



Information quality and needs as precursors of usage in restoration of Awoja watershed in Eastern Uganda

Akello, S.^{1,3*}, Turyahabwe, N.¹, Sseguya, H.², Agea J. G.¹,¹ Nasirumbi, L.¹
and Esimu, R.³

¹Department of Extension and Innovation Studies, School of Agricultural Sciences,
Makerere University, P.O Box 7062, Kampala, Uganda

²International Institute for Tropical Agriculture (IITA) East Africa Hub, Plot 25,
Mikocheni Light Industrial Area Mwenge Coca-Cola Road, Mikocheni B,
P.O. Box 34441, Dares Salaam, Tanzania

³Zion Integrated Investments Limited Private Forestry consultancy firm
P.O. Box 299 Kumi, Uganda

*Corresponding author: sarahakellok@yahoo.com

Abstract

This study assessed information quality and needs as precursors of usage in restoration of Awoja watershed in Eastern Uganda. Data were collected using household surveys and Focus Group Discussions. The findings revealed that sex of the respondents had bearing on usage of the restoration information especially among the marrieds, widowed, a-level and diploma educated, and even in the respondents that did not get any formal education. There was a mismatch in the information received vs. information needed by the residents of Awoja watershed. Whereas the residents received information on wetland and tree nursery management, establishment and maintenance of trees, controlled harvesting and marketing of trees and tree products, their information needs were different and were mainly on livestock farming, how to detect occurrence and mitigate effects of climate change outcomes such as drought, floods and hunger, and how to integrate fruit tree growing in the farming landscapes within the greater Awoja watershed. The information received by the residents were from governmental and non-governmental institutions. The information should be adequate, relevant, timely

Akello, S. *et al.*

and presented in user-friendly language. Watershed restoration training events were the outstandingly preferred information dissemination.

Key words: Awoja, information quality, socio-demographic factors, watershed restoration, Uganda

Introduction

Restoration of degraded global watersheds has received increasing attention through large-scale initiatives such as the Bonn Challenge, a global development effort to restore about 350 million hectares of degraded watershed forests landscapes by 2030 (Verdone and Seidl, 2017). Successful watershed restoration initiatives, however, requires quality information - information that is relevant, adequate, consistent, timely and packaged in user-friendly language, and shared with the utmost appropriate channels to users (German *et al.*, 2005, Eberle and Luehring, 2013). Daudu *et al.* (2021) and Vidanapathirana (2012) also opined that accurate, adequate, appropriate, consistent, relevant, timely and useful information is a pre-requisite for a development initiative.

A watershed is an area of land where all of the water that is under it or drains off it goes into the same place. John Wesley Powell, geographer and a scientist, put it best when he said that a watershed is: “that area of land, a bounded hydrologic system, within which all living things are inextricably linked by their common water course and where, as humans settled, simple logic demanded that they become part of a community” (US. EPA, 2012).

Health of the watershed has direct effect on the quality of the water, which drain in the watershed area and the livelihoods of the residents (Giri *et al.*, 2012). Maintaining a healthy watershed is important for provision of critical ecosystem functions and services that support human, animal, and plant health; and is an on going concern in many watersheds throughout the world (Giri *et al.*, 2012; Akello, 2017). Meanwhile, anthropogenic activities such as direct industrial discharges and agricultural practices significantly interfere with natural processes, which ultimately degrade watersheds (Giri *et al.*, 2012). Natural systems are mainly working on the logic of a life cycle. A change in a parameter can effect all other parameters. Healthy watershed management is therefore very crucial for protecting or conserving the hydrologic services that the watershed provides and for reducing or avoiding negative downstream or ground water impacts, and the betterment of the integral residents (Darghouth *et al.*, 2008).

Whereas many scholars have argued that quality of information shared is paramount to watershed restoration efforts, the appropriateness of information delivery channels

are also deemed crucial for the success of any watershed restoration initiatives (Cheserek, 2005; Berkes, 2009; Cruz, 2010; Parlee *et al.*, 2011; Wyborn *et al.*, 2012). Furthermore, quality information if received by communities may spur reciprocity of their actions to make informed decision on watershed restoration efforts.

Reports from Kenya, Caribbean countries, India and Latin America underscore the importance of quality information and appropriate information delivery channels on watershed restoration initiatives (Leslie and McLeod, 2007; Salas *et al.*, 2008; Palmer, 2009; Eberle and Luehring, 2013). In Ethiopia, there are reports that restoration initiatives in the past decades have enhanced ecosystem services including soil health, crop yield, biomass production, and groundwater recharge (Nyssen *et al.*, 2009).

In Uganda, there have been partnership attempts between Government and Non-Governmental Organisations to protect and restore degraded watersheds such as Awoja. In Awoja watershed, such partnership initiatives have brought on board Farm Income Enhancement and Forest Conservation (FIEFOC1) and the Community Based Wetland and Biodiversity (COBWEB) projects (World Bank, 2013). The FIEFOC1 project aimed at restoring Awoja to enhance residents' household incomes through sustainable natural resources and agricultural enterprise ventures like fruit tree growing, soil and water conservation technologies, and conservation of natural watershed forests. On the other hand, the COBWEB project was aimed at restoring Awoja watershed through strengthening the Ugandan National Protected Areas (PAs) network.

Both projects trained the watershed resident communities on aspects of tree growing including fruit trees, establishment of soil and water conservation technologies, controlled fishing, protection, restoring and monitoring of biodiversity, which ultimately would lead to watershed restoration and improving livelihoods of the watershed residents (MWE, 2013; World Bank, 2013). Although these projects emphasised information sharing as crucial for successful restoration initiatives of Awoja watershed (Mutekanga *et al.*, 2013; MWE, 2013; World Bank, 2013; Dee leeuw, 2016; Aben *et al.*, 2019), there is a dearth of information on how the quality of information received by the resident stakeholders and information delivery channels influenced restoration efforts.

This paper therefore, presents the findings of the study that was aimed at assessing the quality of information and its sharing mechanisms in the restoration initiatives of Awoja watershed. We hypothesized that there was a no relationship between respondents' socio-demographic characteristics and perception of quality of information and its sharing mechanisms used within the restoration efforts of Awoja watershed under FIEFOC1 and COBWEB project interventions.

Theoretical framework anchoring the study

The study was anchored on the Social Exchange Theory (SET) framework. SET grew out of the intersection of economics, psychology and sociology. It evolved from the work of sociologists such as Homans (1958), Blau (1964), and Emerson (1972). The purpose of this study was to view SET as a motivational theory of benefits and costs and how it related to resident behaviors in participation to watershed restoration initiatives. SET is a general theory concerned with understanding the exchange of material or non material resources in information between individuals or groups in an interaction. The relationship in which a person or group acts in a certain way toward others in order to receive a reward (i.e., benefit or return) is called an exchange relationship (Homan, 1958; Blau, 1964). Like economic exchange, SET generates an expectation of some future return for contributions; however, unlike economic exchange, the exact nature of that return is unspecified.

Blau (1964) believes that individuals will enter into and maintain a relationship as long as they can satisfy their self-interests and at the same time ensure that the benefits outweigh the costs. An individual will seek to maximize his or her profits and minimize losses in interactions with others. In terms of continuing relationships, individuals will try to maintain those exchanges which have proven to be rewarding in the past, and break off those which proved to be more costly than rewarding, and to establish new relations which have a good chance of being more rewarding than costly.

This theory basically asserts that people develop attitudes toward people and other things in the context of anticipated personal benefits and costs to be derived from contact with them. Activities for instance of a program that generate net benefits will tend to be perceived positively, while those activities that generate net losses will tend to be perceived negatively (Napier and Napier, 1991). Contemporary exchange theory stresses that farmers seek the “best value” to get in participating in the programs (Napier *et al.*, 1986). Consistent with SET, Napier and Napier (1991) argue that rural residents tend to contribute to programs that have positive net benefits to them. The central idea of this theory is that the exchange of social and material resources is a fundamental form of human interaction (Ingoldsby and Smith, 1995).

As Wilson (1997) argued that SET can provide a model for understanding individual behavior in participation in a program. In this regard, a study was designed to explain how the residents in Awoja watershed receive and utilize information that support continued restoration of the watershed to provide critical ecosystem functions and services that support their livelihoods, as well as animal and plant health.

Materials and methods

The study site

The study was conducted in two restoration sites of Awoja watershed in Kapir and Mukura Sub counties in Ngora District, Eastern Uganda (Fig. 1). The watershed covers 15 districts of Napak, Moroto, Soroti, Ngora, Kumi, Mbale, Manafwa, Butaleja, Bulambuli, Kapchorwa, Bududa, katakwi, pallisa, Bukedea and Serere. Awoja watershed was selected based on its high degradation rate experienced in the last two decades estimated at 20%, compared to the national average of 11% (MWE, 2013), which is postulated to be a result of high population dependency on watershed resources, estimated at 25 million in Uganda. The Uganda's watershed area under forest plummeted by 4,924,000 ha (about 11.2%) by 1990 (MWE, 2019) but had increased by 12.4 % in 2017 (UBOS, 2018) due to various restoration efforts by government and the civil society organisations (Tukwatanise, 2023).

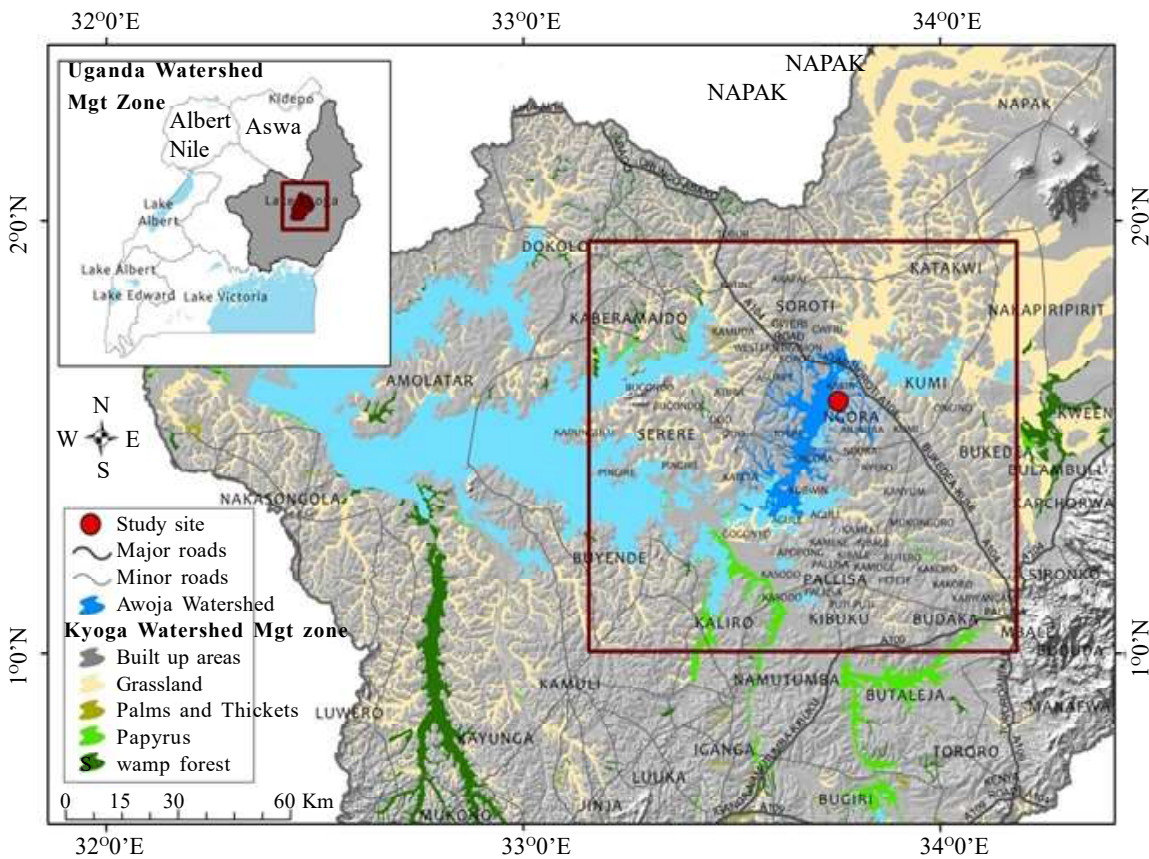


Figure 1. Location and reach of Awoja watershed in Uganda.

The study was conducted in Ngora district of the Teso region, in which a greater part of Awoja watershed lies, and it piloted the two watershed restoration interventions by the Farm Income Enhancement and Forest Conservation (FIEFOC 1 and 2) and the Community Based Wetland and Biodiversity (COBWEB) projects (World Bank, 2013). Ngora district is situated in North Eastern Uganda and lies approximately between latitudes 1°10' and 1°35' North and longitudes 33°30' and 34°20' East (Fig. 1) with a total area of 715.9 km² (Government, 2015). The main water bodies include Lake Bisina, Lake Nyaguo, Lake Meito and Lake Nyasala. Over 93% of the households are engaged in agriculture growing crops like groundnuts, millet, sorghum as well as rearing animals - mainly, goats, cows and sheep that often benefit from the vegetation in the watershed. The area has a population density of 267.5 persons/km², which is higher than the national average of 174 persons/km² (UBOS, 2015).

Research design

This study used an ex-post facto cross-sectional research design, often used after an event has occurred (Ali *et al.*, 2014). From the perspective of social science research, the ex-post facto research design aims at establishing the possible relationship among the variables by observing the present condition and looking back for some possible contributory factors (Kerlinger and Rint, 1986). This design was deemed appropriate for the watershed interventions at Awoja because the study occurred well after the interventions of the Farm Income Enhancement and Forest Conservation (FIEFOC 1) and the Community Based Wetland and Biodiversity (COBWEB) projects.

Sampling strategy, sample selection and size

Two parishes that piloted the implementation of the Farm Income Enhancement and Forest Conservation (FIEFOC 1) and the Community Based Wetland and Biodiversity (COBWEB) projects were purposively selected. These included Moru-Kakise in Mukura Sub county and Omiito parish in Kapir Sub county. Moru-Kakise parish was the implementing parish for the FIEFOC I project and Omiito parish for the COBWEB project. The two parishes are also from sub counties with the highest average household sizes of 5.3 and 5.2 persons/km², respectively, well above the country's average of 4.7 persons/km² (UBOS, 2015). The group chairpersons of the two projects provided a list of 360 households that were supported by the two projects, from which a sample of 237 households were randomly selected from the four villages of Ariet and Puna in Moru-Kakise parish and Omiito and Kakor in Omiito parish.

In total, 112 respondents were selected from the households in Mukura and 125 from Kapir. The sample size was determined following Krejcie and Morgan's table (Krejcie and Morgan, 1970), commonly used for determining sample sizes when the

size of the study population is known. A respondent who was either the head of the household or any member of the household who was knowledgeable on the group activities represented each household. The unit of analysis was the household. On average, each group had 40 and 50 registered households for FIEFCOC I and COBWEB Projects, respectively.

Data collection

A household survey and Focus Group Discussions were used to collect data from resident households in the selected study areas. A household survey was carried out by using a questionnaire with both structured and semi structured questions. The tool was administered by three (3) trained and experienced research assistants to aid in the collection of data on socio economic characteristics of the household, information type received and shared, the source, quality, preference, need and channels used to disseminate information on restoration efforts of Awoja watershed. Focus group discussions (FGDs) were held with a small group of resident people who had special knowledge and interest in Awoja watershed restoration initiatives. FGDs sessions were typically comprised of between 6-12 people. Discussions were based around a short list of guiding questions that were designed to probe for in-depth information arising from residents' household survey. Discussions typically lasted one and two hours.

Quality assurance

Prior to the data collection, the tool was validated by experts in watershed restoration, content validity index was calculated and was found to be 0.8. To ensure reliability, the tool was pre-tested in Gweri sub county of Soroti district in June 2016 as recommended by Amin (2005) and (Ali *et al.*, 2014).

Data analysis

The survey data was coded, entered and analysed using SPSS version 22.0 for Windows. Descriptive statistical analyses were run to generate frequencies on the type, source and channels of information preferred. The results were summarised and presented using tables and graphs developed in MS Excel. A chi square test was ran to assess associations between the sex of the respondents, and between quality of information (relevancy, consistency, adequacy, timeliness and packaging) and social demographic characteristics of respondents in restoration efforts of Awoja watershed. FGDs outcomes were narratively reported.

Results

The results on socio-demographic characteristics show that 41.3% of the respondents were male and 58.7% were female. There was a significant difference between the

sex/gender of respondents among the married ($P \leq 0.012$), and the widowed ($P \leq 0.001$) residents in use of information received on restoration of Awoja watershed with the females being the more responsive. There were also significant differences in gender with regard to education level with more women respondents who had not attended formal education ($P \leq 0.001$) more likely to use the information received on restoration of Awoja watershed than men, but the reverse was true for those that had attained A-level ($P = 0.016$ and Diploma level ($P = 0.038$). The primary occupation of the residents did not influence use of the information for either gender (Table 1).

Table 1. Socio-demographic description of respondents and their association to information usage disaggregated by sex of respondents in restoration of the Awoja watershed, N=237

Variable	Sex		Total	X ² -Value	P- value
	Male n=98 41.3%	Female n=139 58.7%			
<i>Marital status</i>					
Single	6.8	5.9	12.7	2.034	0.154
Married	32.5	37.1	69.6	6.33	0.012*
Separated	1.7	3.4	5.1	0.335	0.56
Widow/widower	0.4	12.2	12.7	20.410	0.000***
<i>Education level</i>					
Non	1.7	10.5	12.2	10.347	0.001*
Primary	27.8	38.8	66.7	0.035	0.852
'O' level	7.2	8.0	15.2	0.604	0.437
Certificate	0.4	0.4	0.8	0.062	0.803
"A" level	1.7	0.0	1.7	5.771	0.016*
Diploma	1.3	0.0	1.3	4.310	0.038*
Degree & above	1.3	0.8	2.1	0.733	0.392
<i>Primary occupation</i>					
Farmer	35.0	46.4	81.4	1.174	0.279
Formal employment	2.1	1.7	3.8	0.778	0.378
Business	4.2	10.5	14.8	2.765	0.096

*Significant at 5%; ***Significant at 0.1%

Nature and source of information received on Awoja watershed restoration

Qualitative data from key informant interviews indicated that in addition to FIEFOC 1 and COBWEB, information on watershed restoration were also received from such organisations as National Agricultural Advisory Services (NAADS), HEIFER international, Teso Rural Development Organisation (TERUDO), Soroti Catholic Diocesan Development Agency (SOCADIDA) and Mukura Integrated Development Association (MIDA). Information received by the respondents on watershed restoration was mainly on establishment, maintenance, harvesting and marketing of trees and tree products; nursery establishment, wetland management and controlled tree cutting. These parameters were not significantly influenced by sex of the respondents (Table 2).

Table 2. Nature of information received vs. needed on Awoja watershed restoration, disaggregated by sex of respondents

	% response		X ²	P-Value
	Men (n=98)	Women (n=139)		
<i>Information received</i>				
Establishment of trees	9	10	0.56	0.464
Maintenance of trees	17	16	0.138	0.710
Harvesting of trees and tree products	29	30	0.353	0.552
Marketing of trees and tree products	28	31	0.780	0.77
Nursery establishment	42	41	2.14	0.143
Wetland management	42	42	0.062	0.803
Control tree cutting	42	42	0.708	0.400
<i>Information needed</i>				
Livestock farming	41.4	37.5	44.677	0.000***
Climate change	12.2	8.5	7.244	0.007**
Fruit tree growing	0.8	0.0	2.861	0.09

Significant at 1%; *Significant at 0.1%

The results also indicate that majority of the respondents 78.9% (41.4 % of male and 37.5% female) preferred information on livestock keeping, while 20.7% (12.2% of male and 8.5%) would have preferred information on climate change, and only 0.8% preferred information on fruit growing; with response to livestock keeping and climate change information influenced by the sex of the respondents, especially the male gender (Table 2; P<0.01). The respondents who preferred information on

livestock keeping and climate change were more likely to use information received on watershed restoration.

The findings show the reasons for preference of specific types of information by the respondents (Table 3). The main reasons mentioned for respondent preference of information on livestock keeping were livestock rearing being a main source of income. The other reasons were livestock keeping for cultural identity, as a key item used in paying bride price or dowry among the Iteso and a key traditional activity. The main reasons for the preference of information on climate change were to help them forecast the time of occurrence and mitigation of the effects of frequent droughts, floods, and hunger in the area attributed due to climate variability and change. Information on fruit growing was preferred mainly as an alternative source of income. Although preference of information on fruit growing was not significant, it is an opportunity that could be harnessed in the area since it shows great potential

Table 3. Reasons for respondent information expectation/needs on Awoja watershed restoration

Reason (s)	Sex		Total (%)
	Male (%)	Female (%)	
<i>Livestock keeping</i>			
Source of income	44.4	47.6	92.0
For cultural identity	52.4	0.0	52.4
Source of dowry	14.4	0.0	14.4
Main traditional activity	9.6	0.0	9.6
<i>Climate change</i>			
Detect occurrence and mitigate effects of drought	21.5	58.6	80.2
Detect occurrence and mitigate effects of floods	21.1	0.0	21.1
Detect occurrence and mitigate effects of hunger	8.0	13.5	21.5
<i>Fruit growing</i>			
Alternative source of income	0.4	0.0	0.4

Quality of information disseminated and farmers' responses on Awoja watershed restoration

There was a significant relationship between relevancy and household characteristics ($P \leq 0.000$); adequacy and household characteristics ($P \leq 0.002$); timely delivery of restoration information and household characteristics ($P \leq 0.000$); and presentation language and marital status of respondents of Awoja watershed (Table 4).

Respondents were most likely to use information on restoration since information received was deemed relevant, adequate and timely delivered to them from both intervention sites (Table 4). The unit of analysis was the household and specifically those that participated in interventions by either of the projects.

Table 4. Quality of information received and association with respondents' social demographic factors in Awoja watershed restoration n=237

Variables	Social demographic factors	x ²	Df	P-value	% respondents	
					FIEFOC 1	COBWEB
Relevancy	Household characteristics	22.654	3	0.000***	70.5	77.6
	Gender	2.511	3	0.473		
	Marital status	11.371	9	0.252		
	Education level	6.533	18	0.994		
Consistency	Household characteristics	3.377	3	0.337	-	-
	Gender	2.426	3	0.489		
	Marital status	11.531	9	0.241		
	Education level	9.123	18	0.957		
Adequacy	Household characteristics	14.547	3	0.002**	59.8	78.4
	Gender	6.629	3	0.085		
	Marital status	13.865	9	0.127		
	Education level	25.044	18	0.124		
Timeliness	Household characteristics	19.482	3	0.000***	51.8	28.8
	Gender	0.961	3	0.811		
	Marital status	6.027	9	0.737		
	Education level	20.334	18	0.314		
Presentation Language	Household characteristics	7.257	4	0.123	53.3	32.7
	Gender	5.885	4	0.208		
	Marital status	25.942	12	0.011*		
	Education level	11.419	24	0.986		

*Significant at 5%; ***Significant at 0.1%

About 77.6% of respondents from FIEFOC 1 and 70.5% in COBWEB restoration sites indicated that the quality of information received on restoration was relevant. More than half (59.8%) of the respondents from the FIEFOC 1 and 78.4% of COBWEB restoration sites agreed that the information disseminated was adequate, 51.8% of respondents in the FIEFOC 1 restoration intervention households and 28.8% from COBWEB indicated that information delivery was timely relayed. With regard to presentation language 53.3% of respondents in FIEFOC 1 and 32.7% in COBWEB restoration intervention households acknowledged that the presentation language used was simple to understand.

Channels for information sharing and dissemination on Awoja watershed restoration

Most respondents (65.8%) preferred receiving information on restoration of Awoja watershed through training, followed by radio (16.5%) (Fig. 2). The reasons mentioned for preference of receiving information through training were that it enhances interaction and active engagement between the trainers and respondents with immediate feedback and involves practical exercises. The reason for choice of radio is its availability and accessibility by the respondents.

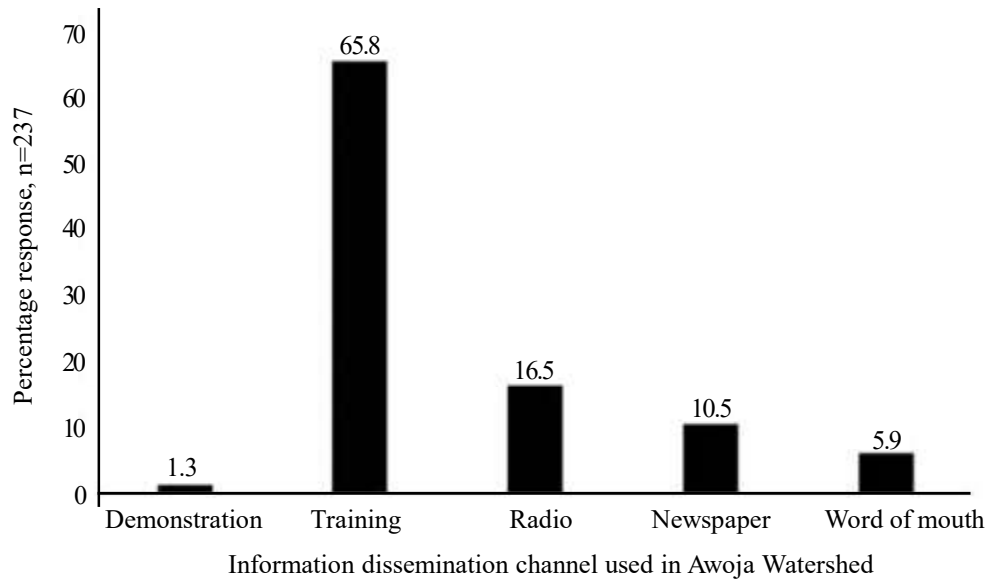


Figure 2. Respondents' preferred channels of information dissemination on restoration of Awoja watershed.

Discussion

Restoration of a degraded watershed like Awoja requires multiple sources of quality information for promoting restoration initiatives. Findings of this study show that usage of information in restoration of Awoja watershed varied between the sexes of the respondents in the cohorts of marital and education status. Chi-square tests found that residents' information quality and needs are influenced by formal education level. Male residents with advanced A-Level and Diploma certificates were more likely to use information received on restoration on Awoja watershed while married and widowed female residents were more likely to use information received on restoration of Awoja watershed. Even uneducated residents, especially females, who never attended any formal education were as likely to use the information received on restoration of Awoja watershed. This is strange because many studies have shown that individuals with higher levels of formal education are more likely to espouse pro-

environmental concerns (Van Liere and Dunlap, 1980; Hines *et al.*, 1986/1987; Schultz *et al.*, 1995; Olli *et al.*, 2001).

Results shows that the residents of Awoja watershed received information on watershed restoration mainly on tree establishment, maintenance, harvesting and marketing of trees, as well as on nursery establishment, wetland management and controlled tree cutting instead of information that would enable them to better manage their livestock, build resilience to climate change and grow more fruit trees to diversify their income as they wanted. Awoja watershed affects the daily lives of every one who is a resident in this watershed and provide a powerful wall of protection for household's socio-economic development. Data are scarce, but subjective understanding from this research is clear that Awoja watersheds are vital to the livelihoods of many households. Information on livestock farming especially on cattle was more preferred by residents here because livestock (cattle) very often act as safe nets which are relied upon by many households here to settle their household immediate needs and problems like dowry for their children, disputes settling, managing debts, medical bills and school fees for household members and their school going children. Livestock especially cattle farming is widely perceived here in Teso as well as with their neighbors Karamojong as a status symbol as opposed to crop farming which is often seen as an activity for the lazy people among the Teso Community (Ongodia, 2014). Similar findings by Akello *et al.* (2017) in Awoja watershed among the Iteso community also alluded to this.

Residents of Awoja watershed also wanted information on climate change issues such as an early warning system against unpredictable weather events that are prevalent in Teso (Uganda National Meteorological Authority, 2020). Climate change severely affects smallholder farmers in developing countries such as Uganda. Residents indicated that agriculture (crop and livestock) has been repeatedly impacted by climate change over the past two decades. Focus group participants and key informants also reinforced the individual farmer responses. The frequent long dry season, floods, and erratic rainfall are the main climate change parameters experienced in the greater Awoja watershed. Climate change is believed by the residents to exacerbate human and livestock diseases by changing environmental factors that lead to the growth and development of insects transmitting diseases to their livestock. Focus group discussants indicated that climate change being experienced in Awoja watershed was as a result of human activities such as excessive environmental and natural resource exploitation resulting from high population. Others think that climate change is an act of God, a punishment for human wrongdoing. As such resident wanted more information on climate change adaptation strategies and or coping mechanisms such as drought resistant food, cash and forage crops and seed varieties.

Preference for information related to fruit tree growing by the residents as reported in this study could be attributed to the desire by the local people to partly tap into fruit processing (TEJU) plant that is the government establishment under its wealth creation programmes in the Teso region (Operation Wealth Creation Report, 2023). Secondly, planting agroforestry fruits trees may serve as a sustainable climate-smart agriculture (CSA) initiative that would enhance the climate resilience of their farms within the watershed, reducing their greenhouse gas (GHG) emissions, and increasing their overall farm productivity. For instance, there were mentions in the FDGs that fruit trees on farms could improve the farm micro-climates and absorb carbon dioxide, a potent GHG that contributes to climate change. Fruit-bearing trees could too generate additional incomes for the resident farmers, improve on farm biodiversity, reduce soil erosion, and improve the capacity of soil to hold water.

Roger's adoption–diffusion theory (1983, 2003) advocates that people always rely on different sources of information during various stages of the diffusion process. Our finding also found that residents of Awoja watershed sources of information for watershed restoration were varied from government to non-governmental organisations. Residents appreciated the technical information these institutions provide towards promoting Awoja watershed restoration efforts. They spoke very highly of the technical staff of these organizations and that they usually provide them with information on time, and understood their watershed restoration and land management needs (e.g. importance of maintaining the productivity of watershed for grazing their livestock).

Previous research has found that preferred outreach methods from initiative such as the restoration of degraded watershed can include multiple types of outreach methods for similar types of audiences and that farm magazines and radio can be an important informational tool in reaching many people (Tucker and Napier, 2002). In addition, face-to-face discussions, training sessions and newspaper articles are also said to be important (Gamon *et al.*, 1998). Our study, also found that residents of Awoja watershed preferred a mixed of information dissemination channels such as watershed training workshops and presentations at different community events, radio, newspapers, demonstration tours and word of mouth. Watershed restoration training workshops and presentations at different community events was the most preferred outreach channel. Interviewed residents mentioned that they preferred training workshops and presentations because they are an effective means of producing innovative changes in practice as well as providing valuable technical information on watershed restoration and management practices. Moreover, the interviews also identified the value of personal engagement, especially in relation to meeting individual human needs, which are facilitated through the workshops. Those who preferred radio and newspapers over other methods mentioned that radio and newspapers are

quick, convenient and non-invasive methods of getting information. Word of mouth through friends, family and neighbors are also an important communication network for disseminating watershed restoration information because they are a highly trusted source of information. Few residents also explained that they like demonstration tours because it allows them a visual encounter with a restoration projects. Although our study provided valuable data on preferred outreach methods, the study did not correlate residents' preferences with their actual adoption of specific outreach restoration programs or activities.

In addition to the type of channel used, the quality of user information is crucial for the restoration of the watershed for the continued sustenance of healthy ecosystems and vibrant resident communities. The main characteristics of quality information are therefore relevancy, adequacy, consistency, timeliness and presentation language amongst others (Bovee, 2004). In this study, perception of adequacy, relevancy and timeliness of the information about Awoja watershed restoration initiatives were driven by resident household characteristics, whereas presentation language was uniquely influenced by the marital status of the residents. Relevancy of the restoration information received by the residents was to be very important in this study. To the residents, the information was perceived to be relevant if it can provide the needed feedback or predictive value and is also received in the right time in right format with adequate accuracy to affect decision making (timeliness). This perception is consistent with Mur *et al.* (2016) who opined that information is considered relevant to users if can address user needs, and is applicable, affordable, contextual, tailored to socio-economic and agro-ecological contexts of the users, timely delivered, and rendering itself to further experimentation and adaptation.

Timeliness/up-to-datedness of information on restoration efforts was regarded as being one of the most important by many residents in Awoja watershed. Information that arrives late was considered useless, even if it would otherwise satisfy the needs of the residents. The timeliness of information was considered critical not only in daily or other short-term decisions but also during strategic and long-term planning. Therefore, it is obvious that timeliness of the information source in providing appropriate information would certainly enhance the credibility of the information sources to the end users and in this way, utilization potential of the information source would be increased. Bovee (2004) in his empirical validation of the structure of an information quality model also underscored the value of information timeliness to the users.

Adequacy of the information received by the residents of Awoja watershed about the restoration initiations from the various information sources was also considered very important. During the focus group discussions, residents said that they always want to be provided with enough and complete information, and that they should not

be left wondering if there is more information yet to be provided. And that where possible, the information provided to them should fully address the purpose for which it is provided so that they can take the required restoration actions without delay, confusion or a reduction in productivity or motivation. Resident also said that where information provided to them cannot be completed in a single message, it should be made clear to them that there is more information yet to follow, with requisite when and how. Elsewhere, the importance of the adequacy of the information received by information users was too echoed by Kenfack-Essougong *et al.* (2019) in their study of “Can community-based organisations deliver adequate agricultural information to farmers? Evidence from rural resources centres in Cameroon”.

The language in which residents received the information on restoration initiatives of Awoja watershed was considered important too and was largely influenced by the marital status of the residents. Different people including married and unmarried ones often differ in their behaviors, attention, emotions, literacy and so they often receive and respond differently to information depending on the language and style in which it is packaged. It's important that information providers use appropriate language when packaging restoration information for the residents. During focus group discussions, residents noted that they always would prefer information packaged in their local languages not English for proper understanding. The importance of information packaging language for the end-users was also underscored by Khan *et al.* (2012) in their study of language as a tool for effective communication between farmers and change agents in Khyber Pakhtunkhwa, Pakistan. Khan *et al.* (2012) opined that languages are always tied to Agri-culture of the local people and that professional advice or information for development must always be given in the local language because people understand their mother language better than their other languages. That is particularly important for illiterate members of the community.

Conclusions

The findings show that sex of the respondents had a bearing on usage of the restoration information especially among the marrieds, widowed, A-level and diploma educated, and the respondents that did not get any formal education. There was a mismatch of the information needs of the residents in Awoja watershed and the information received. Whereas the residents received information on wetland and tree nursery management, establishment and maintenance of trees, controlled harvesting and marketing of trees and tree product, their information needs were mainly on livestock farming, how to detect occurrence and mitigate effects of climate change outcomes such as drought, floods and hunger, and how to integrate fruit tree growing in the farming landscapes within the greater Awoja watershed. Watershed restoration community trainings (workshops and presentations) events were the outstandingly preferred information

dissemination channel. Residents of Awoja watershed needed the restoration information provided to be relevant, adequate, timely and presented in a user-friendly language for eventual uptake.

Acknowledgments

We acknowledge financial support from Carnegie cooperation of New York through RUFORUM as well as Ms. Irene Apiny, Mr. Simon Anyuu and Mr. Awekonimungu for giving help during data collection process.

Compliance with ethical standards

Conflict of interest: The Authors declare that they have no conflict of interest whatsoever in this study.

References

- Aben, C., Okiror, J. J., Agea, J. G. and Hansen, E. F. 2019. Influence of social cultural factors on management of resources in Awoja Watershed. *American Journal of Climate Change* 08(03):343–363. <https://doi.org/10.4236/ajcc.2019.83019>
- Akello, S. 2017. Restoration of degraded watersheds: The case of Awoja, eastern Uganda, PhD Dissertation, Makerere University, Kampala, Uganda.
- Ali, Z., Khan, A. M., Tatlah, I. A., Amin, M., Dogar, A. H. and Saleem, K. 2014. School
- Amin, M.E. 2005. Social Science Research: Conception, Methodology and Analysis. Makerere University Press, Kampala.
- Berkes, F. 2009. Evolution of co-management: Role of knowledge generation, bridging organizations and social learning. *Journal of Environmental Management* 90(5):1692–1702. <https://doi.org/10.1016/j.jenvman.2008.12.001>
- Blau, P. M. 1964. Justice in social exchange. *Sociological inquiry* 34(2):193-206.
- Blau, P, 1964. Exchange and power in social life, New York: Wiley
- Bovee, M. W. 2004. Information quality: A conceptual framework and empirical validation. University of Kansas.
- Cheserek, G. 2005. Indigenous knowledge in water and watershed management/ : ‘ Marakwet’ conservation strategies and techniques. *Topics of Integrated Watershed Management* 3:25–33.
- Cruz, R. V. O. 2010. *Policy Brief Series* 2010 - 2. 2.
- Darghouth, S., Ward, C., Gambarelli, G., Styger, C. and Roux, J. 2008. Watershed management approaches, policies, and operations: Lessons for scaling up

- watersector board discussion paper series, Paper 11 The World Bank, Washington, DC.
- Daudu, S., Chado, S. S. and Igbashal, A. A. 2021. Information needs of women subsistence farmers in the Dlangubo village, South Africa. *Libri*, 71(4):361–373. <https://doi.org/10.1515/libri-2020-0007>
- De Leeuw, J. 2016. Trees and watershed management in Karamoja, Uganda: Evidence on demand. climate & environment, infrastructure and livelihoods. *A quick desk study commissioned by DFID Uganda*.
- Eberle, M. and Luehring, P. 2013. *An approach for assessing and improving watershed condition. USDA Forest Service Watershed Condition Framework*.
- Emerson, R. 1972. Power-Dependence Relations, *American Sociological Review* 27(1): 31-41.
- Gammon, D., Sorlie, T., Bergvik, S. and Hoifodt, T.S. 1998. Psychotherapy supervision conducted via videoconferencing: A qualitative study of users' experiences. *Nordic Journal of Psychiatry* 52:411-421.
- German, L., Mansoor, H., Alemu, G., Mazengia, W., Amede, T. and Stroud, A. 2005. Participatory integrated watershed management: Evolution of concepts and methods authors. In: *International Centre for Research in Agroforestry*.
- Giri, S., Nejadhashemi, A.P. and Woznicki, S.A. 2012. Evaluation of targeting methods for implementation of best management practices in the saginaw River watershed. *J. Environ. Manag.* 103:24-40.
- Government, N. D. L. 2015. *Ngora District Development Plan 2015/16 - 2019/20* (Issue November 2015).
- Hines, J. M., Hungerford, H. R. and Tomera, A. N. 1986/1987. Analysis and synthesis of research on responsible environmental behavior. *Journal of Environmental Education* 18(2):1-8.
- Homans, G. 1958. 'Social behavior as exchange'. *American Journal of Sociology* 63 (6): 597-606.
- Ingoldsby, B.B. and Smith, S. 1995. *Families in multicultural perspective*. New York: The Guilford Press.
- Kenfack- Essougong, U. P., Fongang - Fouepe, G. H. and Degrande, A. 2019. Can community-based organisations deliver adequate agricultural information to farmers? Evidence from rural resources centres in Cameroon. *Information Development* 35(3):435-446. <https://doi.org/10.1177/0266666918754937>
- Kerlinger, F. N. and Rint, N. 1986. *Foundations of behaviour research*. (R. and W. Holt (ed.)
- Khan, M. and Hussain, F. 2012. Palatability and animal preferences of plants in Tehsil Takht Nasrati, District Karak, Pakistan. *African J. Agricult. Res.*, 7(44): 5858-5872.

- Krejcie, R. V. and Morgan, D. W. 1970. Determining sample size for research activities. *Educational and Psychological Measurement* 30(3):607–610. <https://doi.org/10.1177/001316447003000308>
- Leslie, H. M. and McLeod, K. L. 2007. Confronting the challenges of implementing marine ecosystem-based management. *Frontiers in Ecology and the Environment* 5(10):540–548. <https://doi.org/10.1890/060093>
- MoWE. 2013. *The National Forest Plan 2011/12 – 2021/22. January*, 118.
- Mustonen, T. 2013. Oral histories as a baseline of landscape restoration - Co-management and watershed knowledge in Jukajoki River. *Fennia* 191(2):76–91. <https://doi.org/10.11143/7637>
- Mur, R., Oonk, L. and Bitzer, V. 2016. Quality of content in agricultural extension. KIT Working Paper 2016:2.
- Mutekanga, F. P., Kessler, A., Leber, K. and Visser, S. 2013. The use of stakeholder analysis in integrated watershed management. *Mountain Research and Development* 33(2):122–131. <https://doi.org/10.1659/MRD-JOURNAL-D-12-00031.1>
- Napier, T.L. and Napier, A.S. 1991. Perceptions of conservation compliance among farmers in a highly erodible area of Ohio, J. *Soil Water Conservation* 48 (3): 220–224
- Nyssen, J., Haile, M., Naudts, J., Munro, N., Poesen, J., Moeyersons, J., Frankl, A., Deckers, J. and Pankhurst, R. 2009. Desertification? Northern Ethiopia re-photographed after 140 years. *Science of the Total Environment* 407:2749–2755. <https://doi.org/10.1016/j.scitotenv.2008.12.016>
- Okwu, O. J. and Daudu, S. 2011. Extension communication channels' usage and preference by farmers in Benue State, Nigeria. *Journal of Agricultural Extension and Rural Development* 3(5):88–94.
- Ongodia, S.P. 2014. Oral narrative an under utilised tool of transformation: The case of Ateso folk tales in Iteso communities of Uganda and Kenya. *Journal of Literature and Art Studies* 4(10):767-783.
- Operation wealth creation report. 2023. Orange growing in Uganda – Soroti Fruit factory.
- Palmer, M. A. 2009. Reforming watershed restoration: Science in need of application and applications in need of science. *Estuaries and Coasts* 32(1):1–17. <https://doi.org/10.1007/s12237-008-9129-5>
- Parlee, B. 2011. *Traditional knowledge overview for the Athabasca River Watershed: Contributed to the Athabasca Watershed Council State of the Watershed Phase 1 Report*. 1–57.
- Rogers, E. M. 1983. *Diffusion of innovations* (3rd Ed). New York: The Free Press.
- Rogers, E. M. 2003. *Diffusion of innovations* (5th edition). New York: Free Press.
- Salas, M., Camacho, K., Staiger-Rivas, S., Villa, C., Ferguson, J. and Cummings, S. 2008. Editorial: Knowledge sharing and knowledge management in Latin

- America and the Caribbean (Part II). *Knowledge Management for Development Journal* 4(1):2–4.
- Schultz, P. W., Oskamp, S. and Mainieri, T. 1995. Who recycles and when-A review of personal and situational factors. *Journal of Environmental Psychology* 15(2): 105-121.
- Tucker, M. and Napier, T.L. 2002. Preferred sources and channels of soil and water conservation information among farmers in three Midwestern U.S. watersheds. *Agriculture, Ecosystems and Environment* 92: 297-313.
- Tukwatanise, B. 2023. Deforestation in Uganda: Causes and recommendations. *May 2023*
- Uganda Bureau of Statistics. 2018. Statistical Abstract Information on: Environmental, Demographic, Socio-economic, Production and Macroeconomic sectors. *Statistical Abstract, October*, 353.
- Uganda National Meteorological Authority, 2020. Climate change trends in Uganda.
- US. EPA, 2012. What is a watershed? <http://water.epa.gov/type/watersheds/whatis.cfm>
- Van Liere, K. D. and Dunlap, R. E. 1980. The social bases of environmental concern: A review of hypothesis, explanations and empirical evidence. *Public Opinion Quarterly* 44:181-199.
- Verdone, M. and Seidl, A. 2017. Time, space, place, and the Bonn Challenge global forest restoration target: Bonn Challenge global forest restoration target. *Restoration Ecology* 25(6). DOI: 10.1111/rec.12512
- Vidanapathirana, N. P. 2012. Agricultural information systems and their applications for development of agriculture and rural community: A review study. *The 35th Information Systems Research Seminar in Scandinavia-IRIS, 2000*, 1–14.
- Wilson, A. G. 1997. Factors influencing farmers participation in the environmentally sensitive area scheme. *Journal of Environmental Management* 50:67-93. London, U.K.
- World Bank. 2013. *Development of the Awoja Catchment Management Plan in the Kyoga Water Management Zone; Contract: 7164726. Final Stakeholder Engagement Report.*
- Wyborn, C., Jellinek, S. and Cooke, B. 2012. Negotiating multiple motivations in the science and practice of ecological restoration. *Ecological Management & Restoration* 13(3):249–253.