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COMMUNITY PARTICIPATION IN SURFACE WATER HARVESTING IN MARIGAT DIVISION, KENYA

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Abstract

Water is essential for all life. There is seasonal water scarcity in Marigat Division and the water demand has been increasing for both human and animal needs. In the area, there is plenty of water during rainy season most of which go to waste and frequently causes havoc due to lack of appropriate harvesting technologies. The wastage of water during rainy season can be salvaged with improved storage and rainwater harvesting methods. Such water can be available during periods of water shortages for domestic and livestock use. The study assessed the potential of the community in the area to participate in the task that aims to improve water supply. The sampling procedure was based on stratified random sampling size of 383 household heads and 10 key informants. Questionnaires were distributed to the household heads using stratified random sampling while interview schedule was used to obtain information from Focus Group Discussion (FGDs) and key informants. From the findings, the community is willing to mobilize themselves and harness the surface water runoff and the association between water scarcity and willingness of the community to harvest surface water was statistically significant (p<0. 0246).

Key Words: *Domestic, Livestock, Water supply, Water pans, Willingness*

Introduction

Globally, water resources are increasingly under pressure (Tekken and Kropp, 2012; UNEP and SEI, 2009). Africa is the second driest continent and the availability and access to water is more crucial to existence than it is almost anywhere else on earth (UNEP, 2010).

In developing countries, a large proportion of the population lack adequate supply of water and 40% has no reliable access to portable water (UNEP, 2010). Access to adequate portable water is an essential human need and recognized as a basic human right. Approximately 1.1 billion people mostly in African and Asian countries are at a high risk of water related diseases and death due to limited access to portable water (Ahiablame *et al.*, 2012). The burden of water collection in Africa falls disproportionately on women and girls, who spend up to one-third of their day fetching and carrying water in the hot sun from the nearest fresh water sources (UNEP, 2010; *www.thewaterproject.org*). This backbreaking work leaves roughly half of the country's inhabitants vulnerable to serious dangers (Synder, 2006).

Due to climate change, many parts of the world including Marigat division experience erratic rainfall, extreme floods and droughts in recent times. NWP (2007) points out that

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the world water resources are facing dramatic changes as a result of global climate change, high water demands, population growth, industrialization and urbanization. In wet climates, rainwater harvesting can provide enough water to meet almost all needs, while in arid and semi-arid climates, harvesting usually acts as a supplement to an existing water source.

Water is a major factor for meeting other Millennium Development Goals including eradicating extreme poverty and hunger, reducing child mortality, combating the incidence of malaria and other diseases and ensuring environmental sustainability (UNEP and SEI, 2009).

During the dry season that on average lasts six months in a year, there is water scarcity in Marigat division. However, there is plenty of water during rainy season most of which go to waste and frequently causes havoc due to lack of appropriate harvesting technologies (BDVS 2005-2015). The excess water during rainy season can be salvaged with improved storage and rainwater harvesting methods and such water can be used during periods of water shortages. The common storage methods used include water tanks in individual homes, water pans and sand dams that are silting up. Currently, Marigat community is not effectively using such storage because of inappropriate methods and because such tanks are owned by those who can afford to build them. Even the individuals who can afford the water tanks soon run out of water because of low reservoir capacity of the tanks. Hence, Marigat community experiences water shortages both at household level and at community level during the dry seasons. As sources dry out, the community has to walk further and further for water.

Rainwater harvesting is not new, as communities in Kenya have practiced it for a long time (Futi *et al.*, 2011). Most rainwater harvesting technologies are simple, acceptable and replicable across many cultural and economic settings. Unlike big dams, which collect and store water over large areas, small-scale water harvesting project lose less water to evaporation because the rain or run-off is collected locally and can be stored in a variety of ways (UN-Water, 2006). A report presented by UNEP and World Agro-forestry Centre (UN-Water, 2006) showed that Kenya with a population of about 40 million is capable of meeting the water needs of six to seven times its current population. The rainwater harvesting potential in Kenya is estimated at over 12,300 m^3/person compared with the current annual renewable water availability of just over 600 m^3/person (KRA, 2006; Futi *et al.*, 2011).

A water pan is an excavated water storage structure that is square, rectangular or round, used to retain surface runoff from uncultivated grounds, roads, home compounds, hillsides, open pasture lands, laggas and may also include runoff from watercourses and gullies (SearNet 2011; ICRAF & UNEP 2005; Mati, 2007; *www.paceproject.net*). Water pans are simple to construct and hold at least 100 m^3 but less than 5,000 m^3 of water. They have been used for rainwater harvesting for livestock watering were popularized by "food for work" programs in the ASALs of Kenya and Ethiopia and this was to provide employment to people affected by droughts (Mati, 2007; Amha, 2006). The objective of this study was to assess the potential of the community in Marigat Division to participate in the task that aims to improve their water supply by harvesting surface water.

Methodology

Study Area

Marigat division is one of the fourteen divisions in Baringo County. The County lies between latitudes 0° 12′ and 1° 36′ N and longitudes 35° 36′ and 36° 30′ E. The soils

are mainly clay loams with alluvial deposits derived from tertiary/ quaternary volcanic and pyroclastic rock sediments that have been weathered and eroded from the uplands (Mwangi and Swallow, 2005). The soils are fertile but high evapo-transpiration rates and low variable rainfall is responsible for water scarcities that limit intensive agricultural use. The major topographical features are river valleys, plains and the floor of Rift Valley. The area is on Loboi plain and is characterized by rolling slopes that range from 5% to 25% towards downstream of the rivers. The location of the study area is shown in Figure 1.

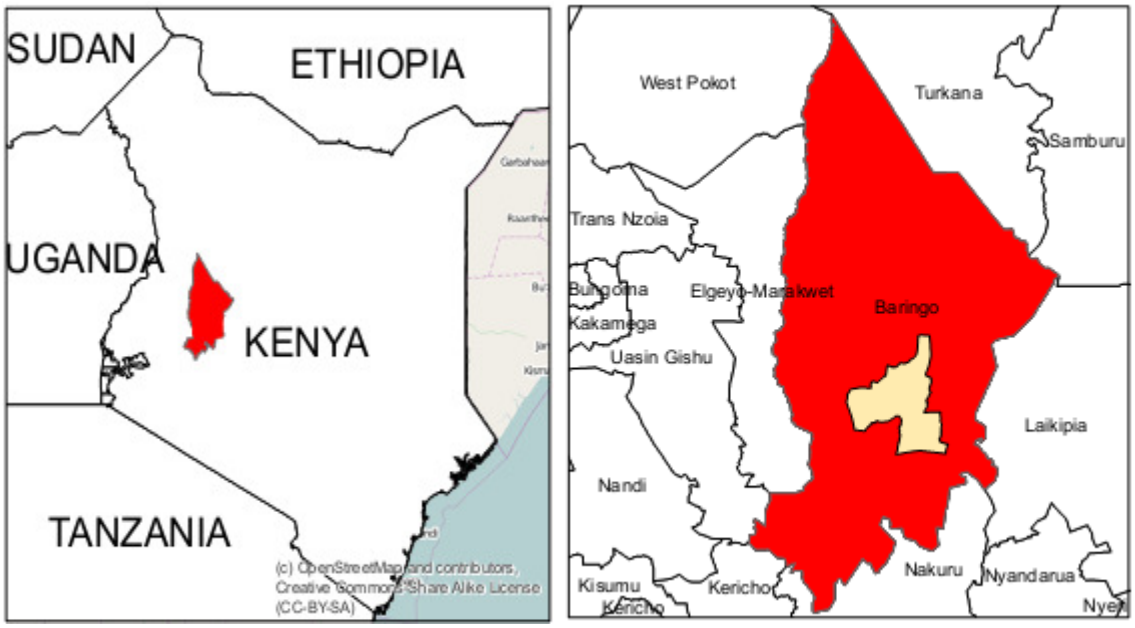

Figure 1: Location of the study area (left: Baringo County in relation to Kenya, right: Marigat Division in relation to Baringo County)

Data Collection

GPS was used to identify the geographic location and the spatial distribution of existing water points within the study area. The collection of data was done by taking the GPS's points of boreholes and tracks of water pans. Stratified random sampling was used in the distribution of questionnaires and FGDs were used to obtain information about the potential of the community to participate in harvesting of surface water runoff. It is a method that ensures certain subgroups in the population are represented in the population and is represented in the sample in proportion to their number in the population. This was determined by the willingness to participate in terms of costs, time, labour and management. The willingness of the community to participate was measured using Likert scale.

Data Analysis

Descriptive statistics were used in the analysis to determine the willingness of the community to participate in water harvesting as a community. The responses of the willingness were cross tabulated with the responses of water scarcity to determine the relationship between the willingness of the community to harvest surface runoff and water scarcity. To do this, chi-square test statistic was conducted to test if there is a relationship between the willingness and water scarcity. The test was conducted at significance level 0.05 and chi-square statistic and p-value obtained and interpretation made.

Results and Discussion

Water Sources

The study findings indicate that indeed, there is huge demand for water both for domestic and animals use. Most of the water sources in Marigat Division are donor funded, five boreholes from Belgium government and the Kenyan government through Belgium Technical Cooperation-Belgium Water Project (BTC-BWP); two boreholes in Salabani, Ilng'arua, Kampi ya Turkana and Chepkoimet. Childfund Kenya in partnership with the community had constructed two boreholes; Endao-Loberer and Maoi-Kaptim CBOs. In Ng'ambo and Salabani locations, five boreholes had been drilled and collapsed due to salinity, Sintaan borehole was also saline and dried up. Fluoride in water is also a challenge in the study area, Salabani and Kailer water has fluoride but Salabani borehole has a de-fluorization unit while Kailer does not. Kimorok water pan in Kimalel was constructed by German Development Services through Kenya Rain Water Association (KRA), while Kapowen water pan was constructed by Kerio Valley Development Authority (KVDA). Ng'ambo water pan had flooded after R. Perkerra changed its course. Figure 2 shows the main sources of water and distribution in the study area.

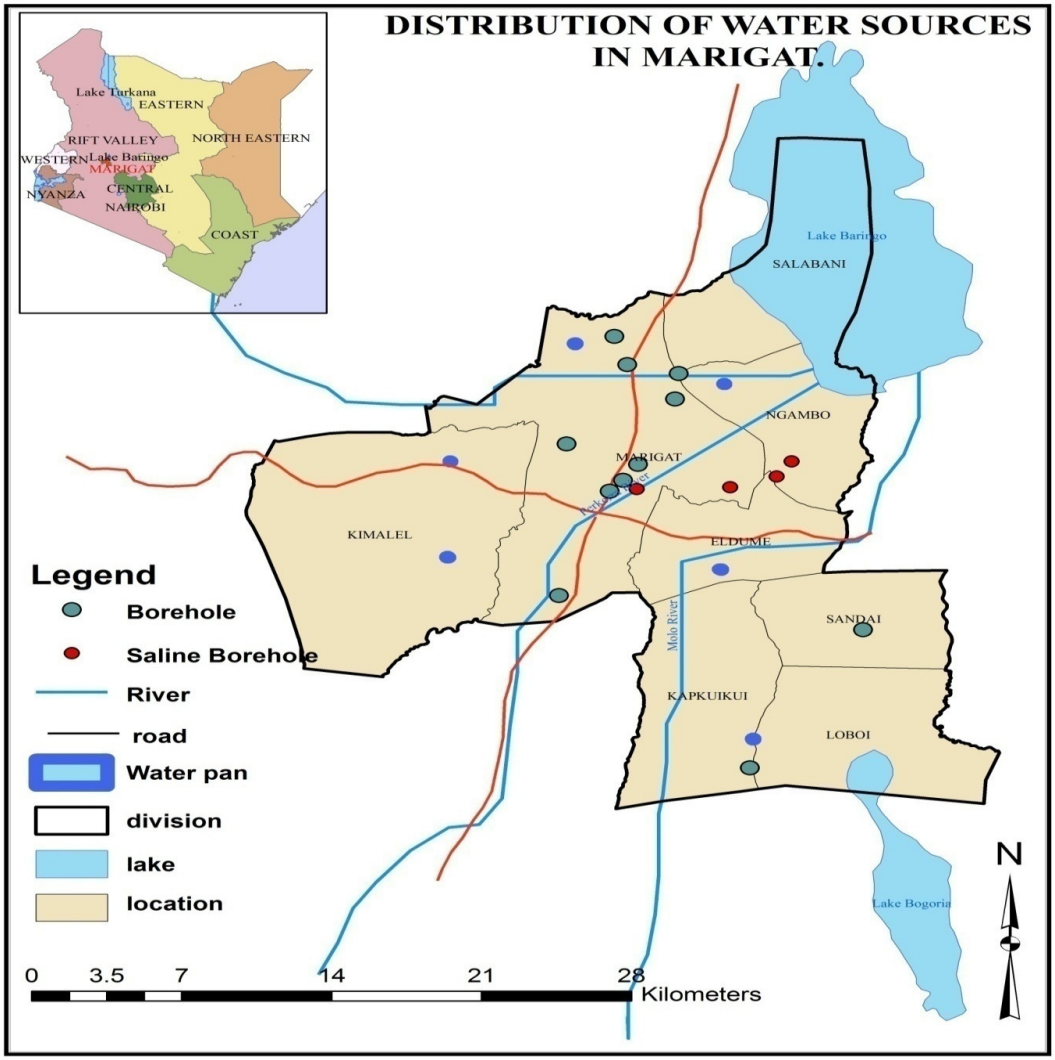

Figure 2: Distribution of various sources of water in Marigat Division

The other indicator of water scarcity is indicated by the distance covered by respondent to fetch water. Majority of the respondents cover a distance of 0-3 Km (61.9%). Those were followed closely by those who walk a distance of 4-6 Km at 34.2% and the least (3.9%) walk 7-9 Km. Table 1 gives a summary of these research findings.

Table 1: Distance to a water source

Distance in Km	Frequency	Percent
0-3	237	61.9
4-6	131	34.2
7-9	15	3.9
Total	383	100.0

These findings indicate that like other areas in Kenya, Marigat has a semi-arid climate associated with limited water resources because the research findings indicate that respondents have to travel for long distances. According to WHO (*www.un.org*), the water source has to be within 1,000 metres of the home and collection time should not exceed 30 minutes. On the other hand, the principal cause of water scarcity in the area is the combination of limited availability and excess demand of water among competing uses; this is illustrated by the fact that more *jericans* of water are fetched each day only for domestic use.

The number of water fetched in a day varies with the use. In the study, the respondents indicated that they fetch water using *jericans* from the water source. The study findings revealed that they use containers that can be able to carry as much water as possible most of the respondents were using a 30 litre *jerican*, though they were also using a 20 litre and 10 litre *jerican*. Rarely were the respondents using a 5 litre *jerican* because it carries little amount of water. The respondents spent on average 121-160 litres of water per household per day.

The findings revealed that there are households that use as low as 80 litres and a maximum of 280 litres. A significant proportion of the households (44.1%) use on average between 121–160 litres of water per day, this was followed by those who consume between 161 – 200 liters per day (25.9%). Few (2.4%) households spent between 241-280 litres per day (Table 2).

Domestic and livestock water use

Table 2: The quantity of consumption of water per household

Consumption in litres	Frequency	Percent
80-120	70	18.3
121-160	169	44.1
161-200	99	25.9
201-240	33	8.6
241-280	12	3.1
Total	383	100.0

According to WHO, the recommended use of water in litres per person per day is between 50 and 100l needed to ensure that most basic needs are met and a few health concerns arise (*www.un.org)* while in Marigat, approximately water use per person per day is 33.3*l*. This implies that the use of water in the study area is low. Other than water for use, the demand for water is not complete until we consider the use of water by the animals.

The study findings revealed that the households have a sizeable herd of cattle that requires water too. This increases the demand for the scarce water resource. The research findings revealed that a higher proportion of the residents have animals that number between 21-30. This category of the residents comprised 60.3 percent. This was followed closely by those with between 1-10 animals at 15.7 percent, then 12.8 percent had between 31 and 40 and the least had between 11-20 at 11.2 percent. Table 3 below gives a summary of the number of cattle that the residents have.

Table 3: The number of cattle per household

Size of herd	Frequency	Percent
1-10	60	15.7
11-20	43	11.2
21-30	331	60.3
31-40	49	12.8
Total	383	100.0

These animals are watered for between 1 to 3 times a day and use an average of 42 litres per day. The study findings indicate that on average, the cattle are watered once per day (62.9%), this indicates that indeed there is a water problem in the area since *www.ukulimasmart.co.ke* emphasizes that cattle should have adequate clean water and from a reliable source.

Willingness to participate in rainwater harvesting

First the respondents were asked to respond to whether, they are willing to participate in harvesting rainwater runoff as a solution to water scarcity. The study findings indicated that a significant proportion of the respondents who were willing to participate were 64.5% while those who were not willing were 35.5%. Those who were not willing to harvest water did not experience water scarcity since they live along L. Baringo and instead the water was being a problem to them and some had even been displaced.

In the study 94.5% were willing to participate in water harvesting as a community while 5.5% are willing to contribute as individuals. This is a clear indication that communities participate and are willing to harvest water as a community. Most sources were donor funded and this shows that there is a dependency syndrome in the study area, and such water projects are not sustainable. It should be community demand driven whereby the community members mobilize themselves and construct the water pans to solve their water problems. Ishaku and Majid (2010) states that No community should sit back and expect others to provide services for them and that they must be ready to organize themselves for community projects. Community participation in water projects is a necessary strategy in sustainable water supply. Every member in the community gets to participate in the planning process and decision making and this ensures sense of ownership of the water resource. Bamidele *et al.* (2012) agrees that community participation promotes self confidence and awareness and also causes people to examine their problems and to think positively about the solutions.

Association between water scarcity and willingness

The study attempted to establish the reason behind the enormity of the respondents to willfully participate in harnessing surface runoff water. The responses of the willingness were cross tabulated with the responses of water scarcity as shown in tables 4 and 5.

Table 4: Extent of water scarcity in the community * Overall willingness Cross tabulation

	Overall willingness		Total
Extent	Agree	Strongly Agree	
No water scarcity	73	51	124
Moderate	18	22	40
Serious	62	61	123
Very serious	57	39	96
Total	210	173	383

Table 5: Chi-Square Tests

Statistics	Value	df	P-value. (2-sided)
Pearson Chi-Square	4.151	3	.0246
Likelihood Ratio	4.148	3	.0246
Linear-by-Linear Association	.022	1	.881
N of Valid Cases	383		

The chi-square statistics indicate that there is a significant relationship (0.0246) between water scarcity and the willingness to participate in harnessing water. The p-value is less than 0.05 and the hypothesis that there is no relation between willingness to harness water and water scarcity is rejected and conclusion made that there is a significant relationship between water scarcity and willingness of the community to harvest surface water. These findings agree with findings by ATPS, (2013), who notes that more than 90 percent of the households showed willingness to practice rainwater harvesting since such techniques will largely improve water availability in the area and their livelihoods at large.

Findings from the Key Informants and FGDs

The study sought to solicit information from key informants pertaining to water management and their role in assisting the Marigat community to alleviate or reduce water shortages. The key informants in the study comprised of key respondents from Kerio Valley Development Authority (K.V.D.A), Marigat Child and Care program (MCFP) and National Drought Management Authority (NDMA).

The role of these organizations appeared distinct. However, each supplements the other in providing essential services in the Marigat community. K.V.D.A is charged with the role of planning, co-ordinating and implementing integrated programs and utilizing the available resources for the benefit of the communities in their areas of jurisdiction. MCFP is charged with alleviation of child poverty while NDMA's mandate is to try and mitigate drought emergencies through community resilience creation and climatic change adaptations. Other organizations that supplement include World Vision, Kenya Agricultural Research Institute (KARI), GoK, Japan International Cooperation Agency (JICA) and Kenya Rainwater Association.

The organizations support the community in mitigating water shortage problems. For instance K.V.D.A does this by assisting the community construct water pans and dams to store water. NDMA plan and conduct Food for Asset programmes and construction of pans. At the time of study, K.V.D.A was assisting, through sourcing of funds and capacity building to construct dams in Kipkututia. On the other hand, MCFP was engaged in extending water supply from Endao to Kampi ya Samaki and in construction of water tanks, pipes and kiosks.

They are also engaged in the business of capacity building. JICA have been drilling boreholes in the whole of Baringo County. The organizations are involved in continuous efforts to educate the community on rain water harvesting. This is because they have helped to boost crop production through irrigation. The study findings indicated that these organizations strategically partner and provide funds where possible to activities that avail water to the residents of Marigat division. Other methods facilitated to harness rain water include facilitating purchase of water pipes and construction of semi circular and zai pits. With regard to sustainability of already existing projects, the organizations ensure that they are maintained through check dams to reduce siltation and ensuring

that governance and community management structures are in place through community initiatives. The government has been handy in as far as such projects is concerned because they provide technical expertise at all times.

From FGDs, the community confirmed that they are facing water shortages and it is always the work of women and children to look for the scarce resource. Women have always spent a lot of time looking for water instead of doing other income generating activities like business and farming. In as much as women are willing to harvest the rainwater, men are the ones who make decisions in the community because they own the land. The community is ready to mobilize its resources as a community than individuals in terms of finances, labour, time and management so as to curb their problem of water shortage. The community has tried to engage themselves in activities that help them get water for instance the Word Vision's 'Food For Asset (FFA)' programme where the community provide labour in constructing water pans and then they are given food in return and will also have water once it is harvested in water pans.

Conclusion

There is water scarcity in Marigat and in addition the water resources are sparsely distributed although some of the sources run out of water, some are saline, and some have fluoride and others are quite reliable. Women and children suffer most since they have to walk long distances to fetch water yet they are not involved in decision making of water resources. Rainwater harvesting is a water supply alternative acceptable to the local people but utilization has been hindered by limited financial resources and thus coming together as a community to mobilize themselves and harvest in water pans is the cheapest, fresh, fluoride free and best way of curbing their problems of water shortage and instead of waiting for external organizations to fund their water projects. From the findings, the community has the potential to harness surface water runoff for domestic and animal use and there is a relationship between water scarcity and the willingness of the community to harness surface water.

Recommendation

It is recommended that Marigat community should come together and harness local resources, local initiatives, and mobilize themselves, and harvest surface rainwater in water pans to solve their water problems this will also ensure sustainability of the water projects. It is also highly recommended that women should be actively involved in decision making of water resources in the community.

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