They are encouraged, for example to have different scoop holes for different uses, not to water livestock on the upper side of the dam, and not to bathe in the dam. Community members are trained on the importance of soil conservation on the farms through terracing and planting of cover crops. The training also covers planting of fruit trees and other species for wood and construction purposes. Food budgeting is also a constituent part of the training.

During the research, it was established that in majority of the cases (25%) the number of women trainees ranged between one and five people while in 30.6% of the cases male trainees ranged between one and five. Generally the total number of trainees in majority of the dams ranged between one and five. In 13.9 % of the cases, members of the upper class were trained on community management; leadership and organization, while in 39% of the cases members of the middle class were trained. On these aspects, the poor were trained in 22.2% of the sand dams (table 10).

Table 10: Number of trainees by class

No of trainees	Upper class		Middle class		lower class	
	Frequency	percent	Frequency	Percent	Frequency	Percent
None	14	38.9	5	13.9	11	30.6
1---5	4	11.1	9	25.0	4	11.1
6---10	1	2.8	1	2.8	-	-
11---15	-	-	2	5.6	3	8.3
16---20	-	-	1	2.8	-	-
31---35	-	-	1	2.8	-	-
Above 51	-	-	-	-	1	2.8
Missing cases	17	47.2	17	47.2	17	47.2
Total	36	100.0	36	100.0	36	100.0

There was a significant imbalance in terms of gender in the training. For instance, in management and leadership, it was reported that in 66.6% of cases where training took place, there was unequal gender balance. Similarly, in 60% of the cases trained in health and hygiene, there was no gender balance. In training for management and leadership, gender balance was reported in only 20% of the cases while in health and hygiene, gender balance was reported in 33.3 % of the cases trained. Training in natural resource management took place in 16.7 % of the total sample. Of these, there was no gender balance in 66.5 % of the cases.

The foregoing discussion shows that women participated more in the training sessions than men. Further, the middle class dominated the training in terms of numbers. The explanation for the higher number of women in training is that, they are the majority in the rural areas since most men have migrated to urban areas in search of employment. In development literature, the middle class have been singled out as movers of development in rural areas. The findings of this study are in agreement with this assertion. It should be noted that of those trained (41.7%) all classes were trained in 40.4% according to women and in 46.5 % according to men. Thus there is a fairly moderate social equity in training received. Since those trained act as trainers of communities, this implies that the information gained in training is fairly passed on to the entire community and this is geared towards effective water source management and use. This can be improved with ease. Table 11 presents information on the effective use of training received.

Table 11: Distribution of respondents by effectiveness in use of training

Use of training	Women	men
Training received not being used	5.0%	4.6%
Training used by few but some are good at it	30.0%	31.8%
Training used by most and most are good at it.	25.0%	27.3%
Training is being used by all and well	40.0%	36.3%
Total	100%	100%

In agreement with the earlier discussion, table 11 shows that in majority of the cases (40% as reported by women and 36.3% as reported by men), training received is being used by all and well. Training is being used in 95% of the cases as reported by women and in 95.4 % as reported by men. The percentage failure of use of training received is meagre and can easily be dealt with. In any case, it is fallacious to expect perfect adherence to information pertaining to development in an ordinary community and within a short span of time.

USE OF EXISTING SAND DAMS

The basic objective of SASOL is to provide water to communities in ASALS for domestic and production purposes. The planning objective was to provide water to a distance of less than two kilometers from home. Field data shows that sand dam water is used for domestic and agricultural purposes but in varying degree as shown in table 12 .

Table 12: Water use

Water use	Frequency	Percentage
Watering cattle	36	100.0
Washing clothes	35	97.2
Bathing	35	97.2
Construction	34	94.4
Brick making	33	91.7
Tree nurseries	28	77.8
Irrigation	24	66.7
Drinking	22	61.1
Beer brewing	21	58.3
Bee keeping	18	50.0
Fish breeding	16	44.4
Swimming	13	36.1

Table 12 shows that the sand dam water is mainly used for watering cattle (100.0%), washing clothes (97.2%), bathing (97.2%), construction (94.4%) and brick making (91.7%). These are uses that do not strictly require safe water. The relatively lower use of the sand dam water for drinking (61.1%) is explained by the fact that majority of the sand dams (55.6%) are in the filling stage and have stagnant water, which is only safe for other purposes other than drinking. Scoop-holes for human use are only in 55.6% of the sand dams. Further, most of the sand dams (86.1%) do not have operational off-take wells. In other instances some few people have alternative sources of drinking water which include water tanks and piped water (only in Tungutu). Several others have dug their own wells near the rejuvenated rivers. [Sinking of off-take wells is still going on].

It should be noted that the sand dam project has been able to meet the peoples' need for drinking water in 61.1% of the cases. Before then, this was the population that had severe shortage of safe drinking water. The fact that in 100% of the cases people used the sand dam water for their livestock is a sure pointer to the acuteness of the water problem that existed prior to the initiation of the project.

Notably, the water use patterns seem to have no direct relation with the management structure. This is in the sense that if people had easy access to drinking water prior to the initiation of the project, they are most likely to use the sand dam water for drinking even if there is no off take well. They scoop water from the sand and many may not bother to treat it. Thus, whether or not there is a management committee to ensure cleanliness of the water source, the people's past experiences are much more important in determining the uses of the sand dam water.

Reliability, and Quantity of the Sand Dam Water

Majority of the dams in Kitui (55.6%) are in the filing up stage. Mature dams constituted only 22.2% of the study sample. Some 13.9% of the dams had just been constructed. Mature dams with a water lifting device constituted a small percentage of 8.3%. This implies that reliability of the sand dam water is dependent on the purpose for which the water is needed. Thus, in majority of the cases, the dams provide adequate water for

livestock, construction, irrigation, and brick making. It was reported that 33.3% of the dams have stagnant water for 10 months in a year. Some 22.2% of the dams have water between 1—9 months in a year. This means that there is adequate water for the above purposes through out the year in a majority of the dams. In 63.9% of the cases, dams have water, either stagnant or in the sand for more than 10 month. In cases where there is no off-take well, people draw water from scoopholes on the sand. It is only in 13.9% of the cases where it was reported that dams have no water at all. These are the dams that were newly constructed and since their completion, there was no flow of water in the river channel. This also includes the one sand dam that had been washed away (itumba sand dam).

Quantity of water in the sand dam is said to be a function of the size of the reservoir. It has however been demonstrated that the quantity of water in a sand dam is much higher than the calculated volume of the reservoir. This is due mainly to lateral and vertical recharge. Community members reported that there is water in the off take wells even after the water in the sand has dried up. However, 63.6% of the women in mumbuni-ngomango community placed the quantity of water between 10 and 20 on a hundred unit scale on the rope. Men (42.9%) put the figure at 10. In Mbiuni community, 61.1% of the women and 62.5% of the men placed the quantity between 40 and 50. In Ithookwe/Mathunzini community, 72.4% of the women placed water quantity between 30 and 50 while 77.7% of the men placed it at 30 on the same scale.

The above discussion is reminiscent of the fact that water is always available in the sand dams/ off-take wells through out the year since only one person placed the quantity at zero.

Access to Water Sources

It was established that in the three communities, Mbiuni, Mumbuni/Ngomango and Ithookwe/Mathunzini, all the families access water from sources within two kilometers from their homes. Data shows that in the three communities, a mere 11.1% trek for two kilometers from their homes to the nearest water source. Majority (89.9%) of the people access water from sources within a distance of less than a kilometer. Indeed majority of the homes access water from a distance of ½ a kilometer from their homes. The longest distance from a water sources is 2 kilometer while the shortest distance was found to be 50 meters. This is a pointer to the fact that the project has achieved its goal of minimizing distances to water sources in addition to providing water for domestic use and production purposes. This is the way to catalyze development in ASALs.

CONCLUSION

Water source management needs to be construed as a process of building the capacity of the people to take care of their water sources and ensure their sustainable use. As such, it is pertinent that management structures are developed (through election of committee members by the community) in the initial phase of establishing a water source structure taking into account gender and socio economic disparities in the community. This ensures that those charged with the management responsibility understand the different

aspects of a well managed water source since they have participated in all stages of its development (initiation). In addition, as managers, they are also owners of the project and this boosts their morale in ensuring that the source is used well.

Nevertheless, a management structure can only be effective if the members are well trained on the various aspects of management of a water source. Thus training on natural resource management is vital for the members. For effective and efficient management, rules and regulations are paramount. Hence for a water source to be managed and utilized appropriately, sound rules and regulations need to be developed. These rules need to be adapted to the 'development stage' of the water source (in this case, the sand dam) since the uses of water seem to change as the sand dam progresses to maturity. This is a sure way of ensuring sustainable water source management and use.

Pertinently, it needs to be noted that the management of the water sources does not seem to have any influence on the patterns of water use. This is because the water use patterns in areas with active committees are nearly the same as those in areas with less active committees. The use of the water seems to be determined by the experiences of the community. Thus in areas where there are no alternative sources for drinking water, sand dam water is used for all purposes including drinking. However, where there is an alternative source of drinking water, the community is most likely to use the sand dam water for other purposes unless there is a well with a pump. This is in disregard of whether or not there is a water committee.

RECOMMENDATIONS

In view of the study findings the following recommendations have been made.

- There is need for the project agency to embark on a programme to strengthen the management structures of the sand dams.
- There is also need to assess the current capacity of the committees (in terms of management skills with a view to establish the existing capacity gaps and design strategies to fill these gaps for better management.
- There are a lot of sand dams that have no off take wells. In order to address the peoples need for safe drinking water there is need for efforts to build offtake wells. This will also increase the uses of water since people will have easy access to it. Currently many people are relying on the stagnant water or draw water from the scoop holes. This poses a challenge on the amount of water accessible to the community.
- In addition, there is need to increase the communities' capacity in utilizing the sand dam water to increase food production with a view to improve the community's nutrition levels. This needs to be done through organized trainings on agricultural production methods using irrigation.
- Training is also needed on income generating activities that would make enhanced use of the sand dam water. This will ensure improvement in the economic status of the community.