Journal of Sustainable Development in Africa (Volume 13, No.2, 2011)
ISSN: 1520-5509
Clarion University of Pennsylvania, Clarion, Pennsylvania

UTILISATION OF IRRIGATION FACILITIES TOWARDS POVERTY REDUCTION IN THE UPPER WEST REGION OF GHANA

Daniel Kweku Baah Inkoom
Department of Planning, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana

Constantine Zomanaa Nanguo
Social Development Network, Kumasi, Ghana

ABSTRACT

The economy of the Upper West Region of Ghana is largely agrarian with an estimated 86 percent of the population engaged in agricultural production as a source of livelihood. However, agriculture in the region is beset with a single maxima and erratic rainfall pattern which leads to poor yield of crops. This goes to worsen the poverty situation of the people. In order to mitigate the negative impact of this problem, the Government of Ghana and other development partners have provided some irrigation facilities in the region to ensure all-year-round farming activities so as to increase food production. The irrigation facilities are however underutilized. This study therefore set out to find the underlying causes of the underutilization. The study found among other things, the causes of underutilization to be non-adherence to the project planning stages, poor construction works, low technical capacity of agricultural extension agents, and weak management of Water User Associations. Underutilization can be curbed by involving farmers in the irrigation planning process as well as creating an enabling environment for farmers to produce and market their produce.

Keywords: Agricultural Production; Irrigation; Undertilization; Poverty Reduction

INTRODUCTION

Irrigation contributes immensely to agricultural production in the world. About 40 per cent of the total world food crops produced is through irrigation undertaken on only 17 percent of the total agricultural land in the world (Upton, 1996; International Programme for Technology and Research in Irrigation and Drainage, (IPTRID) 1999). This means that 60 per cent of food crops is produced with rain-fed agriculture. The marginal productivity of irrigated agriculture is therefore higher than that of rain fed agriculture. Shah (2008) has therefore concluded that irrigation is the lifeline for sustained agriculture.

Irrigation increases agricultural production in a year by providing all year round farming opportunities through the artificial supply of water to crops. It has the ability to regulate water supply to crops especially at times when the crops need water most and provides drainage facilities for the disposal of excess water, which is impossible with rain-fed agriculture (Rydzewski, 1987). Together with other agricultural inputs like fertilizer, improved seed varieties, and technologically improved cropping systems; the yield per acre of irrigated land far outweighs

that obtained through rain-fed agriculture on the same size of land (Shah, 2008). Yilma T. E. Berg., & T. Berger (2005) identified that the yield per hectare of rice cultivated on irrigated land on the Tono and Vea irrigation schemes in the Upper East of Ghana is more than four times that produced using rain-fed agriculture. Shah (2008) also found an increment of over 76 per cent in wheat yields in Khutti village in Pakistan which is attributed to irrigation technology. Caruthers, J., M.W. Rosegrent, and D. Sohkler, (1997) therefore suggest that irrigation development is the most effective tool for poverty alleviation than any other public development in arid and semi arid climates

Hussain, Giordano, and Hanjira (2003) identified five key interrelated dimensions of the irrigation/poverty alleviation relationship. This includes production, income/consumption, employment, vulnerability/food security, and overall welfare. All year round farming and technical efficiency towards increased agricultural production made possible by irrigation reduces poverty drastically especially in agrarian economies (Kimenyi, 2002). Poverty reduction in India from 50 per cent to 35 per cent between the years 1970 and 1990 has been attributed to the development of irrigation schemes (Shah, 2008). Irrigation reduces poverty by offering employment especially to rural households, ensuring food security and by stabilizing (or lowering) food prices both in the rural and urban markets (Lipton, M, J. Litchfield, R. Blackman, *et al*, 2003). Irrigation also increases the supply of agricultural input to industry thereby fostering agro-industrial growth (Hussain, Giordano, & Hanjra, 2003; Shah, 2008). The supply of cheap raw materials to industry will also ensure price stability or low prices of industrial output or goods. Irrigation therefore alleviates suffering, preserves life, averts famine and advances the material prosperity of a country (Shah, 2008).

The agricultural sector in most African countries, which provide the main livelihood of rural people, constitutes the largest proportion of the workforce (Moyo, 2006). However, the practice of agriculture during the rainy season alone, lasting for about just five months in the year especially in the savannah countries in Sub-Saharan Africa, offers seasonal employment to rural dwellers (farmers). Therefore, during the dry spell in the year smallholder farmers have no opportunities for farming and are thus less productive. They only earn incomes some four months after harvest and stay without livelihoods and incomes for the remaining eight months in the year. Most of them are therefore unable to meet their basic needs of food, education and health. This situation puts smallholder rural farmers in a cycle of poverty. The provision of irrigation facilities that provide year round farming opportunities and increased productivity offers smallholder farmers permanent employment throughout the year and thereby increasing their annual incomes and purchasing power to help them meet their needs. According to Ali and Pernia (2003) rural household incomes is 77 per cent higher with irrigated agriculture than those who resort to rain fed agriculture.

The high levels of poverty in Northern Ghana (comprising Upper West, Upper East, and Northern Regions) have been attributed to the one rainy season experienced in the year (GoG, 2002) compared to the two seasons in the South. Farmers in Northern Ghana therefore cannot engage in all-year-round farming with one rainy season. Having realized the inability of rain-fed agriculture to guarantee food supply and all year round farming

especially in Northern Ghana (National Development Planning Commission,2008), the Government of Ghana and other International and Non-Governmental Organizations have provided some irrigation facilities in the various regions to help boost agricultural production and reduce poverty. However, current poverty levels in the North are still high. The Ghana living standards survey (2005/2006) revealed that 88 per cent of the population of the Upper West Region was poor (United Nations Development Programme-Ghana, 2007). This study therefore seeks to examine factors affecting utilization of irrigation facilities in the Upper West Region.

Problem Statement

Irrigation facilities in the Upper West Region have been underutilized. Out of a total of 154 hectares of irrigable land available at some dam sites in 2000/2001, only 41.5 hectares, representing 25 percent of total irrigable land, was actually cultivated (Ghana/IFAD, 2005). Also, a target of 1,800 family units were projected to benefit from irrigation land use, however, only 455 family units representing 27 per cent, actually put the land into use (Ghana/IFAD, 2005). This leaves farmers to idle during the dry season. This problem persists even when an 86 per cent of the region's population are subsistence farmers who are also being described as the poorest and most vulnerable in terms of poverty analysis in Ghana (Upper West Regional Coordinating Council, 2008).

The ineffective utilization of irrigation facilities has contributed to deficits in agricultural production and food insecurity, as well as outmigration from the region (Ghana News Agency, 2007). Subsistence farmers experience or are at risk of experiencing food insecurity every year. Currently, 34 percent of the population of the region, which is rural, is food insecure; the highest in Ghana, and an additional 13 percent is vulnerable to food insecurity (World Food Programme, 2009). This problem has contributed to migration of inhabitants of the region to other parts of the country during the dry season, especially in the Brong Ahafo Region in the middle belt where they can engage in all-year-round-farming to feed their families back home. It is therefore the aim of this study to investigate the factors that lead to the persistence of the problem and suggest appropriate solutions to them so as to bring relief to the rural people and also maximize the use of resources.

Objectives of the Study

The general objective of this study was to investigate the factors leading to the underutilization of irrigation facilities in the Upper West Region and to propose measures to ameliorate the situation. To achieve this general objective the following specific objectives were pursued:

1. To examine the types of irrigation systems in the region, their management, and their suitability for the crops cultivated in the region;

2. To investigate the extent of beneficiaries involvement in the project cycle of the irrigation schemes;

3. To examine operational deficiencies and bottlenecks in the management of dams;

4. To propose appropriate measures that will promote effective utilization of irrigation facilities in the region.

METHODOLOGY

The research was undertaken through the case study approach. The sampling techniques used were purposive, quota, snowball and accidental sampling. The sample size of all respondents combined was determined mathematically from the sample frame of all households in the study communities using the formula $n=N/[1+N(\alpha)^2]$, Where: n = sample size, N = Sample frame (all households in the study communities), and α = significance level of 92 percent.

Households in communities using the irrigation facilities in the selected schemes for the study were used as basis for selecting the sample size. Irrigation farmers were the sample frame for users of the facilities. The sample frame for the non-users of the irrigation facilities for irrigation farming comprised the remaining of those farmers (households) in the same communities within the catchment area of the irrigation facilities. Thus, a total households numbering 1,062 of all the communities was obtained through projections of the 1984 and 2000 population census figures. Putting the total number of households of 1,062 in the formula above resulted in a sample size of 136 for both users and non-users combined. Simple proportions were then used to allocate a sample size for each community based on the numerical strength of households in the respective communities. The quotas for Users and Non-Users were 50 percent for each group. The sample size allocation to the three selected schemes, Sankana, Piina, and Bullu are 81, 39, and 16 respectively. Table 1 presents the sex distribution of respondents (users and non-users of irrigation facilities).

Table 1: Sex Distribution of Respondents

RESPONDENTS	**Male**	**Female**	**Total**
Users	43 (63.2%)	25 (36.8%)	**68 (50%)**
Non-Users	40 (58.8%)	28 (41.2%)	**68 (50%)**
Total	**83**	**53**	**136 (100%)**

Source: Authors' Field Survey, May 2010

Structured questionnaires were used to interview the sampled respondents. Semi-structured questionnaires/interview guides were used to interview the institutional stakeholders on irrigation development in the region. Focus group discussions were also conducted with men and women in Bullu and Sankana schemes respectively. The data obtained were both secondary and primary. The Statistical Package for Social Sciences (SPSS) was used to analyze the primary data from respondents.

RESULTS AND DISCUSSION

This section analyzes the data gathered from the field regarding factors that contribute to the underutilization of irrigation facilities. It covers the irrigation planning process, utilization, and management systems put in place as

well as the challenges militating against maximum utilization of the facilities. A brief overview of the schemes studied is presented in table 2.

Table 2: Overview of Schemes Studied

INDEX	SCHEME		
	PIINA	BULLU	SANKANA
Year constructed	1983	1983	1969
Total Irrigable Land	10 ha	15 ha	40 ha
Current Cultivated Land	2 ha (20%)	4 ha (26.6%)	15 ha (37.5%)
Water Distribution System	Close conduit	Furrow (Open canals & laterals)	Furrow (Open canals & laterals)
Target No. of Users	393	200	400
Current no. of Users	68 (17%)	54 (27%)	59 (14.8%)

Source: Authors' Field Survey, May 2010

Irrigation (Project) Planning Process and Beneficiary Involvement

The irrigation facilities in the region are considered to be small scale, (irrigable land area below 200 hectares). They consist of furrow and close conduit (pipes and tanks) irrigation types. They are also supposed to be community owned schemes. As it pertains in public irrigation schemes where government owns the schemes and employs a management board to administer them, the small-scale community owned schemes are managed by the Water User Associations (WUA). The project cycle of these community owned schemes is discussed below.

According to Ghana Irrigation Development Authority (GIDA), the irrigation planning process involves several stages, the first being the initiation stage. A community needs assessment or a request from the beneficiary communities should be the first step. GIDA then conducts several feasibility studies on the project:

1. The first of the studies to be conducted is a socio-economic survey to determine the community's ability to use and maintain the facility
2. A hydrological survey of the water table is conducted after the socio-economic survey to assess water sufficiency and availability
3. Soil studies are also conducted to determine which crops are suitable to be cultivated on the irrigable land
4. The next study is topographical studies that will give an idea of the kind of water flow system to be constructed in order to ensure water distribution to the fields.

However, field information collected from the GIDA-UWR in the course of the research by the authors indicated that majority of the existing irrigation projects were initiated by politicians without the appropriate needs assessment from communities. Only 8.8 per cent of respondents indicated that a community needs

assessment was done to come out with irrigation projects thereby attesting to GIDA's assertion. Those who did not know how these projects came into being were 35.5 per cent whilst 41.7 per cent said the community was merely informed about the start of the projects. Some 20.6 per cent and 16.2 per cent indicated that the community was consulted on the location of the project and to provide communal labor respectively. The remaining 4.4 per cent indicated that they were consulted on two main issues: to make financial contribution to feed workers on project construction and also on their ability to manage facility. Thus, irrigation projects appear to have been supply driven, with very little input from the famers and other stakeholders. This situation appears to have negatively affected the beneficiary communities' ability and willingness to accept responsibility for the maintenance and repair of the facilities as and when necessary.

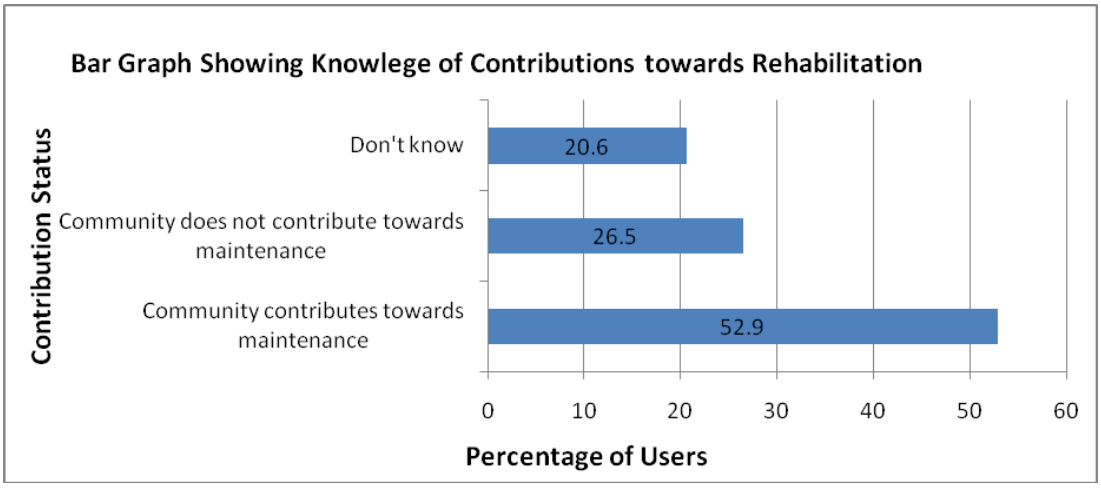
The next stage after the feasibility studies was the development and presentation to the community of the technical and engineering designs of the project for approval. This was to enable community members assess the suitability of the project design and their ability to use and maintain the facilities to be provided. As noted by Giordano *et al* (2006) and Small and Caruthers (2003) the appropriateness of facility design to the users affects their performance or utilization. According to the Irrigation Development Authority (GIDA), however, the designs were not sent to the communities for approval.

The next implementation stage was the actual construction of the irrigation facilities According to Adams (1992), community involvement in project construction proper fosters community ownership of project and appropriate maintenance culture. In the case of community owned irrigation project construction in Ghana, the community may be expected to provide unskilled communal labour during construction (Ghana Irrigation Development Authority Institutional Survey, May 2010). The field survey indicated that the attitude of the community towards the provision of labour is sometimes not encouraging as 26.5 per cent of respondents indicated that the community does not contribute in any way towards the construction of the projects. Sixty per cent of this figure said the community did not contribute towards construction because they were government projects while the remaining 40 per cent said nothing concerning construction was ever discussed in the community. This situation has negative consequences for ownership and maintenance of the facilities.

After the implementation stage the project then moves into the operation stage. This starts with a training of the community on the use and operation of the irrigation facility. After training, active involvement of GIDA ends whilst continuous monitoring and technical advice and training in agronomy is supposed to be offered to farmers by the Regional Agricultural Development Unit (RADU) and the District Agricultural Development Unit (DADU) of the Ministry of Food and Agriculture (MOFA). However, there appears to be insufficient clarity on the roles between MOFA and GIDA, as MOFA sees the irrigation facilities to be the concern of GIDA (Field Survey, May 2010). This leads to inadequate technical assistance to farmers. On major rehabilitation/maintenance of the facilities, 52.9 per cent said the community contributed especially towards maintenance as shown in figure 1. Those who were emphatic that the community did not contribute towards rehabilitations were 26.5 percent while 20.6 percent had no knowledge of the community's contribution. Those

who said the community had never contributed indicated various reasons chief among them being the fact that the projects were government projects and not the community's.

Figure 1: Knowledge on Contributions towards Major Rehabilitations



Source: Authors' Field Survey, May 2010

About thirty-six per cent (36.8) of those who said the community contributed towards rehabilitation works said the community contributed only labor by collecting stones to fortify dam walls, and 16.2 indicated both labour and financial contribution.

According to GIDA, maintenance of irrigation facilities is categorized into three in terms of regularity. They are routine, periodic, and emergency maintenance. Routine maintenance is carried out seasonally after every cropping season. Farmers are supposed to clean the canals of weeds and do minor repair works such as patching. Periodic maintenance is supposed to be done once in a year where major repair works are done. The field survey however indicated that maintenance is hardly carried out on the facilities due to a myriad of factors that are discussed in later sections of the paper.

Monitoring and evaluation (M & E) is the last stage of the irrigation planning process, and is the responsibility of GIDA, Regional and District Agricultural Development Units, GIDA monitors the water levels in the dam and advices when to supply water to irrigable fields and when not to. The RADU and DADUs monitor farming practices on the field and the performance of the WUAs. There is evidence of M & E as one evaluation report on irrigation activities in the region is available. This report came about as a result of implementation of the Upper West Agricultural Development Programme (UWADEP), which had a water resources development component.

Utilization of Irrigation Facilities

Utilization of irrigation facilities depended on the motivations of farmers to embark on it as well the socio-economic and design problems that emanated from the community and the facilities. These problems and motivations are discussed hereunder.

Overwhelmingly, majority of Users interviewed indicated their main motivation for undertaking irrigation farming as the desire to be employed all year round so as to make some income to reduce their poverty. Largely, income generation is the main reason for undertaking irrigation farming as 97.1 per cent of Users indicated it as their motivation to undertake irrigation farming though all of them indicated supplementing their family food needs from the produce obtained from dry season irrigation farming. The table below shows farmers motivation for engaging in irrigation farming.

Table 3: Motivation for Undertaking Irrigation Farming

No.	MOTIVATION FOR UNDERTAKING IRRIGATION FARMING	FREQUENCY	PERCENTAGE (%)
1.	All year round employment and income	54	79.4
2.	For additional income	12	17.6
3.	Hobby	2	2.9
TOTAL		68	100

Source: Authors' Field Survey, May 2010

The most common crops cultivated at irrigation sites are leafy vegetables, tomatoes, onions, okra, and pepper. Other crops include rice, which is cultivated in the rainy season, cassava, garden eggs, cabbage, lettuce, banana, and maize. Farmers' choice of crops for cultivation is influenced by agronomic advice offered by agricultural extension agents (AEAs) and the availability of ready market for produce. The table below indicates the reasons for the choice of crops cultivated at the irrigation sites visited.

Table 4: Factors Influencing Choice of Crop Cultivated

NO.	REASON FOR CHOICE OF CROP	FREQUENCY	PERCENTAGE (%)
1.	Expert advice/ Agronomic reason	32	47.1
2.	Availability of Ready Market	28	41.2
3.	Production for family consumption	8	11.8
Total		68	100

Source: Authors' Field Survey, May 2010

Most farmers however preferred to grow other crops due to various reasons. Sixty three per cent (63.2 percent) of farmers preferred other crops to what they were currently cultivating. Out of those farmers who preferred to cultivate other crops 86 per cent of them assigned a higher market value to their preferred crops than what they

were cultivating. The explanation for the inability to cultivate preferred crops was largely attributed to the infestation of the soil by nematodes and waterlogging which affected the growth of such crops. As would be seen in subsequent pages, nematodes (a tiny worm, often microscopic) and pest infestation ranked third among the reasons accounting for the underutilization of irrigation facilities as the study found. The implication here is that the ability of soil to support high value crops would determine the extent of utilization of irrigation facilities.

Managing Irrigation Schemes in the Region

The management of irrigation schemes and facilities in the region is largely the responsibility of the Water Users Associations, though GIDA, and the Ministry of Food and Agriculture also play some roles in terms of the technical aspects. The successful and satisfactory management of the schemes however depend on the capacity of the WUAs. An analysis of the operations of the WUAs is therefore presented in the subsequent subsections.

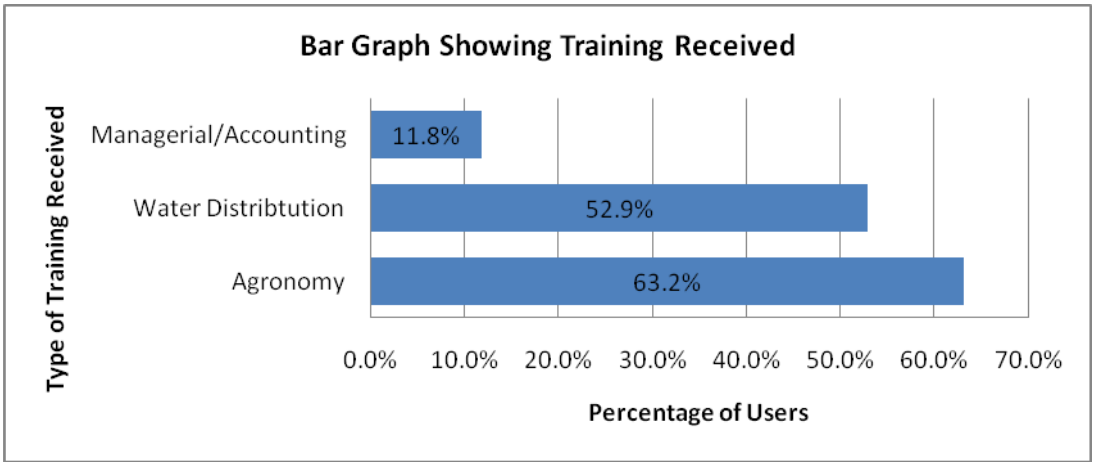
It is expected that farmers engaged in irrigation farmers would belong to the WUA, as plots are allocated to them with this understanding. However, field study indicated that a number of farmers engaged in irrigation farming do not belong to the WUA and have never paid dues or any sort of financial contribution. Close to 9 per cent (8.8%) of Users interviewed do not belong to a WUA, whereas 33.8 per cent of Users have never paid any dues or contribution to the WUA. All these have implications for the management of the schemes. These include conflicts between users, and the inability to generate sufficient funds to support maintenance of the facilities. Even when dues are paid, the small size of the contribution (about USD 1.20 per year) does not raise sufficient money towards maintenance. This explains the reason why these facilities are in a state of disrepair despite the benefits irrigation farmers get from the facilities. WUA members thus depend on donor assistance to maintain the facilities. In addition to these constraints, all the executive committee members were males. The International Water Management Institute (IWMI) recommends the inclusion of women in the executive committees of WUAs as a prerequisite to effective management because they are directly involved in providing water at the household level (Giordano, M.A. Madar Samad & R.E. Namara,, 2006).

The effectiveness of the executive committees leaves much to be desired. The focus group discussion in Bullu revealed that the executive committee has hardly organized any meeting nor do they approach members to pay their water user charges. This point is attested to by 33.8 per cent of users who said they did not pay water user charges or financial contributions of any kind, whereas 20.6 per cent of respondents indicated their non-satisfaction with the executive committee's management of the irrigation facility. The executives equally mentioned non-cooperation of members in cleaning or maintaining the facilities.

Some training in irrigation agronomic practices, conflict management, and on operating the facility is necessary for the sustenance of irrigation schemes (Giordano *et al*, 2006). In this regard 75 per cent of farmers interviewed confirmed having received some training in irrigation farming. Those who received some training on irrigation agronomy are 63.2 per cent, those who had orientation on how to operate the facility in terms of water supply

and distribution are 52.9 per cent and those who received training in management/account keeping constituted 11.8 per cent of users as indicated in the graph below.

Figure 2: Kind of Training Received by Irrigation Farmers



Source: Authors' Field Survey, May 2010

Training in agronomy and water distribution is encouraging but the quality and depth of training needs some improvement. According to the Regional Office of MOFA, their AEAs are only trained in general agronomy and have inadequate knowledge in irrigation water management. As a result these AEAs are unable to adequately guide farmers to follow best practices in irrigation farming. Consequently quite a substantial percentage (13.2%) complains of poor yield and in some cases none at all as a result of overwatering.

Problems Contributing to Underutilization

Many problems account for the underutilization of irrigation facilities in the region. They range from technical to socio-economic problems.

The capacity of contractors also affects the quality of construction of irrigation facilities. The issue of broken canals was the most common problem reported by 33.1 per cent (54.4% users and 11.8% non-users) of respondents interviewed. The canals in two of the facilities studied, Bullu and Sankana, are broken down thereby making it impossible for water to flow to most parts of the land. In Sankana more than half of the irrigable land suitable for dry season farming cannot be cultivated due to a broken canal. This raises questions on financial contributions by members of the WUAs. For the Sankana case, the canal has been broken down for three years and no attempt has been made at reconstructing the canal despite the fact that the WUA is responsible for maintaining them. This has greatly contributed to their inability to do repair work on the facilities. The plates below show a couple of broken canals in Sankana and Bullu.

Plate 1: Broken Canal at Sankana Dam **Plate 2: Dilapidated Canal at Bullu**

Source: Constantine Z. Nanguo

Closely linked to broken canals is the issue of inappropriate canal design. Though this problem has not been mentioned by many respondents (only 4.4 percent), the study deems it important and worth mentioning. In Sankana some farmers complain that one of the two canals flow uphill that causes the water to spill where the canal is connected to the valve. The water overflow causes over watering to crops that are closer to it thereby either destroying the crops or causing low yields. This problem raises concerns about the quality of skills possessed by the contractors and engineers that construct these facilities.

According to the Regional Office of GIDA most of the contractors who construct the irrigation dams are feeder road contractors who lack the necessary skills and equipment to construct dams and thereby resulting in such problems. This causes financial losses to those who sponsor the construction of these facilities and also makes the lifespan of the facilities shorter than expected. Resulting from the poor quality of construction works, is the water seepages through dam walls. Also due to the poor quality of construction, the dam walls are not compact enough to keep the water in the reservoir. As a result the water penetrates the dam walls onto the irrigable area thereby reducing the irrigable land drastically. The plates below indicate the collection of water on the irrigable land resulting from leakages.

Plate 3: Water Seepage at Bullu

Plate 4: Water seepage at Sankana

Source: Constantine Z. Nanguo

The seepage of water with time weakens the dam wall resulting in the breaking down of the dam wall. Below are pictures showing a broken dam wall in Piina since the year 2007, which has caused dry season irrigation farming to come to a standstill.

Plate 5: Broken Dam Wall at Piina

Plate 6: Broken Dam Wall at Piina

Source: Constantine Z. Nanguo

Unfair water distribution is another problem accounting for the underutilization of the irrigation facilities. Some 32.3 per cent of users interviewed complain of being discriminated against in terms of water distribution. Those at the tail end complain that water does not get to their plots because before it gets there it would have flown through the nearby laterals. Therefore the 'tail enders' have to use buckets to fetch water to water their crops. Three per cent of the non-users also gave this reason for not engaging in irrigation farming. In Sankana a solution to the issue of unfair water distribution has been attempted by putting farmers into four groups so that water is distributed to them in turns. This has also led to overwatering of crops because those who are not present are unable to block water to their fields because of bad valve design (leaking valves). Inadequate distribution of water is further compounded by the unleveled nature of the irrigable land. Twenty five per cent of

users complain that their plots were inadequately leveled by the contractors. As a result it becomes impossible for water to flow into their plots. Thus, some are unable to cultivate all their plots and others have even abandoned their fields.

There also seemed to be inadequate research in irrigated agriculture as nematodes and pest infestation is a serious problem affecting irrigation development. This problem ranked the second highest among the problems gathered from the study, as 44 per cent of users interviewed reported this as an issue. Nematodes have attacked most of the irrigable land in the Bullu and Sankana schemes. This problem appears to have no solution as AEAs state that they are unable to deal with the problem. The only antidote they have is to diversify the crops cultivated hoping that some will be able to resist the nematode attack. With the exception of onion, which has been found to be one of the resistant crops to nematode attack, others crops like tomatoes, okra, and pepper that have ready market cannot survive the nematodes.

Some 21.3 per cent of respondents (33.8 % users and 8.8% non users) complained of the lack of poor soil fertility being responsible for poor yield and bringing about underutilization. However, there are no credit facilities extended to farmers to purchase fertilizer for their crops as indicated by 32.1 per cent of respondents (32.3 % users and 11.8% non-users). The other alternative is to embark on composting to fertilize fields, however, only a few are willing to practice composting as indicated by AEAs.

Inadequate marketing opportunities for produce also hamper effective utilization of the irrigation facilities. In all the schemes studied, respondents (16.2 per cent of users) mentioned that during the tomato season a lot of tomatoes rot because of the inability of local markets. What is more, the transportation systems in and around the communities are also not efficient as vehicles available in these communities only on market days.

The destruction of farms by domestic animals was another problem mentioned by respondents. In all three schemes studied 33.1 per cent (54.4% users and 11.8% non-users) of the respondents mentioned that because these facilities are very close to the settlements, domestic animals destroy crops of farmers. Most of the schemes tried to mitigate this problem by fencing the irrigable area. However, the cost involved in fencing meant that only a limited area of land could be fenced by the farmers to use for dry season irrigation farming. Even in situations where fencing is provided, animals like pigs and goats still find their way into the fields. The issue of the proximity of facilities to settlements had probably not been envisaged before the construction of the irrigation facilities because the dams were initially constructed to provide drinking water for communities and animals and also for other domestic purposes. This meant that these facilities had to be close to the communities so that community members could have easy access to water. However, with the construction of boreholes human beings have little use of these dams. Thus, the provision of the irrigation facility components became an afterthought. This problem coupled with the non-traditional use of the facilities for irrigation contribute to low utilization of the irrigation facilities, thereby supporting Stern's (1988) claim that communities that have

traditionally not practiced irrigation farming are most likely to be unsuccessful with irrigation management transfer.

The nature of traditional political institutions can also hinder or promote irrigation development. This is evidenced by the chieftaincy dispute in Sankana, which seriously militates against the practice of irrigation farming. Whereas one section has chosen and enskined (put on the throne) as a chief who has the support of the paramount chief at Kaleo, the focus group discussions indicated that there are factions that do not recognize this chief. The existence of factions on the basis of allegiance has led, in several instances, to the destruction of the opposing side's crops, land confiscation, and denial of access to plots. Theft of farm produce from the fields is another serious disincentive to dry season irrigation farming. About 21.3 per cent (25% Users and 17.6% Non-users) of the respondents complained they had been victims of theft. These circumstances lead to unwillingness to invest in irrigation farming, lack of care of farms, and, in some instances, complete abandonment of farms. Some respondents claimed that some of the thieves have influential relatives and therefore it becomes very difficult to take punitive measures against them.

There is a high level of ethnic homogeneity among the beneficiaries of the schemes studied, especially at Bullu where all the WUA members were Sissala and Muslims as well. In spite of the homogeneity that exists in the communities, the WUAs are very weak (especially at Bullu) thereby contributing to high underutilisation of the Schemes. This calls into question the assertion by Hussain, Giordano, and Hanjra (2003) that homogeneity leads to managerial efficiencies of WUAs and their consequent impact on high utilization. It is obvious from this study that homogeneity alone cannot be the factor that ensures managerial efficiencies and success.

RECOMMENDATIONS

On the basis of the findings of the study, the following are recommended:

1. In the future, irrigation projects should be identified from the District Medium Term Development Plans (DMTDPs) once all communities and area councils present their community development proposals to be incorporated into it. Also, a direct request made to GIDA by communities as a result of community needs assessment should be an alternative. This would enhance community ownership of projects and foster effective management, instead of projects being initiated by politicians without appropriate consultations and needs assessment.
2. The study also recommends that in drawing proposals for irrigation projects, financial provision should be made for fencing for the entire irrigable area suitable for dry season farming from the onset. There should further be a considerable distance between irrigation facilities and settlements, taking into consideration hydrological considerations and human settlement requirements. This would prevent animal invasion of crops.
3. A Regional Maintenance Unit should be created and attached to GIDA to do regular monitoring and prompt repairs of facilities instead of allowing the WUAs to contract their own masons to do repairs. This would ensure quality of work and prolong the lifespan of facilities.

4. Training of AEAs in irrigation agronomy and water management is key to enable them offer the requisite technical advice to farmers to increase their production and productivity. Research should be conducted not only into the development of appropriate crop varieties for irrigation purposes, but also into finding a cure for nematodes as this poses a major problem for crop development and contribute significantly to resolving the problem of underutilization of the irrigation facility.
5. A policy of seizing land of users who default in paying their water user charges by the close of the farming season should be instituted. This would compel members to pay their fees in order not to forfeit their lands, thereby making land acquisition demand driven. This would ensure that all farmers put their plots to good use.
6. The District Assemblies (local governments in Ghana) should put in place programs that link irrigation farmers to institutions and especially boarding schools and those basic schools on the National School Feeding Programme in the various districts to purchase farmers produce (e.g. tomatoes and vegetables) as the marketability is a factor that encourages farmers to go into irrigation farming. This would prevent produce like tomatoes and vegetables from perishing.

REFERENCES

Adams, W. M., (1992). *Wasting the Rain: Rivers, People and Planning in Africa*, Earthscan Publication Limited, London.

Ali, I & M. E. Pernia (2003). *Infrastructure and Poverty Reduction – What is the Connection?* Asian Development Bank 2003. ERB Policy Brief Series Number 13. http://www.adb.org/Economics/default.asp. Date Accessed: July 2, 2009.

Carruthers, J. ; M.W. Rosegrent, and D. Sohkler, (1997) 'Irrigation and Food Security in the 21st Century' *Irrigation and Draining System*, 11, 83-101.

Ghana/International Fund for Agricultural Development (IFAD) (2005). *Upper West Agricultural Development Project Draft Project Completion Report*. http://www.fidafrique.net/IMG/pdf/UWADEP_PCR_2005_.pdf. Date accessed: July 10, 2009.

Ghana News Agency (2007). *Farmers Advised to Utilize Irrigation Dams*. http://www.ghananewsagency.org. Date accessed: December 14, 2009.

Giordano, M. A., Madar Samad & R. E. Namara (2006). *Assessing the Outcomes of IWMI's Research and Interventions on Irrigation Management Transfer*. *Research Report 106*, IWMI. www.iwmi.org. Date accessed: July 2, 2009.

Hussain, I., Giordano, M., & A. Hanjra (2003). "Agricultural Water and Poverty Linkages: Case Studies on Large and Small Systems", in *Water and Poverty – A Collection of Case Studies: Experiences from the Field*. Asian Development Bank, 2003. http://www.adb.org. Date Accessed: July 2, 2009.

Hussain, I. & M. A. Hanjira (2004). *Irrigation and Poverty Alleviation: A Review of the Empirical Evidence*. www.interscience.wiley.com. Date accessed: July 17, 2009.

Hussain, M., Hussain, Z. & M. Ashfaq (2006). "Impact of Small Scale Irrigation Schemes on Poverty Alleviation in Marginal Areas of Punjab, Pakistan", in *International Research Journal of Finance and*

Economics. ISSN 1450-2887 Issue 6 (2006). http://www.eurojournals.com/finance.htm. Date Accessed: July 2, 2009.

International Programme for Technology and Research in Irrigation and Drainage (IPTRID)(1999). *Poverty Reduction and Irrigated Agriculture*. FAO. www.fao.org. Date accessed: July 10, 2009.

Kimenyi, M. S. (2002). *Agriculture, Economic Growth and Poverty Reduction, KIPPRA Occasional Paper No. 3*. www.kippra.org. Date Accessed: July 2, 2009.

Lipton, M., J. Litchfield, R. Blackman, D. De Zoysa, L Qureshy & H. Waddington (2003). *Preliminary Review of the Impact of Irrigation on Poverty,With Special Emphasis on Asia*. FAOwww.fao.org. Date accessed: January 10, 2010.

Moyo, S. (2006). "Africa's Agrarian Transformation: The Efficacy of the NEPAD Agricultural Strategy" in *Africa and Development: Challenges in the New Millenium, The New Debate.* Adesina, J. O., Berg, E and A. Olukoshi (Eds). (2006). CODESRIA, Dakar, in Association with Zed Books, London, New York, and Unisa Press, Pretoria.

NDPC, (2008). *Long Term National Development Plan (Draft)*. Vol. 1, unpublished.

Rydzewski, J. R. (Ed.). (1987). *Irrigation Development Planning: An Introduction for Engineers*. John Wiley and Sons, Chichester.

Shah, M. (2008). "Irrigation, Agricultural Productivity and Poverty Alleviation – A Case Study of Stage II, Chashma Right Bank Canal (CRBC), Dera Ismail Khan, NWFP, Pakistan". *Gomal University Journal of Research, Vol. 24.*

Small, L. E. & I. Caruthers (2003). *Farmer Financed Irrigation: The Economics of Reform*. Cambridge University Press. Cambridge, USA.

Stern, P. H. (1988). *Operation and Maintenance of Small Irrigation Schemes*. Intermediate Technology Publications Ltd. London, UK.

United Nations Development Programme Ghana Office. (2007). *Ghana Human Development Report: Towards a More Inclusive Society.* Accra, Combert Impressions.

Upton, M. (1996). *The Economics of Tropical Farming Systems*, Cambridge University Press, Great Britain.

Upper West Regional Coordinating Council (2008). *Regional Status Report of the Upper West Region*, Unpublished.

World Food Programme (2009) *Comprehensive Food Security and Vulnerability Analysis 2008-2009, Executive Brief: Ghana*, http://www.wfp.org. Date accessed: November 16, 2009.

Yilma T., Berg, E., & T. Berger. (2005). *Empowering African Women Through Agricultural Technologies: The Case of Irrigation Technology in Northern Ghana*, http://www.glowa-volta.de/fileadmin/template/glowa/downloads/. Date accessed: July 10, 2009.

ABOUT THE AUTHORS:

Daniel Kweku Baah Inkoom: Department of Planning, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana

Constantine Zomanaa Nanguo: Social Development Network, Kumasi, Ghana