UNIVERSITY OF CAPE COAST

DETERMINANTS OF HOUSEHOLD PARTICIPATION IN RURAL WATER SUPPLY DELIVERY IN WEST MAMPRUSI DISTRICT, NORTHERN REGION

GODFRED YELEWERE

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BY

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DISSERTATION SUBMITTED TO THE INSTITUTE FOR DEVELOPMENT STUDIES OF THE FACULTY OF SOCIAL SCIENCES, UNIVERSITY OF CAPE COAST IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF ARTS DEGREE IN ENVIRONMENTAL MANAGEMENT AND POLICY

AUGUST, 2014

DECLARATION

Candidate's declaration

I hereby declare that this dissertation is the result of my own original research and that no part of it has been presented for another degree in this University or elsewhere.

Candidate's name: Godfred Yelewere

Candidate's signature……. Date……

Supervisor's declaration

I hereby declare that the preparation and presentation of the dissertation were supervised in accordance with the guidelines on supervision of dissertations laid down by the University of Cape Coast.

Supervisor's name: Emmanuel Yamoah Tenkorang

Supervisor's signature…….. Date…….

ABSTRACT

The study sought to assess the determinants of household participation in the operation and maintenance of boreholes provided by World Vision Ghana (WVG) in the overseas area of the West Mamprusi District in the Northern Region. The study was carried out in three communities namely, Loagri No.1, Yagba and Kubori with populations ranging from 500 to 900 people, which have been provided with more than 4 boreholes since the inception of the project in the overseas area of the district in 2000.

A semi-structured household questionnaire was used to collect self-reported data from 150 households. The study found a statistically significant relationship between cash contributions as a dependent variable for household participation in water service delivery and two explanatory (independent) variables (sex of the respondent and household size). This suggests that sex (gender) and household size may be strong predictors of households' willingness to participate towards the operation and maintenance of rural improved water sources.

On the basis of this finding, the study recommends that the District Assembly, as the local government authority, adopt innovative engagement strategies with various identifiable community stakeholders in order to achieve long-term participation of households for ensuring the sustainability of improved water sources.

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DEDICATION

This dissertation is dedicated to a brother; friend and my academic mentor,

Sumaila S. Saaka.

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LIST OF ACRONYMS

ADP	Area Development Programme/World Vision
COM	Community Ownership and Management
CWSA	Community Water & Sanitation Agency
DA	District Assembly
DHS	Demographic and Health Survey
GDHS	Ghana Demographic and Health Survey
GHS	Ghana Health Service
GRWP	Ghana Rural Water Project (World Vision)
GSS	Ghana Statistical Service
GOG	Government of Ghana
HH	Household
ICF	Inner City Fund
MICS	Multiple Indicator Cluster Survey
MDGs	Millennium Development Goals
MWRWH	Ministry of Water Resources Works and Housing
NGO	Non-Government Organization
NCWSP	National Community Water and Sanitation Programme
PHC	Population and Housing Census
SDM	Service Delivery Model
SPSS	Statistical Package for Social Science
WATSAN	Water and Sanitation
WHO	World Health Organization
WRC	Water Resources Commission

WSMP	Water and Sanitation Monitoring Platform/Ghana
WVG	World Vision Ghana
WV	World Vision
WVI	World Vision International

CHAPTER ONE

INTRODUCTION

Background to the study

Despite many decades of sustained efforts by governments, donors and non-governmental organizations (NGOs) to provide safe water supplies and sanitation services to the world's increasing population, universal access may not be achievable any time soon to stimulate economic development and poverty reduction (Montgomery, Bartram& Elimelech, 2009). Access to improved water and sanitation is important because it is the basis for healthy communities, and results in significant health, economic, and socio-economic development (Hutton, Haller& Bartram, 2007; Montgomery & Elimelech, 2007; Bartram, Lewis, Lenton& Wright, 2005). However, about 900 million people worldwide and 320 million people in Sub-Sahara Africa, 85 percent of whom are rural dwellers, have no access to safe and reliable water supply (MacDonald, Davies & Calow, 2008; cited in Adugbire, Kuma, Suglo& Nartey, 2010; UNICEF& WHO, 2008). In addition, 2.5 billion people live without access to improved sanitation, majority of them live in rural communities in Africa (UNICEF& WHO, 2008).

However, it has been established that no any single intervention is more likely to have a significant impact on global poverty reduction than making safe water accessible to as many people as possible (Schuster-Wallace, Grover, Adeel, Confalonieri& Elliott, 2008). Access to improved water and sanitation is central to the attainment of all the Millennium

Development Goals (MDG) targets, including the goal of a 50 percent reduction in the proportion of people without sustainable access to safe drinking water and basic sanitation by 2015 (Schuster-Wallace et al., 2008). It is also well documented that improved access to clean water would significantly reduce diarrhoea and waterborne diseases, and that the transition from unimproved to improved sanitation is accompanied by more than a 30 percent reduction in child mortality (Montgomery & Elimelech, 2007; Fewtrell, Kaufmann, Kay, Enanoria, Haller& Colford Jr, 2005; Esrey, Anderson, Hillers& Sawyers, 2001).

In addition, rural women and girls in particular stand to benefit significantly from improved access to safe water and sanitation. Women and girls are the "water haulers" of the world. It is estimated that on average, women and girls in developing countries walk six (6) kilometres a day, carrying 20 litres of water, greatly reducing the time they have for other productive work or to attend school (UNICEF, n.d). Nauges and Strand (2011) have established a statistically significant relationship between water hauling time and girls' school attendance in Ghana. They reported that a 15-minute reduction in collection time increases proportion of girls attending school by 8 to 12 percent.

The national safe water coverage of Ghana is impressive as compared to sub-Sahara Africa, which stands at an overall coverage of 60 percent with rural and urban coverage at 47 percent and 83 percent respectively. As of 2008, the national coverage was estimated at 82 percent, with a rural coverage of 74 percent and urban coverage about 90 percent (WHO/UNICEF, 2010), though these figures appear to contradict official government figures. For

instance, the Community Water and Sanitation Agency (CWSA), based on its standard measurement criteria and definitions estimated rural and small town water supply coverage at 58.9 percent as at the end of 2009 (Ministry of Water Resources, Works and Housing [MWRWH], 2009). This notwithstanding, Ghana is on track to meeting or even exceeding the MDG target for use of improved drinking water, which is 78percent, (WSMP/Ghana, 2009). This feat has been achieved through the collective work of government and its international and local development partners over the years to improve access to potable water, which is critical to achieving better health gains as well as productive workforce that will ultimately translate into rapid socio-economic development and poverty reduction.

However, some sector players are worried that though meeting the MDG target for improved water supply in Ghana is feasible, progress may be stalled by the unavailability of resources to meet the cost of sustaining the facilities, particularly in the rural areas (Ghana Integrity Initiative, 2011; Harvey, 2004). High rates of waterpoints disrepair have been reported across Sub-Saharan Africa. In a survey of 11 countries on the continent, the percentage of functioning water systems in rural areas ranged from 35–80 percent (Sutton, 2005). Though in Ghana national figures on waterpoints functionality are unavailable, case studies report functionality of boreholes varying from 42 percent to 90 percent (Bakalian and Wakeman, 2009; Skinner, 2009). Skinner (2009:1) argued that a significant number of rural water infrastructure in Africa failed, often a few years after reconstruction, "for a simple and avoidable reason: lack of maintenance", partly due to lack of

community participation in operation and maintenance after a project had ended.

The absence of effective and efficient operation and maintenance mechanisms for boreholes, wells and hand pumps for sustainability has been identified as a major challenge to the provision of reliable access to safe drinking water from underground sources in Ghana (Adugbire et al., 2010). Prior to the launch of the National Community Water and Sanitation Programme (NCWSP) in 1994, many rural water point sources could not be sustained due to non-payment of tariffs by beneficiary communities resulting in little or no maintenance and rural potable water access was abysmally low at 30 percent in the early 1990s (MWRWH, 2009).

For instance, Harvey and Reed (2007: 375) argued that “although community participation remains indispensable for sustainable rural water provision in Africa”, community management is not the panacea, but can only become sustainable with appropriate institutional support, which is currently lacking in most cases, thus explaining the low rural water supply sustainability levels in most African countries, where community management has become the dominant model. Skinner (2009) reported that a survey conducted by the Global Water Initiative (GWI) found that 58 percent of water points in northern Ghana needed repair. Skinner summed it all by noting that, "the water community has often focused on building infrastructure, rather than on maintaining it. This failure is forcing women and children to carry water over great distances with serious impacts on their health and education," and then concluded, “it is not enough to drill a well and walk away. Water projects

needs to support long term maintenance needs and engage local communities. Without this, it is like throwing money down the drain."

Problem statement

Ghana is well endowed with surface and ground water resources. The Country's total actual renewable water resources are estimated to be 53.2 billion m^3 per year, although water quantity and quality is decreasing in recent years due to climate change, rapid population growth, increased environmental degradation and surface water pollution (Water Resources Commission of Ghana [WRC], 2011a). The Volta River basin system, with a catchment area within Ghana of nearly 70 percent of the country's landmass, is by far the largest river draining the entire northern, central and eastern parts of the country. The remaining rivers, all in the south and southwest, drain about 30 percent of the country (WRC, 2011b). There is abundant groundwater in the Mesozoic and Cenozoic sedimentary rocks and in the sedimentary formations underlying the Volta basin. As a result, about 52 percent of rural communities get their potable water supply mainly from groundwater resources (Gyau-Boakye & Dapaah-Siakwan, 1999). Despite, the abundance of groundwater resources, many rural communities still lack access to improved water sources estimated at 22 percent in 2008 (Ghana Statistical Service [GSS]/Ghana Health Service [GHS]/ICF Macro, 2009).

Thus, with the establishment of the CWSA by an Act of Parliament, Act 564 in 1998 to implement the NCWSP, Ghana adopted a decentralized community ownership and management (COM) approach to rural water delivery at the district and community levels aimed at ensuring the sustainability of facilities through active beneficiary participation, ownership

and management. With the collaboration of sector stakeholders, policies and strategies have been put in place to guide the implementation of the NCWSP. Donors and their implementing partners like World Vision International (WVI) also require borehole beneficiaries to contribute either in kind or cash to facility provision. Again, this requirement is meant to ensure that the beneficiary communities and households have a keen interest in the water facility and will therefore manage it sustainably when provided. However, in recent years, some sector stakeholders have started questioning the effectiveness of the decentralized COM approach to rural water supply.

The question then is how water projects can engage local communities and households meaningfully to ensure that they assume ownership in the management for long term sustainability of their improved water supply sources. Is it to put in place mechanisms to ensure that water users pay the required user fees regularly and promptly? What if the water user fee is too high for local people to afford and there are no systems in place to support poor people on long term basis to afford water for their basic needs. In such a situation, would people resort to alternative water sources (unimproved) for drinking and other domestic purposes, which are cheaply available? Beyond the inability to pay for improved water supply systems, what other support mechanisms are needed to facilitate effective households and communities' participation in the operation and maintenance of their improved water sources. Answers to these questions are critical to government and its development partners in an attempt to find workable solutions to improving community and households' participation as one of the means towards

sustaining gains achieved to improve rural water supply delivery in line with MDG targets and beyond.

Objectives of the study

The general objective of the research was to assess the determinants of household participation in rural water supply service delivery provided by World Vision Ghana in three communities in West Mamprusi District of Northern region.

Specific objectives

Specifically the study sought to:

- Assess household water use practices.
- Identify barriers that prevent households from participating fully in managing community improved water sources.
- Assess attitudes of households towards protection of community improved water sources.
- Determine the monetary and non-monetary contributions of households towards the improved water sources operation and maintenance
- Determine the role of education and community mobilisation towards enhancing household participation.

Research questions

- To what extent do household water use practices influence user's willingness to participate effectively in managing improved water sources?

- What are the barriers to household members' participation in managing community improved water sources?
- What are the prevailing attitudes of water users towards the protection of community improved water sources?
- What is the contribution of households towards the operation and maintenance of improved water sources?
- What role does water user education and community mobilisation play towards enhancing household participation and maintenance of improved water sources?

Significance of the study

World Vision Ghana's rural water delivery approach is in line with the government's decentralised COM policy. After drilling and installation of hand pumps, facilities are handed over to the Districts Assemblies (DAs) and Water and Sanitation (WATSAN) Committees formed at the community level for day-to-day operation and maintenance. WVG may continue to support communities through building capacities in repair and maintenance during the lifespan of an Area Development Programme (ADP), which is often about 15 years. However, what happens afterwards? This study is an attempt to assess the determinants of household participation in waterpoints management for sustainability within WVG intervention communities. Previous studies on WV/GRWP point sources had focused on the technical aspects (Harvey, 2004). This study fills the gap in looking at the social or human factor dimensions of managing water points sustainably.

As noted by Skinner (2009), there cannot be enough justification for rushing to meet rural water supply MDG targets through the provision of new

facilities without paying much attention to supporting sustainable maintenance of older systems. Therefore, as there is the need to strengthen community participation and management structures to ensure sustainability, the findings of this study will aptly fill in the vacuum.

Limitations of the study

The focus of this study is on rural water supply in three communities in the overseas area of the West Mamprusi District of Northern Ghana where WVG has provided boreholes fitted with hand pumps and wells. The definition of a rural community for provision of an improved waterpoint (borehole) is based on the CWSA definition of a community with not more than 5000 inhabitants (GOG, 1998). Rural sanitation and hygiene promotion have not been part of this study for convenience, even though sanitation, hygiene and water supply are bed fellows and are often discussed together. The study communities – Loagri No.1, Kubori and Yagba – were purposively chosen as WVG intervention areas in and therefore the results cannot be generalised to cover all communities in the district. Data was collected during the rainy season May/June and reported water use practices would differ from the dry season. Data was collected through the use of structured quantitative questionnaire and a waterpoint checklist among elder female household members.

CHAPTER TWO

LITERATURE REVIEW

Introduction

This chapter reviewed relevant literature on the subject matter. Some concepts were defined and explained where necessary. The review also covered models for improving safe water delivery in rural communities, the role of user participation in safe water delivery and user willingness to contribute towards improved water services either in cash or labour in operations and maintenance.

Access to improved water sources

WHO and UNICEF established the Joint Monitoring Programme (JMP) for Water Supply and Sanitation aimed at monitoring access to water and sanitation at the international level in line with the MDG goals. JMP data sets have national coverage and provide information on the population with access to an improved water supply; i.e. available from some type of technology (household connection, public standpipe, borehole, protected dug well, protected spring or rainwater collection). According to the JMP definitions, a "not improved" water supply is from an unprotected spring or well, vendor-provided water, or tanker truck-provided water. The JMP also defined "reasonable access" as the availability of water at least 20 litres (five gallons) per person/day from a source within one km of the user's dwelling (WHO/UNICEF, 2000). The definition makes allowance for other locally-defined technologies (UNICEF& WHO, 2008). The JMP definitions and standards are for international comparisons in line with the MDG target for

safe water and sanitation delivery. However, definitions and standards of improved sources and access may be context and country specific (WHO/UNICEF, 2000). The CWSA defined access to safe drinking water in rural Ghana to include supplies from boreholes delivering a minimum of 20 litres per person/day, serving at least 300 persons each within 500 meters of households being served (CWSA, 2007). The CWSA definition of access to safe water supply and delivery was adopted for this study.

Rural water supply service delivery models in Ghana

A rural water supply service delivery model (SDM) for the purpose of this study is an agreed description of a type or level of service, the system providing the service and the management model including the functions and legal instruments necessary for the SDM to function (IRC & Aguaconsult, 2011).

Access to improved water points in rural sub-Saharan Africa are among the lowest in the world. With only three years to the MDGs targets, about 278 people on the continent still lack access (WHO/UNICEF, 2010). Several factors have been cited for the low levels of access to improved rural water supply in developing countries, including inappropriate system designs, poor management of improved sources, rent-seeking behaviours and limited institutional capacity (Marks & Davies, 2011). In addition, communities often have serious challenges in sustaining operation and maintenance of water supply facilities over their design lifespan (Braimah & Fielmua, 2011; Binder, 2008; Komives, 2008). These and other reasons informed international demands for rural water and sanitation service delivery reforms, beginning in

the early 1990s. Ghana and many other Sub-Saharan Africa countries thus adopted various decentralised participatory rural water supply service delivery models to improve efficiency and sustainability. The essential role participatory approaches play to galvanise a sense of ownership for water delivery systems among direct beneficiaries and by extension ensure users' commitment to long term operation and maintenance has been widely acknowledged (Skinner, 2009; Binder, 2008; Narayan, 1995). In Ghana, the main rural water supply SDM is the CWSA point source SDMs managed by Water and Sanitation (WATSAN) Committeesbased on the concept of community ownership and management (COM). Other emerging SDMs are the NGO implemented point sources and small mechanised systems (IRC & Aguaconsult, 2011). In the context of this study, two models are of importance; the CWSA/WATSAN point sources management model and the NGOs point sources model.

CWSA/WATSAN service delivery and management model

At the lowest local level, gender balanced WATSAN committees consisting of five to nine members are formed to manage point sources. They are assisted by District Water and Sanitation Teams (DWSTs), comprised of staff of the District Assembly and its relevant decentralized departments. WATSANs generally manage point sources such as hand-dug wells; boreholes fitted with pumps, and mechanized boreholes for settlements with a population between 75 and 2,000 (IRC and Aguaconsult, 2011; CWSA, 2007). In some cases, WATSANs may also manage mechanized systems that serve sections of a community or a number of small communities. Under such arrangements,

members of the different WATSANs may constitute a Water and Sanitation Development Board (WSDB). In theory, the WATSANs are responsible for operation and maintenance of their water facilities, and they are expected to collect user fees to pay for maintenance. They are also expected to contribute up to 5 percent of total capital cost of service delivery (Sun, Asante & Birner, 2010).

Sun et al., (2010) noted that in practice, the WATSAN model is not without challenges. For instance, Braimah and Fielmua (2011), in a survey reported that the biggest challenge of WATSAN/WSDBs was how to ensure regular payment for O&M of waterpoints. Their study revealed that having paid the 5 percent capital cost contribution, community members were convinced that they had met their obligations and therefore expect to fetch water free until the system is broken down before any payment demands are made on them again. In addition, Braimah and Fielmua (2011) reported that the ineffectiveness of WATSANs in managing rural water points could also be due to "lack of interest or weak community participation in the selection of committee members, lack of transparency in the operation of WATSAN/WSDB and the failure of the committees to account to the community members", concluding that this challenge "affects the willingness to pay for sustainable services delivery which the COM concept seeks to achieve" (p.84).

NGO point source service delivery and management model

Within the last three decades many point sources have been provided in poor and remote rural communities, under bilateral donor agreements, by

international and local nongovernmental organizations (I-NGOs) in order to increase coverage of safe water supplies. These were and are still managed under different approaches, which may not necessarily be the same as the standards set by CWSA (IRC & Aguaconsult, 2011). One such International Non-governmental Organization (INGO) that has made substantial investments in rural potable water delivery in Northern Ghana is World Vision (WV). The service delivery model of WV is that target communities benefitting the potable water point sources are selected by World Vision in consultation with the District Assembly and Community leaders.

Sources of household water supply in northern Ghana

Even though about 79 percent of all households had access to improve water sources in Ghana (Ministry of Health, Ghana Statistical Service, Measure DHS/Macro International, 2008), there are wide disparities between regions and within regions (urban vis-à-vis rural areas). UNICEF/WHO analysis of the 2006 Ghana Multiple Indicator Cluster Survey (MICS) data indicated that only four percent of the rural population in Ghana had "house connections" (this includes: water piped water into house, yard or plot or sachet water), as opposed to 38 percent in urban areas (UNICEF& WHO, 2008). People living in Northern Ghana and in rural households are less likely to have access to any improved water source than urban households and people living in Southern Ghana (Ministry of Health, Ghana Statistical Service, Measure DHS/Macro International, 2008). Unprotected water sources such as dams (dugouts), reservoirs, streams, rivers, seasonal ponds and shallow wells appear to be the main sources of drinking water for many rural communities in the Northern Region (Johnson, 2007, Peletz, 2006,). In a self-

reported survey, Peletz (2006) reported that more than half (56%) of the population in the region does not have access to an improved water source. Water from unimproved sources is usually contaminated by both human and animal excreta and therefore poses disease risks to people.

The context of participation

The terms participation, involvement, and engagement are used interchangeably "to denote a process by which individuals and groups come together in some way to communicate, interact, exchange information, provide input around a particular set of issues, problems, or decisions, and share in decision-making to one degree or another" (Ashford &Rest, 1999: III-3). For this study household participation refers to a process by which rural households come together to contribute toward the operation and maintenance of improved water supply point sources.

A review of the literature on ways in which participation is viewed in different interventions revealed multiple conceptions of participation. Pretty, Guijt, Scoones, & Thompson (1995: 60), for example, argue that the term participation has been used to build local capacity and self-reliance, but also to justify the extension of control of the state. It has been used to devolve power and decision making away from external agencies, but also to justify external decisions. It has been used for data collection and also for interactive analysis. But more often than not, people are dragged into participating in operations of no interest to them, in the very name of participation.

This is an indication of the diverse ways in which the concept is being used and practised under different circumstances. An understanding of the

concept as discussed in the next sections will serve to provide some perspectives of the process and the dynamics involved in it.

Participation 'as means' or 'as end'

One of the common distinctions made by scholars and development practitioners is that of 'participation as a means' and 'participation as an end'. Participation as means implies the use of participation to achieve some pre-determined goals, which may or may not be compatible with the needs of the participants. It is a way of harnessing rural people's physical, economic and social resources to achieve the aims and objectives of development programmes and projects more efficiently, effectively or cheaply (Samah & Aref, 2011; Oakley, 1991).

Participation as an end is seen as an active, dynamic and genuine process which unfolds over time and whose purpose is to develop and strengthen the capabilities of rural people to intervene more directly in development initiatives (Oakley, 1989). As an end, participation is viewed as a process in which individuals and communities are directly and genuinely involved in shaping, deciding and taking part in the development process from the bottom-up (Samah & Aref, 2011). The proponents of this view often maintain that development for the benefit of the poor cannot occur unless the poor themselves control the process, thus leading to meaningful participation. It is argued that by establishing a process of genuine participation, development will occur as people are given the chance to formulate their own development initiatives or have a major say in the decision-making process regarding projects initiated by outsiders (Samah & Aref, 2011). Table 1

provides a comparative analysis which summarises the differences between these two concepts.

Table1: Summary of participation as means vs. participation as end

Participation as means	Participation as end
• It implies use of participation to achieve some predetermined goals or objectives.	• Attempts to empower people to participate more meaningfully.
• It is an attempt to utilise the existing resources in order to achieve the objectives of programmes/projects.	• The attempt is to ensure the increased role of people in development initiatives.
• The stress is on achieving the objective and not so much on the act of participation itself.	• The focus is on improving the ability of the people to participate rather than just in achieving the predetermined objectives of the project.
• It is more common in government programmes, where the main concern is to mobilise the community and involve them in improving of the delivery system.	• This view finds relatively less favour with the government agencies. NGOs in principle agree with this viewpoint.
• Participation is generally short term.	• Viewed as a long term process.
• Appears to be a passive form of participation.	• Relatively more active and long term.

Adapted from: Oakley (1989).

Levels of participation

Development agencies and authors distinguish different dimensions, spaces, degrees and levels of participation. The typology of participation (see Table 2), which positions participation on a seven step ladder is useful in analysing these degrees (Brett, 2003; Pretty, 1995; Pretty et al., 1995; Wilcox, 1994). Comparing these levels with the 'participation as means and ends' analysis shown in Table 1, the first four levels on the ladder can be interpreted as 'participation as means' while the last three levels fall under 'participation as an end'. Some suggest that the 'manipulation' which is often central to types one to four implies that they should be seen as types of 'non-participation' (Pretty, 1995).

Brett (2003:5) conceptualises these levels in terms of 'weak and strong participation'. According to Brett (2003), weak participation involves "informing and consulting" while strong participation means "partnership and control". Brett argues that, in practice agencies managing complex projects find it hard to move from the 'weak end' of the continuum and tend to assume that, intended beneficiaries will be consulted during the project design to take into account their felt needs and aspirations. Wilcox (1994) cautions that, information giving and consultation are often presented as participation leading to disillusionment among community interests.

However, the problem with levels of participation is that they do not imply a step-by-step process, so most development organisations operate simultaneously in a wide range of participatory modes (Oakley, 1991). One level on the continuum is not necessarily better than any other level, and appropriate levels are used at different times and contexts to meet the

expectations and interests of different stakeholders (Wilcox, 1994). Oakley (2001) in an analysis of three development projects in Ghana observed that community participation may sometimes be used purely for administrative expediency without the intention of transferring real power or empowering people and making their voices count. In another study of Malawi Social Action Fund (MASAF) projects, Dulani (2003) concluded that, the level of community participation was limited to being informed on what had already been decided by other key players such as chiefs, which implied "passive participation by consultation".

Table 2: Typology of participation

Level	Characteristics of each type
1. Passive participation	People participate by being told what is going to happen or has already happened. It is a unilateral announcement by leaders or project management without listening to people's responses or even asking their opinion.
2. Participation in information giving	People participate by answering questions posed by extractive researchers using questionnaire surveys or similar approaches. People do not have opportunity to influence proceedings, as the findings of the research are neither shared nor checked for accuracy.
3. Participation by consultation	People participate by being consulted, and external people listen to views. These external professionals define both problems and solutions, and may modify these in light of people's responses. Such a consultative process does not concede any share in decision-making, and professionals are under no obligation to take on board people's views.
4. Participation for material incentives	People participate by providing resources, for example labour, in return for food, cash or other material incentives. It is very common to see this called participation, yet people have no stake in prolonging activities when the incentives end.

5.	Functional participation	People participate by forming groups to meet predetermined objectives related to the project, which can involve the development or promotion of externally initiated social organisation. Such involvement does not tend to occur at the early stages of project cycles or planning, but rather after major decisions have been made. These institutions tend to be dependent on external initiators and facilitators, but may become self-dependent.
6.	Interactive participation	People participate in joint analysis, which leads to action plans and the formation of new local institutions or the strengthening of existing ones. It tends to involve interdisciplinary methodologies that seek multiple perspectives and make use of systematic and structured learning processes. These groups take control over local decisions, and so people have a stake in maintaining structures or practices.
7.	Self-mobilisation	People participate by taking initiatives independent of external institutions to change systems. They develop contacts with external institutions for resources and technical advice they need, but retain control over how resources are used. Such self-initiated mobilisation and collective action may or may challenge existing inequitable distributions of wealth and power.

Source:Adapted from Pretty (1995)

From the foregoing discussion, it is clear that there is a myriad of aspects of participation. This means that great care must be taken when using and interpreting the term. It should always be qualified by reference to the type of participation. In addition, observers seem to agree that the application of participatory approaches further calls for an appreciation of the social dynamics and diversities such as gender, age, social status, ethnicity, disability and power amongst others.

Gender and participation

Gender relations define, amongst other things, how both men and women have access to control of resources in the community. According to Hunt (2004:139) gender analysis is the "process of assessing the impact that a development activity may have on females and males and on gender relations (the economic and social relationships between males and females which are constructed and reinforced by social institutions)".Despite the importance placed upon people's participation in development programmes, many agencies still experience poor participation of women (World Bank, 1996). According to Guijt (1994), many participatory approaches such as participatory rural appraisal (PRA) do not adequately address issues of gender. Rarely do these methodologies take into account gender analysis, gender based differences in labour allocation, and gender differences in access to and control over resources and their benefits. "It is just as easy to fall into the trap of the 'gender average' (assuming harmony and homogeneity amongst women or amongst men) as that of a 'community average',

(Guijt 1994:5). Oakley's (2001) analysis of the rural water supply project in Ghana for example, showed that despite efforts to mobilise women to take an active part in all project activities, this was only successful with respect to self-help labour contributions as most women in the village water committees kept a low profile.

According to the World Bank (1996), gender biases in participatory development projects may exist in the form of customs, beliefs, and attitudes that confine women mostly to the domestic sphere; women's economic and domestic workloads that impose severe time burdens on them; and laws and customs that impede women's access to credit, productive inputs, employment, education, information, or medical care. Since women comprise the majority of rural inhabitants, and they are the major contributors in agricultural production in Ghana, there arises an urgent need to encourage their involvement in development activities. As Guijt (1994) argued, greater involvement of women and attention to gender-differentiated needs holds the promise of more effective and equitable processes of participatory development.

Evaluating participation

There is a growing recognition that if participation in one form or another is an objective of development projects and programmes, it must be evaluated (Karl, 2000; FAO, 1997; DFID 1995). Karl (2000) identified three main aspects of participation in rural development projects and programmes that need to be evaluated namely, the extent and quality of participation, costs and benefits of

participation to the different stakeholders, and the impact of participation on outcomes, performance and sustainability. DFID (1995) suggests that, in evaluating participation, it is important to consider the quantitative, qualitative and time dimensions of participation. This is because participation is a qualitative process that cannot be measured using only quantifiable indicators. While quantification in relation to project outputs may be sufficient, the qualitative dimensions of participation should also be evaluated because project success depends on empowering participants to take on greater responsibility and control.

Barriers to effective participation

Several factors have been identified as obstacles to effective participation in development programmes and projects. Oakley (1991) discusses three major obstacles to people's participation which are structural, administrative and social barriers. Structural obstacles form part of the complex and centralized organisational systems that control decision making, resource allocation and information, and are not oriented towards people's participation. This situation is usually typified by a 'top-down' development approach. Administrative obstacles relate to bureaucratic procedures, operated by a set of guidelines and adopt a blue print approach, providing little space for people to make their own decisions or control their development process. The social impediments include mentality of dependence, culture of silence, domination of the local elite, gender inequality, and low levels of education and of exposure to non-local information.

Another obstacle is "standardization of approaches" (Guijt and Shah, 1998, cited in Masanyiwa and Kinyashi, 2008) which contradicts the original aims of participation, to move away from the limitations of blue print planning and implementation towards more flexible and context-specific methodologies. Cooke and Kothari (2001) cited in Masanyiwa and Kinyashi, (2008) noted that participation has been translated into managerial "toolboxes" of procedures and techniques. This limited approach gives rise to a number of critical paradoxes: projects approaches remain largely concerned with efficiency.

Some scholars have criticised how the term participation is defined in many development projects by observing that participation is often ill defined and meaningless when it comes to actual implementation of projects (Masanyiwa & Kinyashi, 2008; Guijt & Shah, 1998). According to them despite the stated intentions of social inclusion, many participatory development initiatives do not deal well with the complexity of community differences relating to age, economic disparities, religion, gender and ethnicity. Guijt and Shah (1998) pointed out that the concept of "community" is often viewed naively, or in practice dealt with as a harmonious and internally equitable collective unit of analysis for interventions. They indicated that in reality rural communities are composed of different individuals and groups, often with opposing interests and stakes in development interventions.

World Vision (2003) is of the view that participation is most effective when it respects people's knowledge and skills, empowers people to take control of their lives by focusing on training, resourcing and supporting people to make

their own decisions, includes all of the people in the community i.e. men and women, aged and disabled, religious and ethnic minority groups, is flexible, not bureaucratic, adapted to the local circumstances not bound by outsiders' rules and timelines.

Role of user participation in safe water delivery

It is evidently clear that effective and efficient participation of local people in decision-making and ownership is critical to sustainability of rural water infrastructure (Lockwood & Smits, 2011; Skinner, 2009; Gleitsmann, 2007; Narayan, 1995). According to the United Nation (2002:19) broad public participation in decision-making is one of the essential requirements for sustainable development as it helps to unearth new ideas and sources of information; expose issues that need to be addressed; enable problems, needs and preferences to be expressed; and develop a consensus on the need for action that leads to better implementation. The United Nation (2002) noted that broad participatory process entails the full involvement of relevant groups, including the local people, in all phases of the project implementation. The United Nation pointed out that it was necessary to decide how much participation is possible and necessary before deciding to design participatory processes that are multi-layered and inclusive.

However, the introduction of COM models in many developing countries has not yielded the desired results. One explanation for the situation is the weak local management structures and institutional support mechanisms for adequately

addressing citizen engagement, increase awareness on the importance of safe drinking water, facilitate financial discipline and accountability to the community members (Demeke, 2009). Consequently, water sources become non-functional after a few years of installation (Lockwood, 2002).

Many factors have been identified for the high rural water infrastructure failure rates in Africa and other parts of the developing world. These include inappropriate technology, poor construction, lack of community participation and sense of ownership, poor community mobilization, irregular follow-up support and capacity building, the unavailability of spare parts, inadequate professional support services, irregular maintenance regimes, monitoring and the drying up of water sources (Skinner, 2009; Harvey & Reed, 2004). Despite this, the failure rate had been blamed chiefly on technology for many years, to the neglect of the social factors at the local level. Bhandari & Grant (2007) reported that one of the reasons why households in Nepal were not paying water user fees was lack of trust for water use committees. As a result of this, they recommended that due attention be paid to addressing institutional and administrative issues, along with community water education initiatives, to enhance the sustainability of water supply sources (Bhandari & Grant, 2007).

Similarly, Gleitsmann (2007) suggested that sustainability of rural potable water supply systems is partly dependent upon strengthening the role of beneficiary participation as a platform for learning in water supply management, thus stressing the need for striking a balance between the choice of technology and the users' ability and willingness to maintain and protect it over time.

According to Harvey and Reed (2006), low sustainability rates are related to community issues such as limited demand, perceived lack of ownership, limited community education, and limited sustainability of community management structures, such as WATSANs.

To address some of these barriers comprehensively, an evaluation of USAID strategy to increase potable water access and sanitation improvement in rural areas of the Dominican Republic recommended that projects ought to carry out due diligence regarding five fundamental sustainability factors –technical feasibility, financial feasibility, behavior change and education, proper operation and maintenance, and participation by allocating funds specifically for the purpose (RTI International, 2006). The study identified economic constraints (poverty) and the culture of rural people not paying for public services or common pool resources as constraints to the collection of water user fees for operation and maintenance. Other problems cited regarding the effectiveness of local Water User Committees (WUCs) in managing their improved rural water systems include; WUC members limited knowledge of the value of the infrastructure assets that was provided for their community, lack of legal status for WUCs to enable them enforce decisions and sanctions, and conflict over the ownership or title to the land where the water system infrastructure is placed (RTI International, 2006).

In addition, water supply projects have been strongly criticized for their planning approaches, which have focused excessively on physical construction and increasing coverage targets (hardware issues), to the neglect of the human

factor of what happens at the water sources after construction (Lockwood, 2002). Within the last three decades, literature in the water supply sector has shown that sustainability of rural water supply structures has become positively associated with small-scale initiatives, which maintain public participation (Sutton, 2005). Thus, the key to sustainability is to meaningfully involve the beneficiaries and other local stakeholders in the planning, implementation, operation and maintenance of water supply systems according to their needs and potentials (Montgomery et al., 2009; Binder, 2008).

The United Nations Development Programme (UNDP) and the World Bank conducted a mixed methods research in 16 countries in Sub-Saharan Africa and found that the measure that improved rural sustainability in nearly all countries was operation and maintenance. The study particularly highlighted the importance of establishing reliable spare part supply chains, training local skilled technicians to repair facilities, and providing ongoing technical and management support to local management structures (UNDP/WSP, 2006).

However, it has been argued that without community participation, systems are unlikely to be sustainable even if spare parts and repair technicians are available. Participation can take different forms, including the initial expression of the demand for water, the selection of technology and its sitting, the provision of labour and local materials, a cash contribution to the project costs, the selection of the management type and even the water tariff (Harvey & Reed, 2006). It is thus the process through which demand-responsiveness is exercised, and empowerment achieved (Haysom, 2006).

User willingness to contribute for improved water services

One key component of community participation in the sustainability of improved water sources is individuals' willingness to pay for the service. According to Whittington et al. (2008), a sustainable water supply system depends on the availability of funds for operation and maintenance and these resources must come from direct water users. However, many rural households are not willing to pay for water in advance or commit themselves to fixed payment of flat rates (Braimah & Fielmua, 2011; Komives et al., 2008; Whittington et al., 2008; Bhandari & Grant, 2007). Komives et al. (2008) found that many rural households in Ghana were not paying their water user fees to fund facility repairs. Komives et al (2008) in a self-reported survey in two regions of Ghana reported that 42 percent of households in one region were not paying for improved water supply. However, Iyer, Davis, Yavuz and Evans (2006) noted that about 98 percent of World Bank-supported Rural Water and Sanitation projects have included some cash contributions from user communities during the period from 1977 to 2003.

Another contentious issue in the water supply and sanitation sector in developing countries is judging the willingness of households to manage their water sources through the contribution of time and resources (Schouten & Moriarty, 2003; cited in Demeke, 2009). The argument is that if individuals devote more time and resources to the protection, operation and maintenance of their water supply sources, it will potentially improve the sustainability of water supply infrastructures (Whittington et al., 2008; Gleitsmann, 2007). Harvey and

Reed (2006) pointed out that community involvement, even at the lower intensities of participation, is a prerequisite for sustainability. In the view of Narayan (1995), the participation of communities based on their willingness to contribute increases effectiveness, efficiency, empowerment, equity, coverage and the overall sustainability of water supply projects.

Households' non-monetary contributions to service delivery could take the form of labour, material or participation in project-related decision-making and meetings (Bhandari & Grant, 2007). Iyer et al. (2006) in their review indicated that 86 percent of the World Bank rural water projects incorporated labour requirements and 78 percent advocated material contributions, such as wood, while 100 percent of the projects expected operation and maintenance costs to be fully covered by the users. Willingness-to-pay (WTP) in cash, materials, labour, and upkeep can be taken as a useful indicator of the demand for improved and sustained water services (Whittington et al., 2008; Bhandari & Grant, 2007). Households' willingness to pay for an improved service could be a strong indicator that they value the service. Likewise, if households are willing to contribute cash and labour useful for the management of water sources, it is clear that the service that they obtain from a source is valued; and that they have a positive attitude towards promoting its sustainability.

Bhandari and Grant (2007) also revealed that WTP for water is highly correlated with source reliability, trustworthiness of WUCs, convenience of location, and water quality; on the other hand, there is no significant relationship between the gender, age or economic status of respondents.

Ultimately, improved planning procedures which fully consider the value and demand placed on different levels of service by the community are a necessity for the sustainability of rural water systems. However, in spite of the ever-increasing importance placed on the role of participation in development efforts, there have been few quantitative studies to demonstrate the proposition that participation measurably increases development outcomes (Prokopy, 2005).

Conclusion

The literature revealed that effective user or direct beneficiary participation in the management of improved rural water sources could reduce the failure rates and thus ensure the sustainability of such systems. Despite this, approaches to ensure community participation has been piecemeal due to a number of factors. As a result researchers and sector practitioners in recent years have stepped up efforts to address the problem comprehensively. One approach suggested in the literature is that more research ought to be conducted by projects to find out the factors that might hinder getting communities well involved in the process.

CHAPTER THREE

METHODOLOGY

Introduction

In this chapter, the research methods and reasons for the choice of methods will be discussed. First, background of the study area and of WV, the case study NGO is presented. The second part of the chapter discussed the chosen research methods and provides the motivation for this. Both the interviewees of the study as well as the general structure of the interviews are presented.

Research design

In survey research all the processes involved in planning and conducting the research from problem identification, data collection and analysis constitute the research design (Bhattacherjee, 2012; de Vaus, 2001; Babbie, 1992). de Vaus (2001:9) noted that the function of the research design is to ensure that the evidence obtained enables the researcher to answer the research question as clearly as possible. The study design could be cross-sectional or longitudinal. Cross-sectional studies are those in which data is gathered aimed at determining the frequency or level of a particular attribute such as people's perceptions of water quality from improved sources in a defined population at a particular point in time (Santos Silva, 1999:213). Most cross-sectional studies are exploratory or descriptive in purpose. They are designed to look at how things are now, without considering historical trends at work. Longitudinal studies on the other hand involve data collection at multiple points in time to observe trends as social

phenomena constantly change over time. In practice, most surveys adopt cross-sectional designs (Kelley, Clark, Brown and Sitzia, 2003; de Vaus, 2002:36; Babbie, 1992).

The study design was a descriptive cross-sectional survey that used a semi-structured household interviewer questionnaire to collect both quantitative and qualitative data from the primary participants. The questionnaire was complemented by waterpoints observation survey using a checklist to assess the status, functionality, level of O&M and neatness of improved water sources in the study communities. A cross-sectional survey design is useful in assessing knowledge, attitudes, practices and utilization of different services (Santos Silva, 1999:213).In this descriptive cross-sectional survey design was adopted because it allowed the researcher to compare many different variables related to the topic at the same time. For example, it was possible to compare sources of drinking water, income and educational level of respondents from the study communities as well as water use practices at one point in time. It also enabled the researcher to assess differences in water use practices among people in the three study communities.

The study area

The three communities selected for this study, Loagri No.1, Yagba and Kubori, are all located west of the White Volta in the West Mamprusi District known as the Overseas Area. These communities were conveniently selected for data collection because of time and resource constraint.

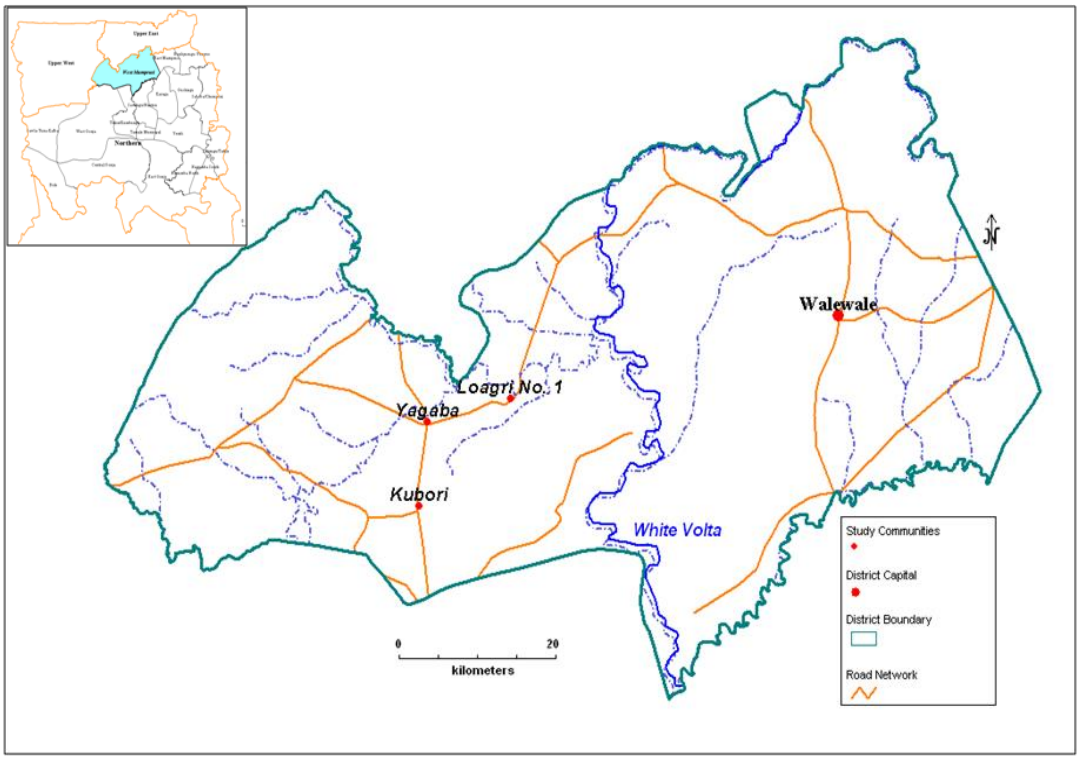

Figure 1: Map of the West Mamprusi District showing study communities

(Credit: Sumaila Saaka, 2012)

The West Mamprusi District is one of the administrative districts in the Northern Region with Walewale as its capital. The District is located approximately between latitudes 9°55' and 10°35'North and longitudes 0°35' and 1°45'West. It has a total land area of about 5,013 sq.km. The District has boundaries with the East Mamprusi and Karaga Districts to the East; West Gonja, Tolon/Kumbungu and Savelugu/Nanton districts to the south; Builsa, Kassena-Nankana and Talensi/Nabdam districts all in the Upper East Region northwards and Sissala East and Wa East districts in Upper West Region in the west. Though the district is under the administrative jurisdiction of the Northern Region, it has strong socio-economic, cultural and functional ties with both the Upper East and West regions, especially with major settlements like Bolgatanga and Fumbisi. The

main occupation in this predominantly rural district (70%) is smallholder agriculture involving food crop production and livestock rearing.

The District has a 2010 population of 168,011 comprising 83,005 males representing 49 percent and 85,006 females representing 51 percent. It has an annual population growth rate of 2.4 percent, with about 82 percent being rural (GSS, 2012). The District has an average household size of eight (8) persons. The District's population density is 24 persons per sq.km, which is lower than the national average of 79.7 persons per sq.km.

Much of the population is concentrated around Walewale, the District capital, with pockets of high densities around Janga southwards and around Yagba, Kubori and Yizesi areas to the west. The Mamprusis are the major ethnic group in the district who co-exist peacefully with other minor ethnic groupings including the Frafras, Kassenas, Bimobas, Fulanis, and the Ewes.

The landscape is undulating characterized by gentle slopes from north-east to south-west with a few isolated outcrops and uplands. Isolated hills, which break the monotony of the generally low-lying landscape, can be found around Karimenga, Shelinvoya and the outskirts of Wulugu. The District is drained mainly by the White Volta and its tributaries the Sissili and the Kulpawn rivers. Flooding by the White Volta is an annual problem caused mainly by the numerous tributaries of the White Volta and the annual spillage effect of the Bagre Dam in neighbouring Burkina Faso which is much felt at Pwalugu through Kpasenkpe along Primah, LoagriNo.1, Yagba, Goriba and other settlements along the White Volta West (Mamprusi District Assembly, 2012).

The geology of the West Mamprusi District is underlain mainly by the Middle Lower Voltaian formation, comprising sandstone, arkose, mudstone and shale. The western part of the district is underlain by the lower Voltaian formation consisting of sandstones and grit. The northern tip is underlain by the metamorphosed Birimian rock formations. The geological formation of the District has been found favourable for ground water tapping. The success rate of borehole drilling is within 60 meters. Available data shows a success rate for borehole drilling of about 50 percent. The yield is low but sufficient for hand-pump installation. Hand-dug wells have been found to be the most preferred option of safe water provision.

The district is characterised by a single rainy season, which starts in late April, peaks in July-August and ends in October-November. Mean annual rainfall ranges between 950 mm - 1,200 mm. The dry season is characterised by cold dry harmattan winds in December-January. Maximum day temperature ranged between 12°C in December-January and 45°C in March-April. The vegetation of the district is of the Guinea Savannah Woodland type, composed of short trees of varying sizes and density, growing over dispersed cover of perennial grasses and shrubs (West Mamprusi District Assembly, 2012).

Coverage of health services in the District is unsatisfactory. The Walewale Hospital serves as the District Hospital and a referral centre to other health facilities. The District has four (4) Health Centres located at Janga, Kpasenpke, Kubori and Wulugu, and quite a few clinics. The current Doctor/Patient ratio of 1:117,821, Nurse/Patient ratio of 1:5,124 and Nurse (midwife)/Patient of 1:6,933

are a disincentive to effective health delivery, particularly in the overseas areas (West Mamprusi District Directorate of Health Service, 2010).

The principal sources of rural water supply in the district are boreholes fitted with hand pumps, hand dug wells (protected and unprotected), streams, pond and dugouts. Sixty-nine percent (69%) of settlements in the district rely on surface water for drinking either year round or seasonally. These water sources are used by both humans and animals. Most of the unimproved water sources (streams, ponds and dugouts) dry up during the long dry season (West Mamprusi District Assembly, 2012).

World Vision Ghana's development approach and profile

World Vision Ghana (WVG) is a leading partner of the government in the provision of improved rural water supply facilities for more than 25 years. Since 1985, WV under its Ghana Rural Water Project (GRWP) has provided more than 2,500 boreholes and other safe water systems in 1679 rural communities throughout Ghana, including the overseas area of the West Mamprusi District of Northern Region (Frimpong, 2013). In the light of recent concerns about the need to find innovative ways to enlist community and household participation in the operation and management of these water systems for sustainability, it would be interesting to know the determinants of household participation in the management of boreholes and wells provided by WVG in the overseas area of the District since 1999.

Selection of study communities

The study communities – Loagri No.1, Yagba and Kubori are ethnically Mamprusi settlements located within the WV West Mamprusi overseas Area Development Programme (ADP) and are within 11km from each other. While subsistence food crop production is the major livelihood activity for a vast majority of people in the area, inhabitants of each community have secondary income generating activities that may differ depending upon resource availability and other factors. Vegetable gardening is prominent in Loagri No.1 and Yagba due to an abundant and readily available water supply from streams and the presence of alluvial soils due to flooding of the river; selling of firewood and charcoal is more significant in Kubori.

The researcher collected and reviewed reports of the ADP for background information on the intervention communities and purposively selected the three communities. The selection criterion was based on the following; a) Loagri No.1, Yagba and Koburi communities have benefited from many boreholes through World Vision. b) Loagri No.1 in particular has got another alternative mechanised water system provided by another donor. The mechanized system is powered by solar panels and this can unearth some of the management issues of the water points. c) They were also among the first communities to benefit from the World Vision Ghana Rural Water Project (GRWP) borehole drilling in the West Mamprusi Overseas area. Domestic water supply coverage was very low and therefore the communities were water stressed, d) there is private or communal initiative in construction and management of these water sources, e) women play

a great role in water supply provision, construction and management, f) Communities play an active role in the operation and maintenance of the water supply schemes.

Study population

The target study population constituted of all households in World Vision Ghana Rural Water Project (GRWP) intervention communities in the West Mamprusi District. However, the primary respondents were the eldest female household members because of women's major participation in domestic water resource management as well as their primary role in water provision and distribution at the household level. Data collectors were, however, instructed to encourage the participation of male household heads, if available, since household heads often made the major decisions regarding their household issues in the study area. Thus, it was reasonable and appropriate that male household heads were involved in responding to some sections of the questionnaire.

Sampling of households

The researcher conveniently decided on a total sample size of 150 households from the three communities based on the 2000 Population and Housing Census estimated total number of households in the communities. Thus with a known sampling frame of an estimated 824 households, the acceptable sample error (Confidence Interval) of 0.07 (± 7) at a Confidence Level of 95%

was derived using a sample size calculator (software) developed by US-based Creative Research Systems (CRS) (See Table 3).

Table 3: Study communities, households and sample sizes

Community	No. of households (HHs) (N)	Sample Size (n)
Loagri No.1	365	66
Kubori	167	31
Yagba	292	53
Total	824	150

Confidence level: 95% Confidence interval: ±7

Skip factor = 5.49 (5)

Source: GSS (n.d)

The lists of households in the study communities were not available for random selection of households for interviews. However, to minimise bias in the household selection process, a random direction from the centre of each community was selected by spinning a pencil. The compounds (houses) along the direction pointed by the sharp-end of the pencil were then counted out to the boundary of the community and one or two households in a compound, depending on the composition of the compound, then selected at random to be the first household surveyed. The skip of 5 was applied through the list of compounds selected using the random starting point. The process was repeated until the sample for each community was attained. The researcher supervised the data collection with the help of three research assistants.

Data collection instruments

A structured questionnaire was used to collect household data and an observation checklist used to assess the status of the community water points regarding their functionality, operation and maintenance, and related issues. The household questionnaire (see Appendix A) had seven sections. Section one covered the demographic characteristics of respondents. Section two looked at variables related to sources of water for household consumption and perceived barriers. Section three of the questionnaire covered issues on household water use practices; section four collected data about the household's attitude towards water safety from domestic sources; section five elicited information regarding cash and labour contributions towards O&M and an assessment of WATSANs performance; section six solicited information on community water education; and section seven looked at the demographic and socio-economic characteristics of the household as the unit of analysis.

In order to understand the state of the improved water supply points in the study communities, waterpoints observation was carried out using structured checklist (see Appendix B).

Data collection

Data was collected from 12th to 15th April 2012 in all the three communities. Data collectors were advised to check the data at the end of each interview session and at the end of each day, and to complete or correct information where necessary. Supervision was provided by the researcher. During

the household and water point visits, the interviewer observed containers used for water collection and storage at home.

Data analysis

The household survey data (150 questionnaires in all) were analysed using the Statistical Package for the Social Sciences (SPSS), now IBM Statistical Product and Service Solutions software. Water point observation data was entered in a separate SPSS file.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

A total of 150 sample households were interviewed in the survey. Out of this total sample, 149 were valid and the remaining one could not be used due to incompleteness and inconsistency of responses. This chapter first presents the descriptive analysis of the survey data, which will be followed by chi-square test of significance to test whether there was relationship between the dependent variables and selected explanatory (independent) variables.

Respondents socio-demographic characteristics

The focus of the study was on the household and therefore the unit of analysis was the household head, but interviews were conducted with theeldest female household member as the unit of analysis primarily because of women's major participation in domestic water resource management as well as their key role in water provision and distribution at the household level. Table 5 presents descriptive statistics of selected socio-demographic characteristics of respondents; sex, age, marital status, religion, educational attainment and how long they had lived in the community. Eighty-five percent of respondents were females, of which 94 percent did not have formal education and 83 percent of them had lived in their communities for more than 10 years. Table 5 also shows that almost half (46%) of the respondents were between 36-51 years of age. Almost all respondents (90%) were either married or living with a partner, and majority

(88%) were Muslims. This shows that the predominate religion in the study communities was Islam.

Table 4: Socio-demographic characteristics of respondents

Characteristic	Obs. (N)	Percent
Respondent sex		
Male	22	15
Female	128	85
Total	149	100
Respondent age		
Less than 20 years	6	4
20-35 years	46	31
36-51 years	69	46
52 years and above	29	19
Total	149	100
Marital status		
Not married	4	3
Married/living together	136	90
Widowed/divorced	10	7
Total	149	100

Table 4 cont'd

Religion		
Christian	4	3
Muslim	132	88
Traditionalist	14	9
Total	149	100
Respondent educational level		
Illiterate	137	91
MSLC/JHS	8	5
Secondary/SHS/Vocational and above	5	4
Post-sec and above	149	100
How long lived in community		
Less than 5 years	8	5
6-10 years	15	10
Over 10 years	127	85
Total	149	100

Source: Fieldwork (2012)

Sources of water for drinking and other household uses

Improved sources of water for drinking and other domestic uses such as cooking, washing clothes, cleaning dishes and bathing in the study communities were mainly boreholes and protected hand dug wells. Unimproved sources included unprotected hand dug wells and surface water (ponds, streams, dams,

etc). Almost all (99%) of the surveyed households depended entirely on the improved sources provided by WVG, the District Assembly and other development partners for drinking water supply during both rainy and dry seasons, and almost all (98%) again reported using water from the improved sources for other domestic household purposes. The results showed that the WVG rural water supply project had made a significant impact on improving access to safe water supply to the target communities.

Household water use practices

Responsibility of collecting water for household use

As shown in Figure 2, it is clear that the responsibility for water collection is almost exclusively carried out by women (50%) and female children (47%). Only 2 percent of adult men and one percent of male children are responsible for collecting water. This clearly shows that gender plays a significant role in domestic water management in the study area. This is not surprising as the 2008 Ghana Demographic and Health Survey (GDHS) also reported that adult females aged 15 and above were the main haulers of water for rural households. This finding is also consistent with Ademun (2009) findings in rural Uganda that women and female children were primarily responsible for water collection for domestic purposes. Similarly, Bogale and Urgessa (2012) in a study in Eastern Ethiopia also reported that fetching of water for various domestic uses was almost the exclusive responsibility of women and children, with serious implications on their participation in income generating activities and education.

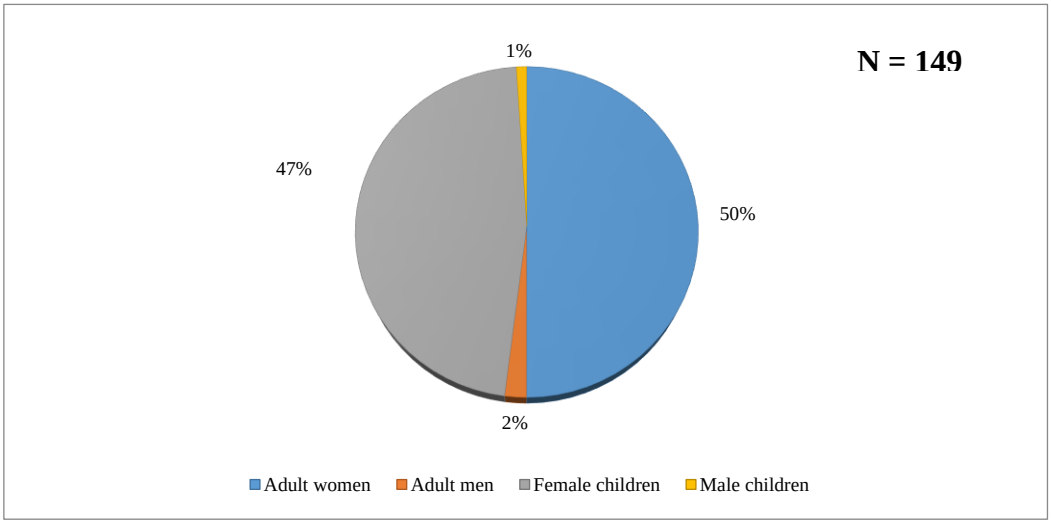

Figure 2: Distribution of persons responsible for water collection

Source: Field data (2012)

Water collection time, frequency and waiting time

Majority of households (93%) as illustrated in Table 5 reported that persons responsible for fetching water, mostly adult women and young girls, spent less than 30 minutes on a round trip to obtain water from the improved source, which is higher than the 2008 GDHS finding that 72 percent of rural households spent less than 30 minutes collecting water for households. In addition, majority of households (81%) reported that persons responsible for water collection often travelled to the sources between three (3) to six (6) times daily to collect water. It is therefore not surprising that almost all households (97%) reported that the location of the water sources were convenient to them.

Table 5: Percent distribution of water collection time, frequency and waiting

Characteristic	Community						Total	
	Loagri No. 1		Yagba		Kubori			
	N	%	N	%	N	%	N	%
Time to obtain drinking water from source and back (N =149)								
Less than 15 minutes	62	95	42	79	13	42	117	78
20-30 minutes	2	3	5	9	15	48	22	15
More than 30 minutes	1	2	6	11	3	10	10	7
Total	65	100	53	100	31	100	149	100
Frequency of water collection, travels/day (N = 144)								
About three times	14	22	36	75	11	35.5	61	42
4-6 times	28	43	9	19	19	61	56	39
More than 7 times	23	35	3	6	1	3	27	19
Total	65	100	48	100	31	100	144	100
Estimated waiting time at water source (N = 149)								
Less than 10 minutes	33	51	20	38	5	16	58	39
10-15 minutes	25	38	13	24	4	13	42	28
15-30 minutes	7	11	10	19	18	58	35	24
More than 30 minutes	-	-	1	2	4	13	5	3
Don’t know/missing	-	-	9	17	-	-	9	6
Total	65	100	53	100	31	100	149	100

Source: Fieldwork (2012)

A possible outcome is that because the improved sources were closer, households could collect more water for drinking, personnel hygiene and

sanitation to improve the health of families and children. Thus, the provision of potable water in the study communities had significantly reduced the time spent by women and girls collecting water for household use.

UNDP (undated) indicated that women and girls in rural areas who spent less time hauling water may also have more time for productive activities, education and leisure. The UNDP further stated that in most of rural Africa, it is common for women to walk 10 kilometres or more in a day to the nearest water source and back, and often twice that distance during the dry season. The time burden of water fetching has been suggested to influence the volume of water collected by households as well as time spent on income generating activities, child care and school attendance (Pickering & Davis, 2012; Nauges & Strand, 2011). Pickering and Davis (2012) recently assessed the relationship between household walk time to water source and child health outcomes in an analysis of Demographic and Health Surveys (DHS) data in 26 countries. They found that time spent walking to a household's main water source was a significant determinant of under-five child health. Pickering & Davis (2012: abstract) reported that a "15-min decrease in one-way walk time to water source is associated with a 41 percent average relative reduction in diarrhoea prevalence, improved anthropometric indicators of child nutritional status, and a 11 percent relative reduction in under-five child mortality." Thus, they concluded that reducing the time cost of fetching water should be a priority for water infrastructure investments in Africa.

Majority of households used tin (gariwa) and plastic containers to collect water; these containers typically hold about 20 litres. Children also used smaller jerry cans and plastic buckets. The customary use of clay-pots to collect water is gradually being replaced by the more durable tin (gariwa) and plastic containers.

Perceptions on water quality

Whether rural households will use water from improved sources for drinking and other domestic uses depends on several factors, including water availability, reliability, quality, cost and management (Carter, 2006). Using a five-point likert scale, households were asked to rate how they perceive the quantity and quality of water from the improved sources. Respondents were asked to rate on a scale of 1-5, whether (1) they were very satisfied, (2) satisfied, (3) neither satisfied nor dissatisfied [undecided], (4) dissatisfied and (5) very dissatisfied with the water quantity or quality. As presented in Figure 3, 88 percent reported that they were either very satisfied or satisfied with the quantity of water from improved sources, and similarly 84 percent of respondents were either very satisfied or satisfied with water quality from their community facilities.

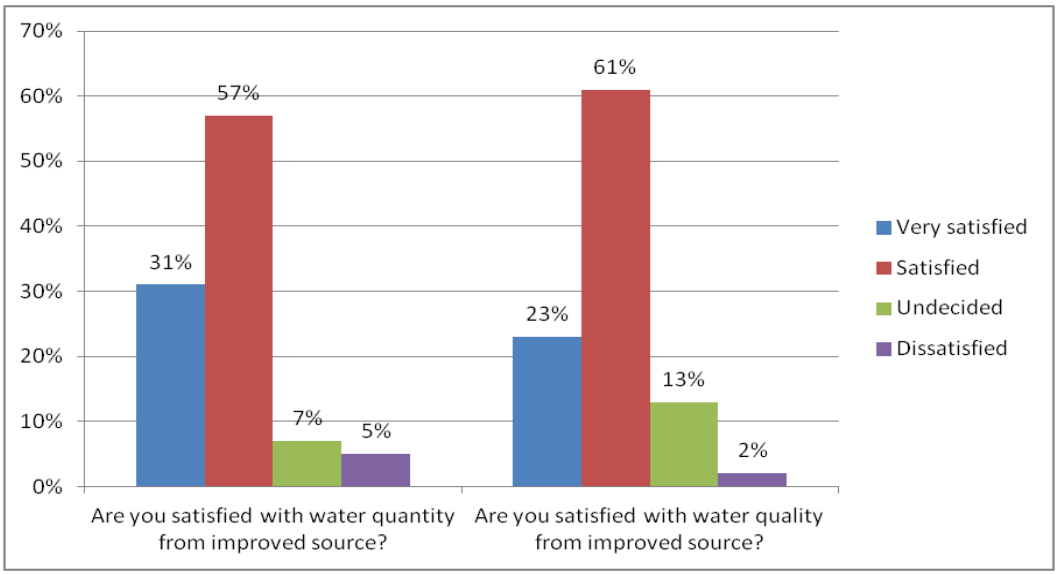

Figure 3: Distribution of level of satisfaction from improved sources

Source: Fieldwork (2012)

Despite the fact that majority of the respondents were satisfied with the quality and quantity of water from the improved sources, there were still a few boreholes with poor water supply (yield) and quality. Some borehole users complained that water from their sources were either salty in taste (hard water) or had bad odour. A few boreholes in some communities dried up in the dry season.

Water described as "hard" is high in dissolved minerals, specifically calcium and magnesium. Hard water is not a health risk as such, but a nuisance because of mineral build-up in water containers and poor soap and/or detergent performance. As ground water moves through soil and rock, it dissolves very small amounts of minerals and holds them in solution. The degree of hardness becomes greater as the calcium and magnesium content increases. These are reasons that may prevent households from using water from improved sources and by extension participation in source operation and maintenance, even though the source might have been closer to households.

Households were also asked whether they had experienced any water shortages from the improved sources during the past two years. As illustrated in Figure 4, more than half (58%) of households in Yagba, 64 percent in Kubori and almost all (83%) in Loagri No.1 reported not having experienced any water shortages from their improved sources during the last two years. Since the improved facilities provided by WVG were many and strategically located to be convenient for various sections of the communities, households who might have experienced little water shortages from their facilities would simply move to the nearest high yielding facility and therefore might have forgotten the impact on their lives by the facility without insufficient water at a particular time.

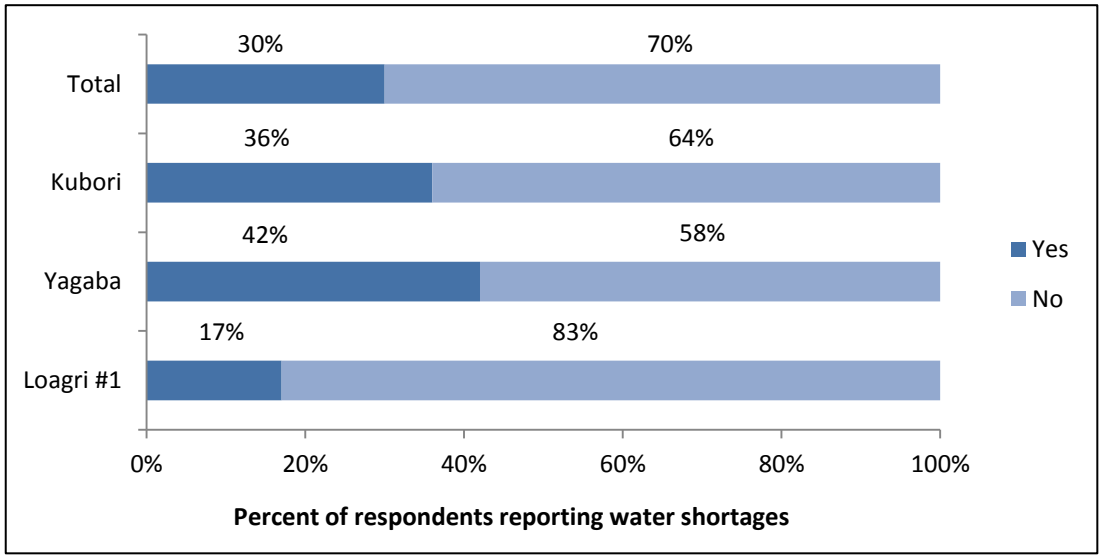

Figure 4: Households reporting water shortages from improved sources

Source: Field data (2012)

Households' attitude towards water quality

Households' perceptions about water quality indicate that knowledge about quality to some extent is limited. About 23 percent of the participants mentioned that 'clean water' is water free from germs, whereas 66 percent of the respondents reported that 'clarity and the absence of particles' is the main indicator of clean water. Eleven percent indicated that 'tasteless, colourless and odourless' were key indicators of water quality. Thus, 93 percent of the respondents believed that the water from their improved source is 'safe' or 'very safe' for them for all household purposes. Majority of respondents (84%) mentioned guinea worm and diarrhoeal diseases (stomachache) as the common waterborne diseases associated with unsafe water in their communities, while a few were more likely to mention bilharzia and malaria. Only 5 percent of households reported that there have been one or two incidences of waterborne diseases during the last 12 months within their individual households. A significant number of respondents believe that the incidence of illness has significantly decreased after the construction of the water sources.

Water, sanitation and hygiene education

One of the compelling justifications of providing improved water and sanitation facilities to rural communities is to reduce water-borne and other water and sanitation related diseases like childhood diarrhoea, guinea worm and trachoma. It has been established that diarrhoea prevalence was highest among children in households with unimproved source of drinking water in Ghana

(Ghana Statistical Service [GSS], Ghana Health Service [GHS] & ICF Macro, 2009). Unfortunately, only 19 percent of respondents reported having been educated on water, sanitation and hygiene (WASH) as well as facility operation and maintenance issues during the last 12 months. Among households that reported having received WASH education, 10 percent reported having received the education from World Vision staff, while another 10 percent said it was provided by the WATSAN committees.

There was a reduction in the water, sanitation and hygiene promotion activities in the West Mamprusi overseas ADP at the time of the study since drilling targets of WVG had been achieved. Currently, the ADP had no WASH Programme Officer since 2007 to continue with hygiene and sanitation promotion. For the past 12 months, community engagement on water and sanitation issues had reduced.

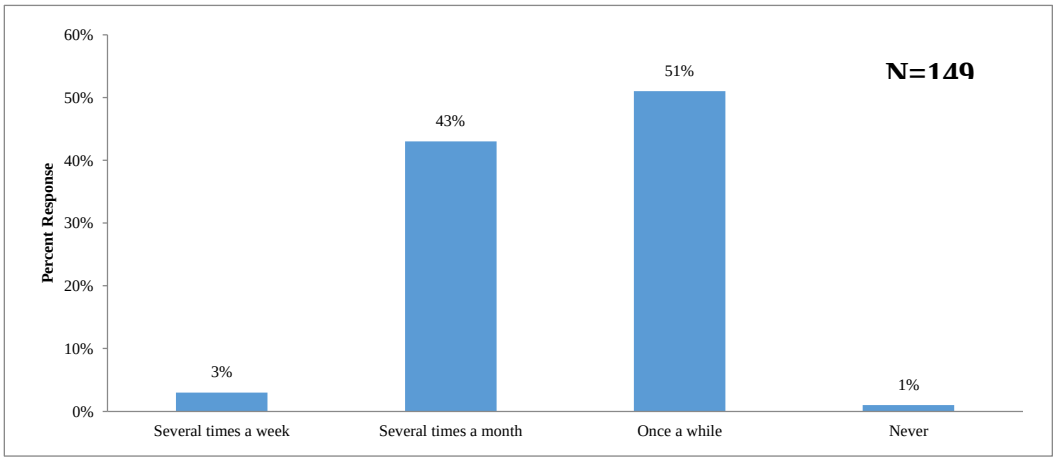

Figure 5: Level of participation in improved water source protection

Source: Fieldwork (2012)

Level of participation in improved water source protection

Respondents were also asked direct questions regarding how often they or members of their households participated in the protection and maintenance of improved water sources and how they could rank their level of participation. As shown in Figure 5, it appears households participation in improved water source protection and maintenance was not very encouraging as a little more than half (51%) of them reported that they had participated once in a while in source protection. Only a few households (3%) reported participating in source protection regularly (several times a week).

World Vision project staff during interactions reported that participation of households in source provision and protection was very high and regular in the early stages of drilling in 2000 to about 2003. This revelation by the project staff confirmed the low level of participation by community people in the care and maintenance of water point facilities as shown in Figure 5.The people might have taken it for granted that once the boreholes were more and functional they could break down in the future. In addition, during the rainy season when households had access to water from unimproved sources (streams and hand dug wells), which they might perceive to be safe and free from contamination could have contributed to their low participation in the care for borehole facilities.

The transfer of the WV WASH programme officer for the ADP as reported by the project staff which was never replaced since 2007 might have affected community people's commitment to the protection and maintenance of the borehole facilities in their respective communities. During the fieldwork in the

communities, some WATSAN committee members complained that they did not have enough access to the WV programme staff to make complaints. Another factor that might have accounted for the once in a while participation of respondents in the protection and maintenance of the boreholes could be the fact that the boreholes drilled were fairly new and might not have encountered frequent breakdowns requiring attention.

Sense of responsibility for improved water source protection

When asked to rank their level of responsibility to protect and maintain the improved water supply sources as a measure of sense of responsibility, majority of households (79%) thought they were responsible as compared to 17 percent who indicated that they were very responsible (data presented in figure 6). These findings showed an encouraging perceived participation of the beneficiary communities in improved source protection, operation and maintenance. Perhaps, households that made a financial contribution towards meeting the 5 percent O & M cost would have considered themselves responsible. Probably the high level of household sense of responsibility for source improvement could translate into conscious efforts for households to protect and maintain the sources or to contribute cash or labour towards operations and maintenance.

Another possible reason why many respondents rated themselves responsible could be that community people might not regard mobilization of local materials like sand, gravel, attending sensitization meetings as actual

contributions towards operations and maintenance. These activities might be considered as part of their normal communal responsibility to development.

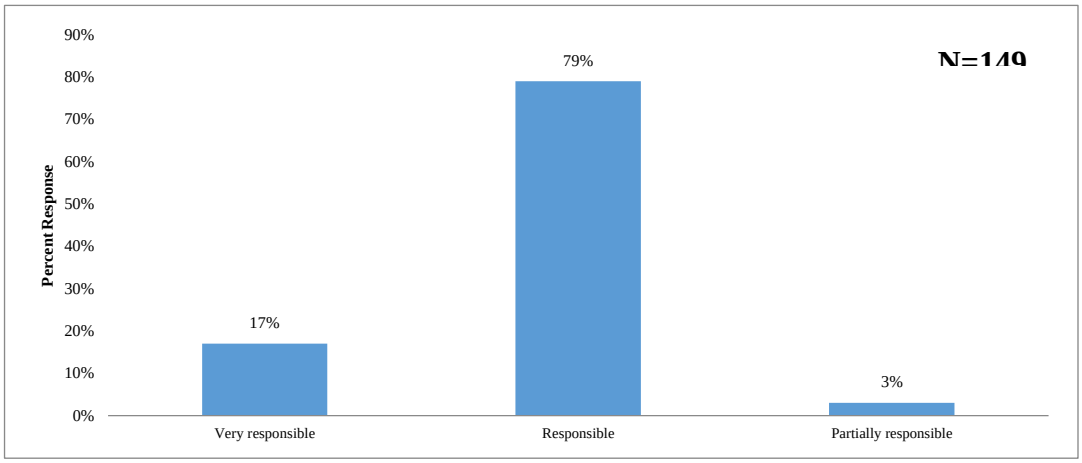

Figure 6: Sense of responsibility for water source protection

Source: Fieldwork (2012)

Degree of participation in preconstruction stage

WVG/ADP WASH team engaged local stakeholders through community animation sessions prior to the provision of the waterpoints to agree on the allocation of facilities and for their inputs in planning for sustainability. This usually involved assessing community capacity and willingness to contribute labour and materials like sand for the construction of borehole platforms and drainage aprons; map existing water and sanitation facilities and analyse current O&M practices and challenges and formation of WATSAN committees for system management after construction. The animators usually share information and facilitate discussion on the costs of providing the waterpoints and

maintenance implications. Households' participation and contributions during the preconstruction stage is very critical in planning for sustainability. Therefore, the study asked participants to indicate their level of participation during the preconstruction processes.

As shown in figure 7, majority of respondents (65%) indicated that their degree of participation in preconstruction stage of their water facilities was very good, as compared to 5 percent of households who did not participate at all. It has been argued that the level of households' involvement in the design and preconstruction stages of improved water sources is likely to engender community ownership, and thus the involvement of the direct beneficiaries towards future operation and maintenance in order to ensure sustainability (Engel et al, 2005). So, in recent years, communities are expected to contribute either in cash or kind (e.g. provide labour and materials) as their capital contribution towards donor funded water projects.

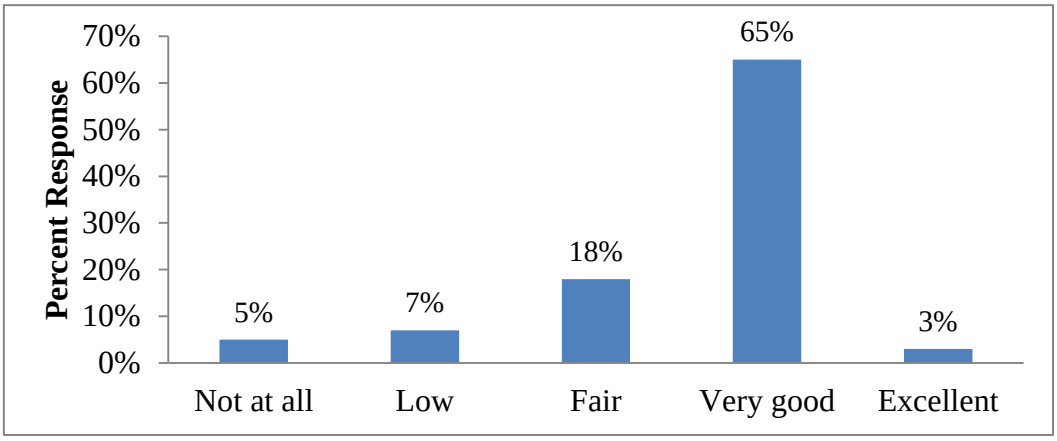

Figure 7: Degree of preconstruction stage participation

Source: Fieldwork (2012)

It is not surprising that majority of the respondents indicated they participated actively in the preconstruction stages. It may be partly due to WVG's approach to community involvement in the provision of facilities. Usually before a borehole facility is provided, the WASH team mobilised community stakeholders for animation on their roles and responsibilities relating to participation, contribution and ownership, which was aimed at ensuring sustainability of facilities when the donor pulled out.

Barriers to participation in protecting improved sources

The dependent variables for this study were the willingness of households to contribute cash (CASHCONT) or labour (LABOURCONT) towards the operation and maintenance of improved sources. It was therefore important to find out the psychosocial barriers that could influence households' willingness to participate in source protection. Participation is associated with opportunity costs (Engel, Iskandarani & Useche, 2005), and one such opportunity cost in this context was the availability of alternative water sources that were perceived safe and less expensive in both monetary and time cost to households. The availability of alternative water sources could act as a barrier to households' participation towards improved source delivery and protection that may be perceived to be expensive (Littlefair, 1998).

One hundred and twenty-eight of the 149 surveyed households responded to the question on whether households had other alternative sources of water for domestic use - 65 households in Loagri No.1, 42 in Yagba and 20 in Kubori.

Sixty-one percent of households in Loagri No.1 reported having only one or two alternative sources in their community, while almost all households in Yagba (95%) and in Kubori (85%) mentioned having only one or two other alternative sources (data presented in Figure 8).

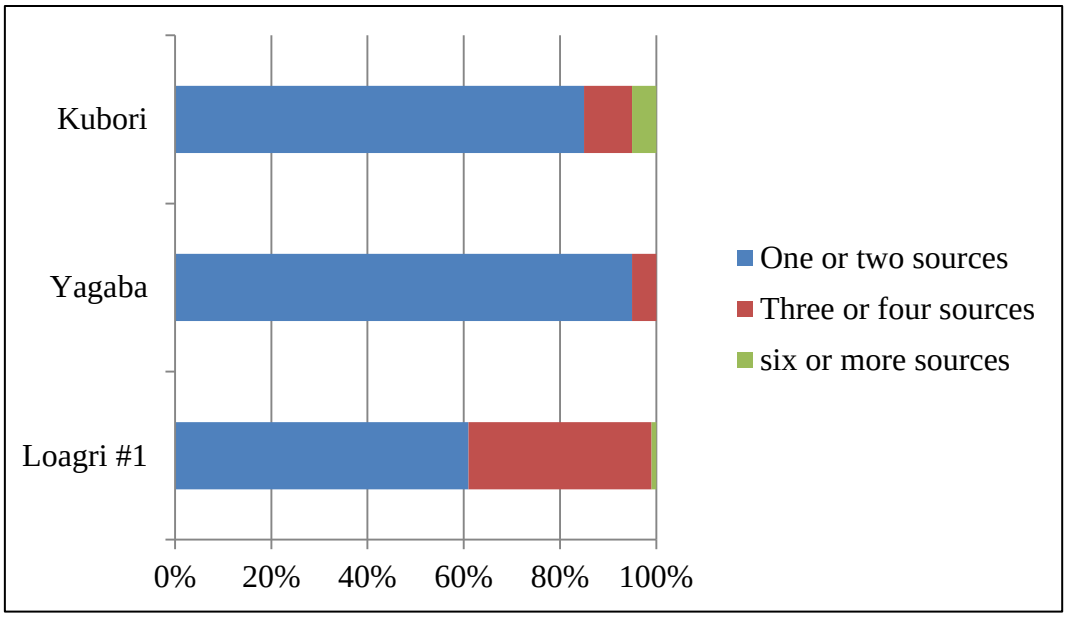

Figure 8: Alternative sources of water for domestic use

Source: Fieldwork (2012)

This finding is an indication that households did not have alternative sources of potable water supply nearby, and were more likely to depend entirely on the improved sources provided by World Vision.

Water supply sources, characterization and their current status

Table 6 presents characteristics of the sample water sources (boreholes) observed. In all, twenty-two (22) water points provided by WV were observed in the three study communities, six (6) in Loagri No.1, nine (9) in Yagba and seven (7) in Kubori. The oldest water source was constructed in 2000, whereas the rest

have been developed after that time. The Communities contributed an average of GH$50 in cash or labour per water point or GH$1.50 per household, before installation, which was deposited in a savings account in the Builsa Community Bank(BUCO) rural Bank in Sandema as part of the community contributions to the capital investment cost. All the water sources observed were boreholes fitted with hand pumps. Seventy-seven percentof the water points were found to be well functioning with 'some minor breakage problems' with a few, while 23 percent were not functioning, mainly due to lack of maintenance. Boreholes that were non-functional or with some technical disrepair were mostly reported to have mechanical problem with the chain.

The neatness of the areas surrounding the sources was also observed because it may have an impact on the quality of the water. The results showed that (86%) of the water sources were either 'not neat or not neat at all', as demonstrated by poor drainage and water stagnation, bad smell, and in some cases by the presence of livestock feces.

According to Abraham and Herrle (2010), a typical schedule of borehole maintenance could involve the following: Hand pump functioning, surrounding area cleanliness, proper drainage of wastewater, user education on proper pump use and user feedback. On a weekly schedule, the moving parts of hand pump should be lubricated and the tightness of nuts and bolts checked. It is also recommended that the security of pump on pedestal should be checked. The pump attendant is also required to check the output rate and condition of the concrete apron monthly. Finally, on a yearly roster, hand pump cylinder from well should

be raised for inspection and parts replaced where necessary. Abraham and Herrle (2010) recommended that a well (borehole) should be regularly checked and maintained by a trained pump operator, whose duties are to make sure major breakdowns do not occur that could severely interrupt service.

Table 6: Type, functionality, level of maintenance/protection and neatness of water source

Name of community	Id No. of water source	Year of construction	Approx. No. of beneficiary HHS	Functionality of source	Main disrepairs	Level of maintenance	Neatness of surroundings
Loagri No. 1	1806	2004	No data	Not functioning	-	-	Marshy, not neat at all
	1575	2000	No data	Functioning	None	None	Marshy and not neat
	6401	2005	No data	Functioning	None	None	Marshy and not neat
	1518	2000	No data	Functioning	None	None	Marshy but neat
	1846	2003	No data	Functioning	None	None	Marshy but neat
	1625	2002	No data	Functioning	None	None	Marshy but neat
Yagba	1578	2001	40	Functioning	None	No disrepairs	Not neat at all
	Un-	2001	No data	Functioning	None	No disrepairs	Very dirty
	numbered	2000	No data	Functioning	None	None	Neat and well drained
	1857	2000	No data	Functioning	None	None	Not neat
	1820	2001	30	Functioning	Chain	Repairs to	Not neat at all
	Zongo (un-numbered)				replaced	replace chain	

Table 6 continued.

Yagba	1517	2000	No data	Not functioning	-	-	Not neat
	1520	2000	No data	Functioning	None	None	Not neat
	1511	2000	No data	Functioning	None	None	Muddy
	2113	2007	No data	Functioning	None	None	Muddy
Kubori	1512	2000	No data	Not functioning	_	_	Waterlogged
	2024	2005	No data	Functioning	Chain replaced	Replacement of	Waterlogged
	2016	2005	No data	Not functioning	Chain needs repairs	chain	Surroundings very
						Chain not yet	weedy
	2011	2005	No data	Functioning	None	replaced	Weedy/muddy
	2015	2005	No data	Not functioning	Chain broken	None	Weedy/muddy
	1579	2001	No data	Functioning	Chain repaired	Not repaired	Very weedy/
	1824	2004	No data	Functioning	No disrepair	Repaired	muddy
						None	Muddy with weeds

Source: Field data, 2012

Cash and labour contribution for O & M and its determinants

Despite the inadequate access to improved rural water supply in sub-Saharan Africa , the cost of investment in water projects and their operation and maintenance is increasingly becoming too expensive that governments, donors and implementing organizations are finding it difficult to finance single handedly as a social good (Whittington, 2008; UNDP/WSP, 2006). In trying to understand the role of households in the protection and maintenance of the water sources and distinguishing the basic determinants of their contributions, the contributions of cash and labour intended for water source protection and maintenance by individual households during the previous three months were recorded and examined.

All the study communities had WATSAN Committees at the time of data collection. In principle, WATSANs are responsible for, among others, collection and management of community funds required for the payment of their share of the project cost as well as the operation and maintenance of facilities. Asked whether households trusted the WATSANs in using all the monies contributed for the intended purposes, 70 percent of households strongly agreed or agreed that WATSANs used money collected for the intended purpose.

It is expected that the WATSANs will set monthly contributions of both cash and labour for the protection and maintenance of the water sources with minimum or no consultation of households. Households contributed an average total of GH¢ 2.00 for the three months prior to the study with a standard deviation of GH¢ 1.6, and they also provided total average labour of 2.3 days with a

standard deviation of 1.8 days during the same period (see Table 7). It is useful to note that these payments are referred to as "contributions" rather than fees for water to show that they were willingly paid. A relevant question is whether the amount that households contributed on average could cover the cost of operation and maintenance of the water sources.

For a borehole serving 120 adult users, who on average are paying GH¢2 every three months, the total annual contribution would be about GH¢960 per year. With the current cost of a borehole chain[1], which is about GH¢ 100, this amount (GH¢960) would not likely be sufficient to support the protection and maintenance requirements of the water source in the long term. The contributions also varied significantly across households. Cash payments for instance, ranged from GH¢ 0 to GH¢10. This was due to the different tariff levels imposed by the respective WATSAN committees of the three communities, delayed and partial payments, or complete refusal to pay the levy. These variables and the results of the descriptive statistics and their description and measurement are summarised in Table 7.

[1]This is the most frequently replaced part of the borehole.

Table 7: Key variables, their description, measurement and descriptive statistics of the results

Variables	Description and measurement	N	Min	Max	Mean	Std Dev.
Dependent variables						
CASHCONT	Actual cash contributed during the last 3 months, GH¢	149	0	10	2.07	1.6
LABOURCOUNT	Actual labour contributed during the last 3 months, Days	149	0	14	2.22	1.76
Explanatory variables						
SEX	Household respondent sex, dummy (1=Female and 0=Otherwise)	149	0	1	0.85	0.35
AGE	Age, 1 to 3: 1= ≥20-35yrs, 2= 36-51yrs, 3=52 yrs+	149	1	4	2.8	0.79
EDUC	Educational level, 0 to 4: 1=Illiterate, 2= literate	149	0	3	0.13	0.45

Table 7 contd.

HHSIZE	Household size, numbers	149	1	10	5.6	2.18
CONOL	Convenience of location, index 1 to 2; 1= Convenient, 2=Otherwise	149	1	4	1.86	0.50
SENORES	Perceived sense of responsibility, index 1 to 5; 1=Very responsible at, 5=Not very responsible	149	1	3	1.87	0.43
TRUSTWATSAN	Trust in WATSAN Committee, index 1 to 2; 1=trust it, 2= Otherwise	149	1	9	2.52	1.84
PSOWS	Perceived safety of the water from the source, index 1 to 2; 1= Safe,…5=Otherwise	149	1	3	1.74	0.57

Source: Fieldwork (2012)

Statistical analysis for test of significance

Based on review of the literature, specific household characteristics and attributes of water source were identified to affect household's decisions on participation in operation and maintenance. These include household size, sex of respondent, age of respondent, education level of the respondent, convenience of location, perceived sense of responsibility to protect the source, perceived trust in the WATSAN committee and perceived safety of water from the improved source.

Determinants of household participation in O & M

Bivariate data categorical responses were analysed using Pearson's χ^2 distribution test to determine if two variables were independent of each other (Bhandari & Grant, 2007). In this case the relationship between dependent and the independent variables. If the two variables are not dependent ($p < 0.05$), Cramer's V will be used as a measure of association. The value of Cramer's V ranged from 0 (no association) to 1 (perfect association).

Table 8: χ2 analysis of determinants of household participation

	CASHCONT			LABOURCONT		
	≥ 2	≤2.50		≥ 2 days	≤ 3 days	
CHARACTERISTIC	Gh¢	Gh¢	Total			Total
AGE						
≥35 yrs	32	19	51	41	11	52
36-51 yrs	51	18	69	44	24	68
<52 yrs	23	6	29	18	11	29
qTotal	106	43	149	103	46	149
	$\chi^2(2) = 2.95, p < .229$				$\chi^2(2) = 3.60, p < .165$	
SEX						
Female	85	42	127	84	43	127
Male	21	1	22	19	3	22
Total	106	43	149	103	46	149
$\chi^2(1) = 7.43, p < .006$	Effect size: .223			$\chi^2(1) = 3.59, p \leq .058$		
EDUC						
Illiterate	99	38	137			
Literate	7	5	12			
Total	106	43	149			
	$\chi^2(1) = 22.54, p < .001$					
HHSIZE						
1-5 members	49	29	78	54	25	79
6-10 members	57	14	71	49	21	70
Total	106	43	149	103	46	149

Table 8 contd.

	$\chi^2(1) = 5.52, p < .019$ Effect size: .192				$\chi^2(1) = 0.047, p < .828$	
WATSANTRUST						
Trust WATSAN	70	34	104	68	36	104
Other	36	9	45	35	10	45
Total	106	43	149	103	46	149
	$\chi^2(1) = 1.04, p \leq .307$				$\chi^2(1) = 2.26, p \leq .133$	

P<0.05

The Pearson Chi-Square indicates that there was a significant relationship between cash contributions as a dependent variable and two explanatory (independent) variables (sex of the respondent and household size) as shown in Table 8, though the strength of the relationship was weak at "Cramer's V" value of 0.223 and 0.192 for cash contribution and sex and household size respectively. This is an indication that sex (gender) may be a strong predictor of households' willingness to make cash contributions towards the operation and maintenance of rural improved water sources, more so when females are the main collectors of household water. Again, the decision to make cash contributions for operation and maintenance of water sources may also depend on the household size. As noted in (Engel et al, 2005)), if the water source is very close to the household and is perceived to be very safe and the payment system is a flat rate, we would expect larger households to be more likely to use the improved source. For communities without direct water charges, the effect is less clear.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This study was carried out to help further understanding of the complex nature of rural water supply issues such as water use practices, attitudes towards drinking water quality, the status of improved water facilities, households' participation in improved water source operation, maintenance and protection, and institutional approaches for enhancing the sustainability of these facilities. Further, it tried to identify the main determinants of household participation in managing their water supply sources and recommend possible solutions to the increasing high breakdown of water supply sources in the study area and in Ghana as a whole. To achieve this, a total of 22 water sources were selected and observed in the three study communities and a total of 150 households were randomly selected and surveyed.

Summary

The major findings of the study as evidenced in the results are presented as follows.

- High illiteracy among the beneficiary communities as 77 percent of respondents were illiterate is perhaps the key invisible catalyst to the lukewarm attitude and lack of commitment to participate in ownership and maintenance of water source facilities in the target communities. Even though the respondents alluded to the benefits that the boreholes had brought to the

communities, their attitude to them apart from the fetching of the water does not show that they practically use the facilities with sustainability in mind.

- Ninety-nine percent of surveyed households depended on boreholes as their main source of drinking water. The results further indicated that about 88 percent and 84 percent of the households were either very satisfied or satisfied with the quantity and quality of the water respectively in their communities. This showed a felt need being addressed by the organization. Majority (80%) of the respondents had access to one or two sources of water.

  However, the level of responsibility of households for water source protection and maintenance was low. About 51 percent of respondents indicated that they participated in water source protection at least once in a while and only percent indicated that they do so regularly. Despite the above findings, as high as 79 percent of the household heads interviewed indicated that they were responsible with only 17 percent assessing themselves as very responsible for improved water source maintenance.

- Gender played significant role in household water management. A household cash contribution to improved water points operation and maintenance is significantly associated with sex (gender) and household size. The results showed that adult women (50%) were the main haulers of water for household use in the area, followed by young girls scoring 47 percent. Almost all households (93%) in the three study communities spent less than 30 minutes to access potable water for household use.

- Household perceptions about water quality were found to be somewhat inaccurate. About 23 percent of the participants mentioned that 'clean water' is water free from germs, whereas 66 percent of the respondents reported that 'clarity and the absence of particles' is the main indicator of clean water. Eleven percent indicated that 'tasteless, colourless and odourless' were key indicators of water quality. Thus, 93 percent of the respondents believed that the water from their improved source is 'safe' or 'very safe' for them for all household purposes. This result suggests that rural communities in the study area have average knowledge on water quality characteristics.
- The surroundings of most water points (boreholes) were described as 'not neat or not neat at all'. This obviously compromises the safety of the water and increases health hazards when this can easily be addressed through adequate water source protection and management.
- The estimated annual contributions of GH¢960 indicate that the amounts currently provided on average by the households are not likely to be sufficient for adequate long term management of the water sources.

Conclusion

This study concludes that promoting participatory approaches which fully involve beneficiaries according to their willingness and potentials supported by the right advocacy and promotion efforts can significantly contribute to sustainability of rural water sources in developing countries. As has been clearly pointed out in Demeke (2009:55), "water supply projects should not only focus on

increasing coverage targets simply looking at the hydrological, financial, and technological possibilities, but also on the sustainability of the systems to help contribute to long-term and comprehensive development objectives".

It is thus important to emphasize the pivotal role of households among others in development agendas. In addition, any water supply project should demonstrate a clear picture and pathway of a sustained and improved water service delivery along with its benefits to the beneficiaries from the onset. This requires demand assessment after a well-planned advocacy on the benefits of the project in the earliest planning stages.

In the implementation phase, households must also be aware that the project is being managed by them, and outsiders and implementing organizations are only there to support them in their technical and financial limitations. Given that the management requirements of point sources (source protection, operation and maintenance) are relatively cost-effective at the household level, it seems reasonable that users would cover it. However, it should be promoted continuously from the beginning. This does not mean that households must be left alone, but appropriate "management capacity" must be created to achieve meaningful sustainability with the right support framework (Schouten, 2006).

Recommendations

1. There is the need for World Vision and the District Water and Sanitation Team (DWST) to organize regular refresher training, at least twice a year, for

the WATSAN Committees to refresh them on their roles and responsibilities in the management of the waterpoints.

2. It is also strongly recommended that the DWST sustain community mobilisation and water sanitation and hygiene promotion and education. The software component of training and community sensitization needs to continue after the donor has provided the hardware (boreholes) since behavioral and attitudinal change is a long term process. WVG should make conscious effort to allocate funds for due diligence and follow-ups on the software component of water and sanitation facility provision to ensure maximum benefits and sustainability.
3. The study also recommends that DWST should re-activate the WATSAN committees, which appear to have become dormant at the time of the study. Commitment of people will definitely decline after a period of more than ten years since the WATSANs were established.
4. The District Assemblies and its development partners should adopt appropriate and sustainable financing strategies required not only for day-to-day management practices, but also for cost recovery. This is because the lack of spare parts, lack of supportive community leadership and failure to support communities who are attempting to deal with major repairs could become major setbacks to improved source sustainability.
5. In addition, more concerted strategies must be adopted by the District Assembly and communities to achieve long-term participation of households

to ensure satisfactory water services of adequate quantity and acceptable quality.

6. It is suggested that the District Water and Sanitation Team (DWST) and the Non-Formal Education Division of the Ministry of Education should collaborate with other development partners like WVG to establish more functional literacy classes in the area to promote effective community participation in development.

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APPENDICES

APPENDIX A

HH QUESTIONNAIRE

DETERMINANTS OF HOUSEHOLD PARTICIPATION IN RURAL WATER SUPPLY IMPROVEMENT IN WEST MAMPRUSI DISTRICT, NORTHERN REGION

HOUSEHOLD QUESTIONNAIRE

PERSON INTERVIEWED: PREFERABLY THE HEAD OF HOUSEHOLD, IF NOT AVAILABLE, ANY ADULT MEMBER OF THE HOUSEHOLD WHO IS ABLE TO GIVE INFORMATION ON THE OTHER HOUSEHOLD MEMBERS.

INTRODUCTION AND PURPOSE OF THE INTERVIEW

My name is _____ The purpose of this interview is to obtain information about your water use practices, socio-economic conditions and your cash and labour contributions for the operation and maintenance of your water sources. The data will be used to develop a system to help improve the sustainability of the water sources based on your suggested solutions. In answering the questions, please remember that there are no correct or wrong answers.

The survey is voluntary and you can choose not to take part. The information that you give will be confidential. The information will be used to prepare reports. There will be no way to identify that you gave this information. Please, be honest and sincere in your responses.

Could you please spare some time for the interview? Yes ☐1 No☐2

EN: PLEASE, CHECK FOR THE COMPLETENESS OF QUESTIONNAIRE BEFORE LEAVING THE HOUSEHOLD

SECTION 1: DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

[**Please, tick one box only**]

1. What is your age?	>20 yrs ☐1	20-35yrs ☐2	36-51 ☐3	52 yrs +☐4
2. What is your sex?	Male ☐1	Female ☐2		
3. What is your religion?	Christian ☐1 Muslim ☐2 Traditionalist ☐3 Other (specify)..... ☐9			
4. What is your level of education? Illiterate ☐0 JHS/MSLC ☐1 SHS/Vocational ☐2 Post-Sec & above ☐3				
5. What is your marital status?	Single ☐1 Married☐2 Widowed/Divorced☐3			
6. How long have you been living in this village : >5 years ☐1 6-10 years ☐2 10+years `☐3				

SECTION 2: SOURCES OF WATER FOR DOMESTIC USE AND PERCEIVED BARRIERS

7. What is the main source of drinking water for members of your household during the rainy season? [Tick one box only]		
Borehole ☐1	Protected hand dug well ☐2	Unprotected hand dug well ☐3
Surface water (river/dam/pond/stream/canal) ☐4	Other (specify)..... ☐9	
8. What is the main source of drinking water for members of your household during the dry season? [Tick one box only]		
Borehole ☐1	Protected hand dug well ☐2	Unprotected hand dug well ☐3

Surface water (river/dam/pond/stream/canal) ☐4	Other (specify)..... ☐9

9. What is the main source of water used by your household for other purposes such cooking, washing, animal watering? [Tick one box only]		
Borehole ☐1	Protected hand dug well ☐ 2	Unprotected hand dug well☐ 3
Surface water (river/dam/pond/stream/canal) ☐ 4	Other (specify)..... ☐ 9	

BARRIERS HINDERING HOUSEHOLDS FROM PARTICIPATION IN THE OPERATION AND MAINTENANCE OF IMPROVED WATER SOURCES.			
10. Apart from the improved sources of water provided for this community, how many alternative water sources (like streams, ponds, rivers, wells, etc.) do you have? [Tick one box only]			
1-2 sources ☐ 1	3-5 sources ☐ 2	6 or more sources☐ 3	Don't know ☐ 8

11. How often do you or any member of your household participate in the protection and maintenance of your improved water source? [Tick one box only]				
Several times a week ☐1	Several times a month ☐2	Once or twice☐3	Never ☐ 4	DK ☐8

12. If you were to describe (rank) your level of responsibility to protect and maintain the improved water supply source (borehole), would you say are [Tick one box only]			
Very responsible ☐1	Responsible☐2	Partially responsible ☐3	Not responsible ☐4

Not very responsible ☐5	Can't choose☐6	DK ☐8	IF VERY RESPONSIBLE OR RESPONSIBLE, SKIP Q. 12.1 AND 12.2

12.1. If not responsible, could you tell us your reasons?

_____

_____

12.2. Having given us your reasons as above, who do you think is responsible to protect and maintain the water source?

_____ Why? _____

_____ Why? _____

_____ Why? _____

SECTION 3: HOUSEHOLD WATER USE PRACTICES

(INTERVIEW A WOMAN)

<table>
<tr><td colspan="5">13. How long does it take for someone in this house to go to the improved water source and back?</td></tr>
<tr><td colspan="2">Minutes ☐☐☐</td><td colspan="3">Don’t know☐ 8</td></tr>
<tr><td colspan="5">14. Who usually goes to this source to fetch water for your household? [Tick one box only]</td></tr>
<tr><td colspan="5">Adult women☐1 Adult men ☐2 Female children ☐3 Male children ☐4 Other (specify)_____ ☐8</td></tr>
<tr><td colspan="5">15. How many times does this person travels to the water source to collect water in a day)</td></tr>
<tr><td>1-3 times ☐1</td><td>4-6 times ☐2</td><td>7 or more times ☐3</td><td colspan="2">Don’t know ☐ 8</td></tr>
<tr><td colspan="5">16. What do you think about the location of the water source (borehole) from your household?</td></tr>
<tr><td>Very convenient ☐1</td><td>Convenient ☐2</td><td>Neutral☐3</td><td colspan="2">Inconvenient☐ 4</td></tr>
<tr><td colspan="2">Very inconvenient☐5</td><td>Can’t choose ☐6</td><td colspan="2">DK ☐ 8</td></tr>
<tr><td colspan="5">17. How long does a person has to wait before fetching water from the improved source (borehole)</td></tr>
<tr><td>> 10 minutes ☐1</td><td>10-15 minutes ☐2</td><td>15-30 minutes ☐3</td><td>30 minutes or more ☐4</td><td>DK ☐5</td></tr>
</table>

18. What is (are) the containers you usually used (most often) for collecting water? [tick one or more]				
Clay pots ☐1	Tin containers ☐2	Basins ☐3	Jerry can ☐4	Other (specify)..... ☐9

19. How do you store the water you collect from the improved source at home?

_____

_____

_____

20. Are you satisfied with the quantity (amount) of water available to your household daily from the improved source for drinking and other household uses?				
Very satisfied ☐1	Satisfied ☐2	Neutral ☐3	Dissatisfied☐4	Very dissatisfied ☐5

21. Are you satisfied with the quality (taste, colour, odour, etc.) of water available to your household daily from the improved source for drinking and other household uses?				
Very satisfied ☐1	Satisfied ☐2	Neutral ☐3	Dissatisfied ☐4	Very dissatisfied ☐5

22. Did you experience any water shortages during the past two years from the improved source? (water shortage = a lack of water for a period of at least 24

hours following normal use)		
Yes ☐1	No ☐2	Don't know ☐8

23. During the past 12 months, how frequently have you used the water from the source for generating income (an example dry season gardening, pito brewing)?				
Not at all ☐1	Sometimes☐2	Often ☐3	Very often ☐4	Doesn't apply ☐5

24. How would you rate the degree of your participation during the project implementation process (in the time of the construction of the water source)?					
Not at all☐1	Low ☐2	Fair☐3	Very good☐4	Excellent☐6	Doesn't apply ☐6

25. If you have participated, in what aspect was your contribution? (Tick one or more based on respondent's level of contribution)			
Labour ☐1	Money☐2	Local materials (stones & sand) ☐ 3	Other (specify)..☐6

SECTION 4: ATTITUDES TOWARDS SAFETY OF LOCAL DOMESTIC WATER SOURCES

26. What do you think are the characteristics (qualities) of safe (clean) water?

_____

_____

27. What do you think about the current safety of water from your improved source?

Verysafe☐1	safe☐2	Undecided☐3	unsafe☐4	Very unsafe☐5	DK ☐8

28. Can you mention some diseases that are associated with unsafe water in your village?

_____

_____

29. Did anyone in your family experience any of these water-borne diseases during the last 12 months?

Yes ☐1 No ☐2 Don't know ☐8

SECTION 5: CASH AND LABOUR CONTRIBUTIONS FOR WATER SOURCE OPERATION AND MAINTENANCE

30. How much have you willingly paid to the WATSAN committee for the operation and maintenance of the improved water supply source during the last three months?

Amount in GH¢_____

31. Has your household or any member of your household ever been fined or sanctioned for not paying the water user fee to the WATSAN?		
Yes ☐1	No ☐2	Don't know ☐8

32. To what extent do you agree or disagree that the WATSAN committee uses all the money contributed by community members efficiently for the intended purpose?					
Strongly agree ☐1	Agree☐2	Neutral ☐3	Disagree☐4	Strongly disagree☐5	Can't choose☐9

33. What do you think are the problems of the WATSAN committee?

_____

_____

34. How many days of labour have you or any member of your household willingly provided for the operation and maintenance of the water source during the last three months? _____days

SECTION 6: COMMUNITY WATER EDUCATION (AWARENESS CREATION ON THE IMPORTANCE OF SAFE WATER SUPPLY AND USER PARTICIPATION IN OPERATION AND MANAGEMENT)

35. Have you or any member of your household been educated on water supply, operation and maintenance issues during the last 12 months?			
Yes ☐1	No ☐1	Don't know☐8	
35.1 If yes, which organisation provided the education?			
DWST☐1	WATSAN ☐2	WVG☐3	Other (specify)……☐9

36. What type of education did you received?

_____

_____

_____

37. Do you have any recommendations to make towards ensuring that the water source is managed more sustainable?

_____

_____

_____

SECTION 7: HOUSEHOLD DEMOGRAPHIC AND SOCIO-ECONOMIC CHARACTERISTICS

<table>
<tr><td colspan="2">I would like to ask you some details of the adult and child members of your household
38. First, how many people are there in your household? (Household Size):
_____</td></tr>
<tr><td colspan="2">ENUMERATOR: Complete the table below according to the following instructions:</td></tr>
<tr><td colspan="2">Household member type: 1 = household head 2 = spouse of household head 3 = child of household head
4 = other (specify).....</td></tr>
<tr><td>Sex: male = 0, female =1</td><td>Age range: 1=1-15 yrs, 2=16-30 yrs, 3= 31-45 yrs, 4= 46 yrs +</td></tr>
<tr><td colspan="2">Level of educational: 0= Illiterate, 1= Can read and write, 2=Completed MSLC/JHS, 3=Completed Secondary/Vocational, 4= Completed post-sec and above</td></tr>
</table>

37.1 DETAILS OF EACH HOUSEHOLD MEMBER AGED 1year +				
Household Member name	Household member type	Sex	Age	Education
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				

38.1. Now, I would like to ask you about the work that you did apart from farming in the last 12 months.

Income from non-agricultural activities for the household (if any)

No.	List of off-farm and on-farm non-agriculture related income generation activities	Annual non-agricultural income, GH¢/year
1		
2		
3		
4		
Total		

38.2. Now I would like to ask some questions about all the crops that have been harvested in the past 12 months

Household annual crop production (last year's planting and harvest) and its current market value.

No	Crop cultivated	Annual yield/unit	Local price of crop in GH¢/unit	Value of crop harvested, GH¢/year
1				
2				
3				
4				
5				
6				

Crop list & code

Millet ……......1

G/corn/sorghum….2

Maize……..3

Rice……4

Groundnuts…….5

Beans …….6

7					Yams ……..7
Tot al					Cassava……..8 Other (specify)…...9

Unit codes: 0 = None 1 = Maxi bag 2 = Mini bag 3 = Basket 4 = Bowl

5 = other (specify)……

38.3 Now I would like to ask some questions about the animals and poultry kept in this house in the past 12 months.

Livestock holdings and their market value (the value at which the owner is willing to sell)

No.	Livestock	Number	Number sold, if any	Average local price per head	Value of livestock in GH¢
1	Bullock				
2	Donkey				
3	Cattle				
4	Sheep				
5	Goats				
6	Pigs				
7	Poultry				
8	Other livestock				
Total					

38.4. Estimated total Income

Total income, GH¢/year = Total value of annual non-agricultural income, GH¢/year + Total value of annual agricultural income (crops, livestock)	GH¢

APPENDIX B

WATER POINT OBSERVATION CHECKLIST

DETERMINANTS OF HOUSEHOLD PARTICIPATION IN RURAL WATER SUPPLY IMPROVEMENT IN WEST MAMPRUSI DISTRICT, NORTHERN REGION

STATE OF WATER SOURCE OPERATION AND MAINTENANCE:

OBSERVATION CHECK LIST

1. Name of Village: .....
2. Borehole Number/Name: .....
3. Year of Construction: .....
4. Date of visit to the water point: .....
5. Time: .....
6. Number of persons interviewed/observed: .....

STATUS OF WATER POINT:

1. Is the water point protected (e.g. fenced)?		Yes ☐1	No ☐2
2. What is the level of functionality of the borehole?			
Not functioning at all ☐1	Functioning with some breakdowns ☐2	Well functioning without any disrepair ☐3	
3. Evidence of human/animal faeces around the water point?		Yes ☐1	No ☐2

4. Is the water draining well around the water point?		Yes ☐1	No ☐2
5. What is the status of drainage around the borehole?	Pond ☐1	Marshy ☐2	Gardening ☐3
6. Who are the majority of people collecting water?	Women ☐1	Men☐2	Children (boys/girls) ☐3
7. What is the level of water spillage?	High ☐1	Medium ☐2	Low ☐3

8. Neatness of the surroundings of the water supply source			
Very neat ☐1	Neat ☐2	Not neat ☐3	Not neat at all ☐4

9. Any additional facilities near the borehole?			
None ☐1	Animal trough☐2	Shower house ☐3	Other (specify)..... ..... ☐4