WATER CONSERVATION AND MANAGEMENT IN THE UPPER CATCHMENT OF LAKE BOGORIA BASIN

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ABSTRACT

Water is one of the basic human needs and should be managed sustainably. The Lake Bogoria Basin Water Resource Users Association (LBB-WRUA) manages water in the basin. The study involved the assessment of the current status of water conservation and management by the WRUA in the upper catchment of the LBB. A cross-sectional survey was used and data collected using a household survey questionnaire, focus group discussion (FGD), in-depth interviews and observation. The data was entered into a computer, analyzed using the Statistical Package for the Social Sciences (SPSS) computer software version 17 and results presented in form of frequency distribution tables, bar graphs, pie charts and measures of central tendency. Chi-square tests were carried out to obtain levels of association between different variables. The results revealed that 30% of the respondents collect and store irrigation water; There was a significant difference between education and home treatment of water ($\chi 2=21.862$;df-1; $p=0.005$ at $\alpha=0.05$); 73% of the respondents were using hose pipes for irrigation and only 16% of women were in leadership positions. The LBB-WRUA has succeeded in promoting catchment protection but should ensure that all water pans are standard and that upstream and downstream communities meet to discuss their common water resources.

Key words: water as basic human need, water management, water storage, water treatment, hose pipes, catchment protection

INTRODUCTION

According to WHO/UNICEF (2010), escalating population growth rates steeply raise demand for water abstraction beyond the supply capacity of the ecosystems. Water is one of the basic human needs and should be managed sustainably or else continued economic growth will not be feasible (Calder, 2005). Proper water conservation and management is the only remedy to water scarcity and water borne diseases in the upper catchment of the LBB. The objectives of WRUAs in Kenya are to conserve the water catchments, manage the resources, increase the availability of water resources and increase the usage of the water for economic and social improvements (WRMA, 2008). Water projects in the upper catchment of the LBB are managed by the LBB-WRUA and the water project committees in liaison with Water Resource Management Authority (WRMA), Rift Valley Catchment Area Regional Offices in Nakuru.

METHODOLOGY

The study area

The upper Lake Bogoria catchment basin covers an area of about 475km^2, occupying the Eastern wall of the Central part of Kenya's Great Rift Valley (WWF, 2009) (Figure,1). It comprises of Mbogo-ini and Subukia divisions. According to the Kenya National Bureau of Statistics, (2009), the population in this part

of the basin is estimated to be 72,910 people with 12,258 households. According to WRMA (2008), the major source of fresh water for upper LBB communities is Waseges River and its tributaries. The climate in the study area is arid and semi- arid except in the moist highlands around Subukia Division. The average annual precipitation is about 700mm per year (WRMA, 2008). Mountane forests are found around Subukia Division while the other areas comprises of grasslands, bush lands, shrubs, scrublands and woodlands (WWF, 2009). According to WWF (2009), the upper LBB has three major soil types; clay soils, clay loam and silt loam. The riverine soils are composed of eroded volcanic sediments and alluvial deposits. The main socio-economic activity is irrigated agriculture. In addition, communities in Mbogo-ini Division practice smaller range/sedentary livestock productions (WWF, 2009). Currently, the government through the Kenya Agricultural Productivity Programme (KAPP) has funded a fish industry for some groups.

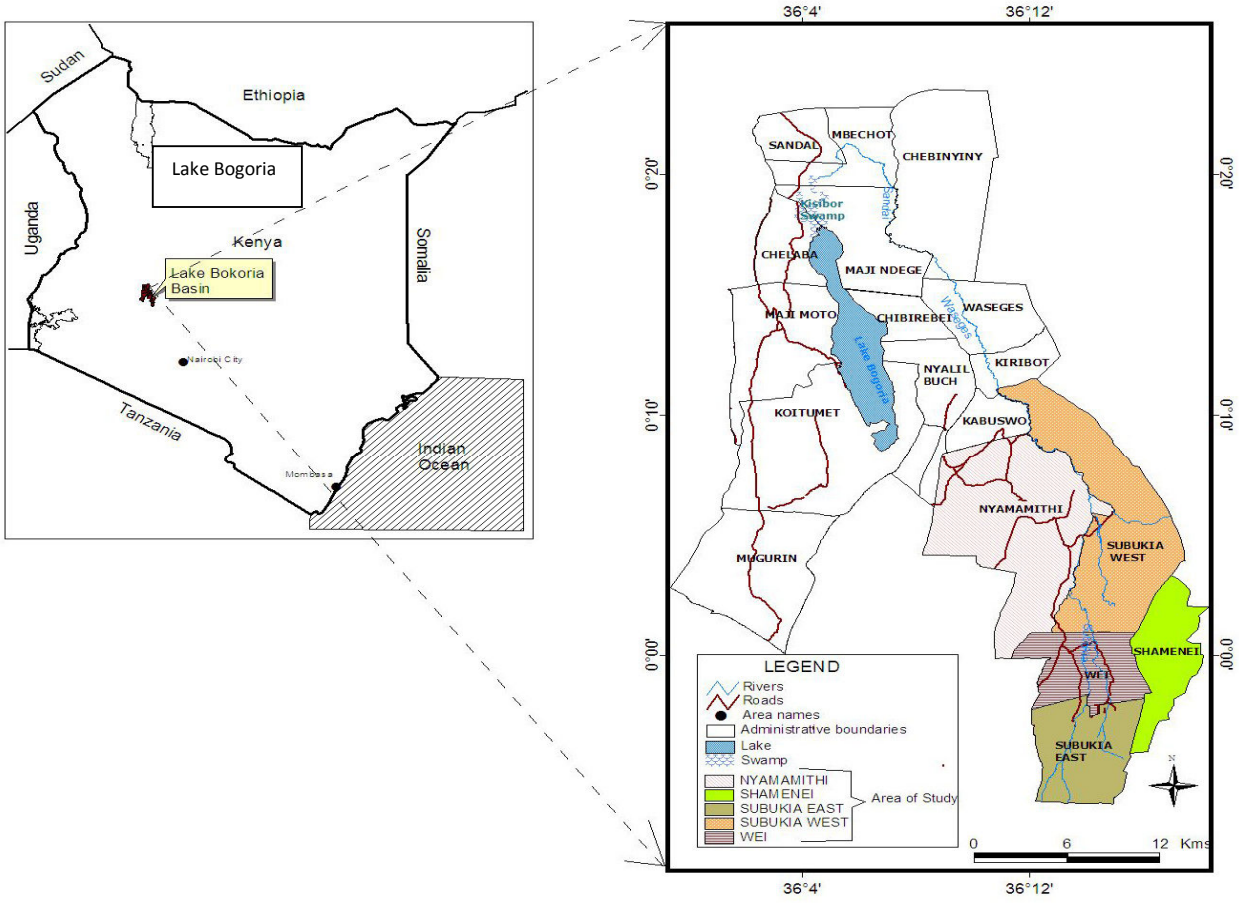

Figure 1: Map of the study area
(Source: Modified from WRMA, 2008)

Research design and data collection

A cross sectional survey research design was used where a group of respondents was asked a set of questions at one point in time and space. The cross-sectional survey was conducted using some modes of data collection which included a household survey questionnaire, focus group discussions, in-depth interviews and observation in the field. A sample size of 221 household was selected among them 149 non-WRUA members and 49 WRUA members. Random selection was employed in selection of the individual households. Purposive sampling was utilized in selection of participants for FGD and in-depth interviews.

Data analysis

Coding of household questionnaires was done followed by data entry into a computer and analysis done by use of the Statistical Package for the Social Sciences computer software version 17. The results obtained were presented in form of frequency distribution tables, bar graphs, pie charts and measures of central tendency. Chi-square tests were carried out to obtain levels of association between different variables. The data obtained from the focus group discussions and in-depth interviews were reviewed and organized. Tapes were transcribed verbatim (word for word) (Mulwa and Nguluu (2003) in order to capture the exact words and phrases voiced by the participants.

RESULTS

Water Storage facilities for domestic and irrigation water

The household survey indicated that only about 30% of the 221 respondents collect and store flood flow for irrigation purposes. The water project members involved in the study had 54 water pans.74% of the water pans were found to be leaking among them, the one shown in plate 1. The cost of constructing a standard water pan in the LBB as provided during the FGD stood at Kshs 25,000 compared with Kshs 16,000 in 2005. This was beyond the reach of many community members in the upper catchment of the LBB, with an average income of Kshs. 4526 per household per month as revealed during the household survey. The communities in the study area are therefore unable to harvest enough water. The household survey indicated that about 93% of the 221 respondents collect and store rain water; 56% in small barrels; 25% in 20 litter jerricans and 42% in water tanks.

Plate 1: An empty water pan at Mwiteithia (Source; photograph courtesy of Wangui, April, 2011)

Water safety as perceived by the respondents and water treatment

During the course of the study, it was observed that a lot of water pollution came from Subukia shopping Centre. Plate 2 shows a channel behind a toilet draining its contents into the river. From the FGD, it emerged that planning was not done when Subukia Centre was being established hence lack of sewerage systems.

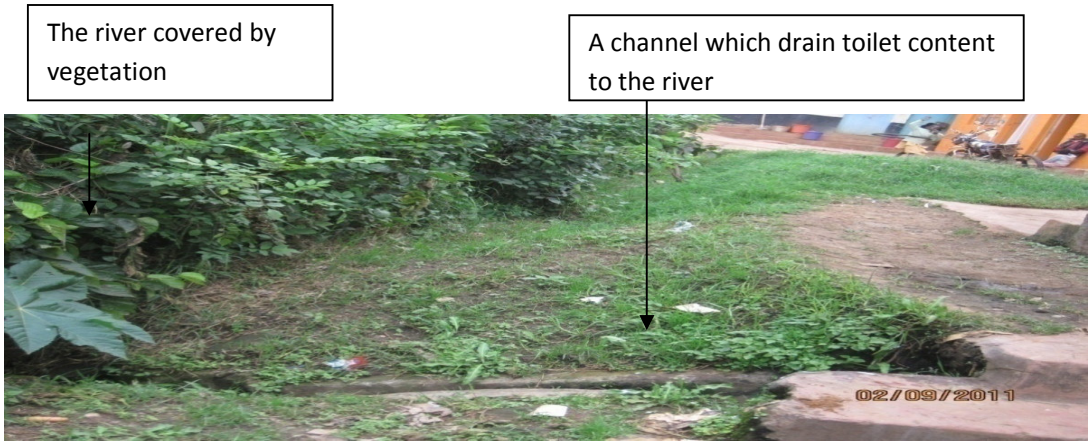

Plate 2: A channel behind the toilets draining contents into the river
(Source: photograph courtesy of Wangui, September, 2011)

Among the 221 respondents, 77% perceived that Waseges river water was unsafe for drinking while about 23% thought it was safe. Water is perceived to be less safe in Mbogo-ini Division as compared to Subukia Division with the percentages of the respondents being about 81% and 63% respectively. During the household survey 93% of the 71 respondents reported lack of water treatment by the LBB-WRUA. Only 33% of the respondents frequently treat water before drinking, 44% treat occasionally while 23% do not treat. Fifty three percent of those who treat water leave it to settle as one of the treatment methods; a method that only gets rid of the insoluble particles leaving dissolved materials and pathogens in the water. There was no significant difference between the project and non-project members on treatment of water ($\chi 2=1.573$; $p= 0.455$). This indicated that being a member of the LBB-WRUA had not helped them link water treatment and good health. The household survey indicated that the LBB communities suffer from a variety of water borne diseases. Typhoid was the most prevalent disease affecting about 60% of the respondents, followed by amoeba at 23% (Figure 2). Treating typhoid is very expensive given that the salmonella typhi (pathogen causing typhoid) is resistant to drugs if not taken as prescribed (Philippa, *et al,* 1998). There was a significant difference between education and home treatment of water ($\chi 2=21.862$; $p=0.005$) indicating that the higher the education, the higher the percentage of people treating their water.

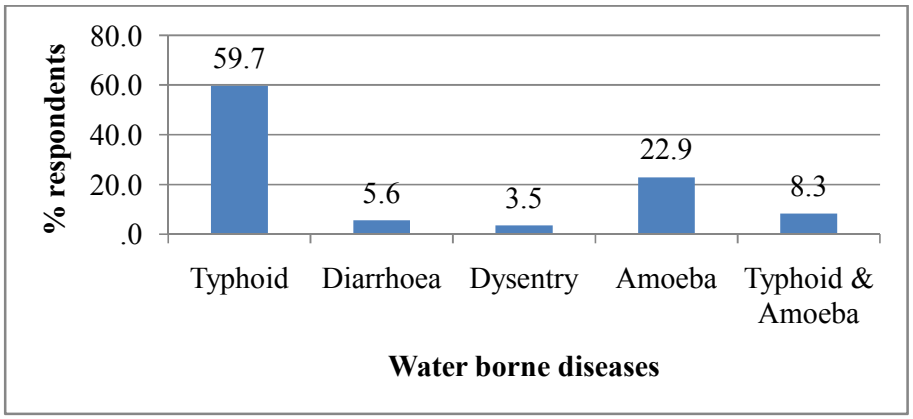

Figure 2 Common water borne diseases in the LBB

Irrigation and catchment area protection

Seventy three percent of the 77 household survey respondents use hose pipes to water their crops. The remaining 27% use overhead irrigation, low ground sprinkler irrigation, flood, canal, bucket and drip irrigation. From the in-depth interviews, it emerged that agriculture has attracted large scale farmers from

within the basin, mobile farmers (farmers from outside the basin) and a few administrators. This, to an extent explains why the basin is experiencing water shortage.

From the in-depth interviews conducted during the course of this study, it emerged that catchment protection has improved through creation of Community Forest Associations (CFAs) like Shamenei. The CFAs ensures that reaforestation is done; the existing trees are conserved and that tree nurseries are established. Shamenei CFA aims at rehabilitating Shamenei forest and membership is open to all water project members regardless of where they come from within the LBB. However, from the FGD held in the course of this study, it emerged that the communities continue sneaking charcoal and poles out of the Basin. This is attributed to poverty, few employment opportunities as well as collaboration of some administrators with offenders.

The FGD held in Subukia center revealed that river bank protection has not been achieved to date since pegging has only been done in a few sections of the Waseges River; Akuisi and Limuru. Plate 3 shows tomato farming adjacent to the river bank in Wiyumiririe. The brownish colour of water is due to intense erosion from the bare river banks and riparian corridor which have been degraded. It was also noted that only 2% of the 71 water project respondents and about 1% of individuals had their own tree nurseries. The household survey indicated that about 20% of the 221 respondents had 10% of their farms under woodlots, and majority (74%) had 5%. All these hamper the efforts by the LBB-WRUA to conserve and rehabilitate the LBB water catchment.

Plate 3: Tomato farming adjacent to the Waseges River channel at Wiyumiririe
(Source: photograph courtesy of Wangui, September, 2011)

Women and youth representation in leadership positions

The household survey revealed that 80% of men held positions in offices in the 50 water projects, 16% were women while 4% were the youth. This is despite the fact that the LBB-WRUA has a provision in its constitution for a third of women representation in leadership positions. The in-depth interviews attributed Poor representation of women to their high illiteracy levels which make them shy away from leadership positions. At the same time, men are custodians of the land title deeds hence decide on who gets into leadership positions.

Attendance of meetings and training seminars

Among the 71 water project members, about 31% attend meetings thrice a year, 52% attend twice a year, 13% once a year while 4% never attend. The study revealed that most community members prefer working in their farms rather than attend meetings, indicating that they consider meetings as a waste of time. It might also be because there are no immediate direct benefits in form of either lunch or cash payments. The in-depth interviews revealed that the leadership of most water projects is questionable and may have contributed to non-attendance of meetings by the water project members. About 64% of the 71 household

respondents revealed that their water projects never organize seminars to train their members on water management and conservation. Members trained by their projects benefit from the sessions, and utilize the skills.

Inviting extension officers and exchange visits

The household survey indicated that about 63% of the 71 respondents in water projects do not invite extension officers to advise their members on better irrigation methods. Extension officers advise the farmers on how they can economically utilize the reserved water in their water pans, best irrigation methods, suitable varieties of crops to grow within 90 days among other things. Among the 71water project members, 95% reported that their water projects have never taken them for tours to other basins to learn about what the other projects are doing with regard to water use and conservation. The FGD held in the study area revealed that Lari Wendani is the only water project whose members and officials have made exchange visits to other water projects (to Meru and Sagana). It is from these visits that they got the idea of closed systems and planting pigeon peas that fetch better returns as compared to beans. This is a water project that other water projects within the basin should visit.

Discussions

According to Bolt, *et al* (1999), communities are expected to own the process of change while the facilitators participate in the communities' projects and not the other way round. Accountability by the water project members is key for the LBB-WRUA to ensure water is conserved and managed in the basin. This is by attending meetings and other educative fora, organizing exchange visits, and electing in office qualified individuals as stated in LBB-WRUA constitution (primary class eight). Nothing can be achieved if the community is not enlightened and orientated in water management and conservation issues. Using advisers and external elites improve the community's pool of expertise (Folifac and Gaskins, 2011). Environmental education, awareness and training plays a significant role in encouraging and enhancing peoples participation in activities aimed at conservation, protection and management of water. Exchange visits allow water projects borrow a leaf from successful WRUAS. Isiolo WRUA is among the most successful WRUAs in Kenya and is regularly visited by other WRUAs with the aim of learning more on water management and conservation (Mati, 2011). There are some water projects in Kenya that have benefitted much from exchange tours and the LBB-WRUA can borrow a leaf. According to Lammerink, *et al*, (1999), communities are no longer the passive receivers of technical goods, but are active participants, knowledgeable and accountable for their actions. As long as the communities in the upper LBB continue playing a passive role on water issues, efficient water conservation and management will remain a pipe-dream.

Water harvesting contributes immensely to water conservation. It is seen as a viable option to provide drinking water to ever expanding population, particularly in developing countries (Adler, *et al*. 2011). Lack of adequate water storage facilities in homes may continue increasing dependency on the Waseges River water which has a variety of pollutants ranging from sewage, agro-chemicals and silt. The livelihoods of poor people are threatened by water scarcity as they spend more of the family income in treatment of water borne diseases. Rain water supplement the river water for domestic purposes and is safer for drinking if handled hygienically.

To prevent water borne diseases, WRMA has to come up and install water analysis stations and treat the water. Water supply and sanitation require a huge amount of capital investment in infrastructure such as pipe networks, pumping stations and water treatment work (FAO, 2010) probably explaining why the LBB-WRUA has not initiated water treatment process. However, other WRUAs like Ena and Rupingazi have

their water samples analyzed in Embu and central laboratory in Nairobi (Ministry of Water and Irrigation, 2007) so, why not the LBB-WRUA? Promoting education in the LBB is vital because educated people were able to link water treatment with health issues. Without a good understanding of the link between hygiene and disease, the health benefits of safe water and sanitation can easily be lost (UNICEF/WHO 2009). There is need for WWF and LBB-WRUA officials to hold intensive training and motivating seminars in all water projects on the link between good health and good hygiene.

Use of uneconomical irrigation methods hampers the LBB-WRUA's effort of conserving and managing water. As global population grow, and as demand for food increases in a world with fixed water supply, there is need to learn how to produce more food with less water, through improvement in irrigation (WHO, 2010). Increased irrigation activities may pose as a challenge to the LBB-WRUA hence the urgency of increasing water sources by rehabilitating the springs, dams and bore holes as well as speed up catchment areas rehabilitation. According to Gichuki (Chakravarty, 1985) we have to adopt necessary technologies to enable us to exploit alternative water sources.

Catchment and riverine protection contributes much towards water conservation and management. The new constitution provides for the establishment and maintenance of a 10% forest cover in order to deal with challenges of climate change and improve the lives of all Kenyans (Kenya Forest Service, 2012). Despite the LBB community's dire need for cultivation area, they have to think about ecological sustainability. Every river is required by law to have a specified amount of land along its banks where no farming or tree cutting is allowed (UNEP, 1982). In the LBB, continued cultivation of riverbanks without adequate conservation measures has triggered intense soil erosion causing persistent turbidity of water.

Water conservation and management cannot be achieved without Community participation. The Water Act (2002) requires that we have institutions at the community level that are fully aware of their responsibility to manage their resources in a sustainable manner (ROK, 2002). Locking women and youth out of the project leadership as it is the case with the LBB water projects will mean reduced speed at which water conservation and management are achieved.

CONCLUSION

The following are some of the conclusions based on the study findings;

a. Catchment protection has improved through creation of Community Forest Associations (CFAs) like Shamenei.
b. Out of the 221 household survey respondents, only42% had tanks for storing water for domestic use and only 30% had water pans for storing irrigation water.
c. Pegging along Waseges River had only been done in Akuisi and Limuru,
d. Seventy three percent of the respondents were using hose pipes to irrigate their land.

4.2 Recommendations

The following are some of the recommendations based on the study findings;

a. The LBB-WRUA should ensure that all water abstractors have standard water pans.
b. The LBB- WRUA should encourage water project members to join hands and construct water tanks through merry go round.
c. The LBB-WRUA should organize a meeting between the upstream and downstream communities to discuss how the two should share out the Waseges River water.
d. WRMA should carry out regular sampling and analysis of water.

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