
WATER SECURITY AND RURAL LIVELIHOODS IN UGANDA. A CASE STUDY OF LWENGO DISTRICT

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ABSTRACT

This study examined the relationship between water security and livelihood of people within Malongo and Kyazanga Sub Counties, Lwengo District. The study objectives were to: (i) identify water security indicators; (ii) identify the main livelihoods; and (iii) establish the relationship between water security and livelihood. The study used SPSS v20 to extract descriptive statistics, correlation and regression analysis to answer earlier objectives. The study found a low water security. Over 43.94% revealed that had only well water as their main source of water while only 14.24% used tap water and 3.03%, boreholes. Averagely, 56.7% required over 2 hours before they could access a water source whereas it took over 51-6% less than <30 min to wait at the water source. Also, 39% of the households were also dissatisfied with quality and quantity of water due to the particles, colour, smell, taste, salinity in the water and fear of infections. The coping strategies were also low as all households had jerricans along with 83.6% that had clay pots as well. Tanks were posed by only 12.4%. Water treatment was also found to be low as over 48% relied on filtering rather than using chemicals and boiling water. In relation to livelihood, households were found to engage in on-farm activities as the key source of income and livelihood with 62% acknowledging. Yet 84% of the on-farm activities are on a small scale (<2 acres of agriculture cover). Livestock on the other hand was reported to be declining in most of the households. The study also found a significant positive relationship between water security and livelihood among households with 98.2% with a prediction of 40.6% towards sustainable livelihood within the area. This study recommended that the Government of Uganda should advocate for a policy approach that focuses on the inter-linkages and interdependencies between sectors in

solving cross- sectorial problems, promote appropriate technologies and initiatives like Rain Water Harvesting and Proper maintenance and development of water distribution facilities.

Key words: *water security and rural livelihoods*

Background to the study

In Uganda, livelihood challenges have also been recorded. Available statistics for 2012 indicate that 67% people in Uganda are life stressed and spend less than \$ 1.20 per day, majority of which are in rural areas (Collins et al., 2023). In addition, results indicated that approximately 43% of the population is at risk of falling back into poverty which is a big threat to ensuring sustainable livelihood. Hence, effort is needed to reduce vulnerability, and help build the resilience of individuals and communities facing high youth unemployment, gender inequality, lack of access to basic services, and low economic development. Livelihood activities of farming, pastoralism and forestry which previously dominated most rural areas in Uganda have also declined (Ahaibwe, Mbowa & Lwanga, 2013; Republic of Uganda, 2019). Notwithstanding, this study was concerned with the livelihood status of households in Lwengo District (Mark et al., 2023).

Uganda is well endowed with water resources, but its availability varies considering across and within regions and seasons. In Uganda 34% of people in rural areas don't have access to safe water. Majority of these are in the districts within the dry belt commonly referred to as the cattle corridor (Ministry of water and Environment (MWE), 2012).

Lwengo District lies within the Ankole-Masaka dry corridor, famous for experiencing a wide spell of dry seasons compared to rainy seasons. With a population 275,450 according to the National Census Report of 2014 (Uganda Bureau of Statistics (UBOS), 2014), livelihood for different category of people is in danger. A recent report indicated that the lives of over 5000 elderly people are in danger following the low

livelihood activities progression. The district is also characterized by low sustainable livelihood framework attributes of human capital, natural capital, financial capital, physical capital and social capital (Oromo et al., 2023). Majority of the people living within the district are low educated with an illiteracy level of 61.6%, something that limits their skills, abilities and experiences (UBOS, 2012). The housing infrastructure is also poor as more than 25000 people sleep in grass-thatched houses in Lwengo district. Poverty levels are also high with statistics indicating that 61% are poor and cannot afford, but rather rely on other relatives and friends for a living (Republic of Uganda, 2014).

In other parts of Uganda, estimates indicate that over 60% of pastoral households in Uganda, particularly those in the cattle corridor including Nakasongola lack water for both domestic and livestock use. This risks human and livestock health reduces livestock productivity and causes conflicts over water access (1 Ourien Isaac, 2 Dr Ariyo Gracious Kazaara, 2023).

Statement of the Research problem

The importance of water cannot be overemphasized, (Care International, 2014). However, there has been an increasing global outcry for water security in both the developed and developing countries. Kyazanga and Malongo Sub counties in Lwengo district have been a subject to increasing water insecurity for a long spell, (Mutabazi, 2014). Many economic activities within the area have been put to a hold making it the most vulnerable areas within the country. There has been rampant famine, increasing poverty, decreasing livestock and agriculture greatly affecting the livelihoods of people living within the area (Vincent & Peter, 2023). However, it is not yet clear whether these trends are as a result of water security facets of accessibility, quality and quantity within the area.

Objectives of the study

- *To identify the water security indicators within Malongo and Kyazanga Sub Counties in Lwengo District.*
- *To identify the main livelihoods activities of people within Malongo and Kyazanga Sub Counties in Lwengo District*
- *To examine the relationship between water security and livelihood of people within Malongo and Kyazanga Sub Counties in Lwengo District*

Research Hypothesis

- *There is low level of water security in within Malongo and Kyazanga Sub Counties in Lwengo District*
- *People within Malongo and Kyazanga Sub Counties in Lwengo District are living a poor livelihood*
- *Water security significantly affects livelihood of people within Malongo and Kyazanga Sub Counties*

Methodology

Research design

A cross sectional research design was adopted. A cross sectional research design involves studying a variable in which data is gathered just once or in a snapshot (Amin, 2005). The research design was selected because it is fast in making conclusions and recommendations since data is collected at a given point in time and based upon to make recommendations. In addition, cross sectional research designs allows the recording of information regarding subjects without manipulating the study environment. The study applied a quantitative research approach because of the large population that was a focus of the study. Besides, it is easier to collect quantitative data more than any other form of data.

Study population

The study population for this study constituted 15,775 households within Kyazanga and Malongo sub counties (Uganda National Bureau of Statistics, 2012).

Sample size and sampling techniques

A sample of 375 households was selected which was determined by the Kreijce and Morgan, (1970) table for selecting a given sample from a population. The actual households were obtained using simple random sampling and proportionate stratified random sampling techniques. Simple random sampling was applied while selecting the sample from each Sub County and proportionate stratified sampling was used to establish the proportion of households that should be selected from each area (Kyazanga and Malongo Sub Counties). Simple random sampling technique was used because it accords equal chance for each member within a given population to become part of the sample from which data is collected. Proportionate stratified random sampling technique summarizes a big population into manageable strata and accords equal chance for each household within a given stratum to become part of the sample from which data is to be collected.

Table 1: Population and sample size distribution

Sub County	Households Population	Sample size (Households)
Kyazanga	9,653	229
Malongo	6,122	146
Totals	15,775	375

Source: UBOS, (2012)

Data collection instruments

The study used questionnaire instrument to obtain data. The questionnaire instrument is highly recommended for acquiring quantitative data which is the major focus of this study. It is also cheaper to use a questionnaire compared to other data collection instruments such as Interview guides or conducting Focus Group Discussions. This was designed in accordance with the research objectives.

Data Analysis

From the field, data was sorted, edited and processed using the statistical Package for social scientists (SPSS. v20) (Nelson et al., 2022). Descriptive statistics and

inferential statistics was obtained and used to analyze data using E-views (Nelson et al., 2023).

RESULTS

Table 1: Evaluation of the sources of water in Kyazanga and Malongo Sub Counties (in % of households)

Water sources	Mostly Used	Moderately Used	Fairly Used	Minimally used	Rarely Used
<i>Borehole</i>	3.03	10.61	6.67	13.33	66.36
<i>Well water</i>	43.94	21.21	15.15	13.03	6.67
<i>Spring water</i>	2.42	2.73	12.12	11.52	71.21
<i>Tap water</i>	14.24	18.48	5.15	17.88	44.24

Source: Primary Data

Water sources within Kyazanga and Malongo sub-counties was not in abundance. The mostly used water source within Kyazanga and Malongo sub-counties was well as almost half (43.94%) recognized it as the most reliable source of water. However, only one well as reliable, that is the one located approximately 2½ km from Kyazanga. Other wells manually constructed were seasonal. While boreholes were circulated in most parts of the area, only 3.03% relied on them as their main water source. The reasons presented by most of the respondents' seasonality and salty nature of the water from this water source making the water not good enough for domestic use in daily activities such as cooking, and bathing among others. Kyazanga and Malongo sub-counties are also not naturally endowed with natural water sources such as rivers, lakes apart from springs which some households reflected as their main source of water.

Water accessibility

Evaluated based on the distance to the nearest water sources, time allocated to water collection was found to differ among households and communities depending on its location (distance to source), ease of accessibility (i.e., the terrain), and

household characteristics such as number of water carriers and gender. Figure 1 shows time allocations and distances commuted by households in communities to access the most important water source. As a major observation, households generally allocate more time travelling long distances to reach the perceived reliable source of water. An average 56.7% travelled for over 2 hours before they could access a water source. The terrain of the area in addition to the scattered water sources were major contributors.

Figure 1: Distance to the nearest water source

Majority of households and communities within Kyazanga and Malongo sub-counties spent averagely 2 hours to reach the nearest water sources. The implication of this is that most of the water sources within the area are distant from the households. Households indicated that they generally allocate more time travelling long distances in the dry than in the rainy seasons. Hence, the geological setting of the area determined the accessibility of water within Kyazanga and Malongo

Comparative analysis of water time spent by households

Even with the limited water sources, their distribution across Kyazanga and Malongo Sub County is uneven resulting in time spent variations to nearest water source. Time required to access water was found to be dependent natural and physical factors. The survey found that Kyazanga sub-county has relatively more water sources compared to Malongo sub-county dictating the time variations to access the nearest water source.

Figure 2: Distance to the nearest water source by sub-county

5Source: Primary Data

Generally speaking, households in Kyazanga sub-county did not require much time to access the nearest water source because of the different options including well water, tap water and boreholes. Almost half of the households (48%) spent barely <30

min. Malongo sub-county households' results indicated that more than half spent >2hrs to access a water source since they did not have various options. Their main source was well water which was only reliable during wet seasons.

Waiting time at water source

Time spent before accessing water at the nearest water source is significant attribute of water quantity. Time spent is largely dependent upon the specific water source, the population and the demand for water at the same source of water. Time was evaluated in terms of <30 min, between 30-1hr and >1 hr. and statistics revealed that most of the household required less than 30 min.

Figure 3: Average waiting time at water source

Source: Primary Data

On average, more than half of the households require <30 min to access water from the nearest water sources. A relatively larger number of households however also indicated that they spend over 1 hour (13.6%). Households required limited time at the source of water because of the low demand for water. On-farm activities were largely on a small scale and no modern approaches such as irrigation were applied. Water was mainly for domestic use which does not necessarily require large volumes of water.

Water storage

Water storage is a coping strategy to enhance continuous water availability and reliability. It also constitutes a viable method to mitigate the effects of that water variability. Broadly speaking, every household has at least one water storage ranging from clay pots, gallons, jerricans, tanks and buckets.

Figure 4: Water storage facilities used by households

Source: Primary Data

The findings revealed that the major water storage facilities included jerricans and clay pots. In all the households visited, each possessed at least a jerrican while 83.6% also had clay pots. Although a tank guarantees more water security it was the second least facility that households used. This could be attributed to the associated cost of acquiring a tank or digging an underground tank.

Water Quality and Quantity

In addition to water availability, accessibility and usage, water quality and quantity plays an important role in determining water security. The quality and quantity of water determines the drinking water security and subsequently health and agricultural productivity status of households. In this regard, household perceptions on water quality are crucial in determining household health production and water treatment decisions. Table 5 presents households water quality ratings by source. On average, 39.18% indicated their dissatisfaction in the available water source within Kyazanga and Malongo sub-county. About 34.2% were fully satisfied with well water although very few households expressed satisfaction towards borehole water.

Table 2: Water quality and quantity in Kyazanga and Malongo sub-counties

Water Quality and Quantity	Fully satisfied	Rather satisfied	Rather not satisfied	Not satisfied	Total
Borehole	13.3	23.0	2.7	60.9	100
Well water	34.2	23.9	29.4	12.4	100
Spring water	5.2	27.6	1.5	65.8	100
Tap water	50.3	30.9	1.2	17.6	100
Average	25.75	26.35	8.7	39.18	

Source: Primary Data

Household average satisfaction of the different water sources within Kyazanga and Malongo sub-counties was 25.75% which is low. It was also observed that tap water was the most satisfying water source with tap water coming second. Although well water was the available source of water to the households, a slight 1/3 of households

(34.2%) were fully satisfied with the water source. The most dissatisfaction was spring water and borehole water. Hence, the water quantity and quality is low within Kyazanga and Malongo sub-counties.

Water characteristics

Table 3: Reasons for dissatisfaction of water quality and quantity

<i>Water Characteristics</i>	<i>Particles</i>	<i>Colour</i>	<i>Smell</i>	<i>Taste</i>	<i>Salinity</i>	<i>Fear of infection</i>
<i>Borehole</i>	1	14	20	14	50	2
<i>Well water</i>	22	31	30	9	1	7
<i>Spring water</i>	10	15	4	28	43	1
<i>Tap water</i>	0	9	18	19	1	52
<i>Average</i>	8.25	17.25	18	17.5	23.75	15.5

Source: Primary Data

In general, households are very much bothered with the salinity of water, taste, colour fear of infection and particles in the important sources of water. It is indicated that the highest dissatisfaction with water quality based on the salinity was mainly with borehole and spring water representing 50% and 43% respectively. The colour and smell of water were also highlighted to be causing the water quality dissatisfaction of well water. Yet well water was recognized as the major source of water in both sub-counties tackled in this study.

Water treatment

Figure 5: Water treatment methods used by households in Kyazanga and Malongo sub-counties

Source: Primary Data

Water treatment among households within Kyazanga and Malongo sub-counties was a common practice. The study revealed that filtering was the most common technique that households applied in improving the water quality. However, much as boiling and

use of chemical are considered as essential methods of water purification, only 7% and 27% respectively opted for these methods. The slight use of chemicals and boiling is either because these chemicals and firewood are scarce within the area or due to the financial burden it causes to the household.

Main livelihoods activities

Table 4: Livelihood activities of households in Kyazanga and Malongo sub-counties

Main Livelihood Activities	Frequency	Percent
On-farm activities		
Mixed farming	330	100%
Livestock	69	21%
Mono cropping	217	66%
Off-farm activities		
Trade (Agricultural products)	219	66%
Remittances and assistance	121	37%
Others (Carpentry, bee keeping etc.)	37	11%
Non-Farm activities		
Retail shop	72	22%
Transport (boda-boda, taxi, bicycles etc)	97	29%
Brick Laying	41	12%
Rental Income	5	2%
Self-employment Income	9	3%
Average		
On-farm Activities	205	62%
Off-farm Activities	126	38%
Non-farm Activities	45	14%

Source: Primary Data

On-farm activities contribute 62% to household income within Malongo and Kyazanga sub-counties. All households were engaged in mixed farming and over 66% engaged in mono cropping. The dependency of majority of the households on on-farm activities suggests lack of opportunities in the nonfarm and off-farm activities and the absence of an enabling environment necessary for agricultural and rural development. Such situations may compel some members or heads of households to out-migrate to other communities with the hope of better agricultural prospects. On average 38% of the households engaged in off-farm activities in which trading in agricultural products was part. The implication of this is that much as agriculture is the main livelihood of the people within Kyazanga and Malongo sub-counties, most households within Kyazanga and Malongo cultivate for domestic use. While this improves the level of food security, it minimizes the ability of households to access financial assets.

On-farm activities (land ownership and size)

Table 5: On-farm activities in terms of land ownership and activity size

	Land Ownership		Size of Activity			
	Yes	No	<=1/2 acre	>1/2 acre-1 acre	>1 acre-2 acres	>2 acres
On-farm activities						
Mixed farming	96%	4%	12%	17%	25%	46%
Livestock	74%	26%	65%	7%	26%	1%
Mono cropping	92%	8%	16%	79%	3%	1%
Average	87%	13%	31%	35%	18%	16%

Source: Primary Data

Majority of households within Kyazanga and Malongo sub-counties practice on-farm activities on their land (87%) with only 13% practicing on-farm activities on rented land. However, the on-farm activities are practiced on a small scale. Generally, 84% of the on-farm activities are on a small scale (<2 acres of agriculture cover). The implication of this is that non-farm activities especially trading in agricultural

products are compromised from being a major source of income and livelihood. The failure to engage on large scale production also signifies that households within Kyazanga and Malongo sub-counties do not have enough financial resources to adopt mechanized agriculture which would improve their livelihood.

Livestock

Table 6: Livestock types by households in Kyazanga and Malongo sub-counties

Livestock	Current no	Previous no (one year ago)	Number Purchased	Number sold (previous year)	Number Consumed (previous year)
<i>Cattle</i>	345	497	19	32	28
<i>Goats</i>	217	283	49	39	92
<i>Sheep</i>	51	64	11	12	39
<i>Pigs</i>	75	59	74	102	121
<i>Chicken</i>	465	317	39	54	295
<i>Ducks</i>	29	35	12	14	75
Total	1,182	1,255	204	253	650

Source: Primary Data

Table 6 indicates that the most reared livestock were chicken, cattle and goats. Unlike goats and chicken, the number of cattle that households heard in the previous year were more compared to what was available. This could be due to the limited water security within the area that is forcing most of the households from rearing animals that require a lot of water to survive. This could be justified by the number of cattle that were purchased in the year of study where this category was the third least purchased only above sheep and ducks. The continuous understocking of cattle has a bearing on the incomes generated from non-farm activity of milk selling that can supplement the on-farm activities that have been recognized as the major source of income. However, with the improved stocking of pigs and most sales records

registered in the same, the livelihood of the households could relatively be improved in the future.

Relationship between Water security and Livelihood

Table 7: Correlation analysis of water security and livelihood in Kyazanga and Malongo sub-counties

	Water Security	Water Source	Water Accessibility	Distance to water	Water Qty & Qty	Livelihood
Water Security	1					
Water Source	.497**	1				
Water Accessibility	.393**	.174*	1			
Distance to water	.320**	.340**	.509**	1		
Water Quantity and Quality	0.078	.360**	.169*	.449**	1	
Livelihood	.982**	.836**	.664**	.692**	.875**	1

** . Correlation is significant at the 0.01 level (2-tailed). * . Correlation is significant at the 0.05 level (2-tailed).

Source: Primary Data

Results indicated significant and positive correlation between water security and livelihood ($r=.982^{**}$, $p<0.01$). Hence, the findings support the earlier hypothesis that was set by the researcher which presumed that water security significantly affects livelihood of people within Malongo and Kyazanga Sub Counties. The results implied water security was positively associated with livelihood of people living within

Kyazanga and Malongo sub-counties by 98.2%. Therefore, when water security is improved within the area, then it would be expected that the livelihood of the people would also improve. The results also revealed that each of the water security indicators was positively associated with livelihood of people. For instance, water sources revealed ($r=.836^{**}$, $p<0.01$), accessibility ($r=.664^{**}$, $p<0.01$), distance ($r=.692^{**}$, $p<0.01$) and water quantity and quality ($r=.875^{**}$, $p<0.01$). The results further indicated that whereas all the attributes of water security were important in improving the livelihood of the people, ensuring diversity of water sources was more important. This is perhaps so because people can always adopt coping strategies such as treating water and acquiring different water storage facilities to ensure that the water is fit for both domestic and other uses.

Table 8: Regression of water security and livelihood of Kyazanga and Malongo sub-counties

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.044	0.698		1.496	0.014
	Water Security	0.645	0.092	0.982	6.402	0.000
	Water sources	0.274	0.194	0.836	3.07	0.000
	Accessibility	0.339	0.107	0.664	3.19	0.013
	Distance	0.233	0.033	0.692	3.697	0.002
	Quality and Quantity	0.136	0.037	0.875	1.604	0.005
	R Square	0.429				
	Adjusted Square R	0.406				

	F-Value	24.498
	Sig.	.000 ^b

Source: Primary Data

Regression results from Table 8 presented $F=24.498$, $p < .0005$ which implied that the independent variable (water security) statistically and significantly predicted the dependent variable. The results implied that the results obtained were fit for making conclusions and recommendations. The regression Adjusted $r^2=0.406$ was also obtained water security and livelihood. This therefore implies that water security along with its components predicted up to 40.6% variance in livelihood while other factors predicted 59.4%. From the components, water sources indicated $Beta=0.836$, $sig < 0.05$, accessibility $Beta=0.664$, $sig < 0.05$, distance to water source $=0.692$ and water quantity and quality $Beta=0.875$, $sig < 0.05$. The results implied that all variables of water security were significant predictors of livelihood within Kyazanga and Malongo sub-counties. The results further indicated that whereas all water security components were significant predictors, water sources were the most significant predictor. Hence it is important that water sources are diversified if people's livelihood within Kyazanga and Malongo sub-counties is to be improved.

Conclusions

Water security within Kyazanga and Malongo Sub Counties is low. Yet water security is fundamental in improving livelihood of people within this area. As an observation, the only source of water is well water which is also not clean for use because it is simply a pool of running water. It has been observed that community members have to move a long distance before they can have access to water. The quality and quantity of water is also poor the fact that one that can be generated from the few boreholes is salty while the wells that were dug by communities only collect rain water which is purely seasonal. Agriculture was also observed as the major economic activity although worries are high since it is practiced on a small scale and relies entirely on natural conditions. Livestock, an activity was the predominant economic

activity is no more because of water security issues that have made many lose their animals during dry seasons.

Recommendations

The Government of Uganda should largely invest in water supply infrastructure and water storage systems. It should enhance proper maintenance and development of water distribution facilities including irrigation systems.

There's need for promotion of appropriate technologies and initiatives such as Rain Water Harvesting (RWH), as an alternative water shortage solution. Its cost of maintenance (RWH) is affordable compared to other conventional technologies, enables storage and collection of water at accessible points, RWH system development encourages individual participation thus creating sense of ownership which results into sustainable source and construction of Rain Water Harvesting systems is simple and easy to learn.

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