International Journal of Agricultural Economics and Extension ISSN: 2329-9797 Vol. 2 (1), pp. 068-076, January, 2014. Available online at www.internationalscholarsjournals.org © International Scholars Journals

Full Length Research Paper

Factors affecting Farmers willingness to pay for improved irrigation service: A case study of Bontanga Irrigation Scheme in Northern Ghana

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Accepted 06 December, 2013

The aim of this paper is to examine factors affecting farmers' willingness to pay (WTP) for improved irrigation services at the Bontanga Irrigation Scheme. There are 13 communities in the scheme's catchment area of which Six (6) communities were randomly selected and 113 farmers interviewed with a semi structure questionnaires. Contingent Valuation Technique was adopted to estimate farmers' willingness to pay (WTP) for improved irrigation services. The mean WTP for improved irrigation per ha per season was GHS 22.92 ($10.51), far below the GHS 50.00 ($22.94) proposed by management. The study found age and maintenance culture of irrigation facilities to be significant in influencing farmers' willingness to pay at 10% significant level. Also on-scheme income as ratio of household income and off-scheme income were significant in influencing farmers' willingness to pay at both 5% and 10% level of significance. The study recommends that any proposed increase in Irrigation Service Charges (ISCs) should be taken into consideration the mean WTP of 22.92GHS. Also, management of the scheme should put in place a comprehensive routine maintenance for facilities within the scheme to ensure regular delivery of water to merit farmers increase financial commitment towards sustainable management of the irrigation scheme.

Key words: Farmers, Irrigation, on-Scheme, off-scheme, Willingness, Pay and Bontanga.

INTRODUCTION

Agriculture over the years had been the main stay of the Ghanaian economy, up until 2010, when the sector was overtaken by the service sector as the leading contributor to Ghana's Gross Domestic Product (GDP). In 2010, the agricultural sector contributed about 29.9% of the country's Gross Domestic Product (GDP). It provides direct employment for about 50.6% of the nation's labour force and directly or indirectly supports about 80% of the total population economically, through farming, distribution of farm products and provision of other services (ISSER, 2012 and MoFA, 2012).

Although agriculture contributes greatly to the country's economy, the structure of the sector is vulnerable because it relies on rain fed agriculture. Droughts and other unpredictable weather patterns pose serious risks to farmers. Under these conditions, irrigation development offers the promise of improved food security and sustainable rural development by ensuring year long farming. In most cases, irrigation is central to increasing productivity of existing agricultural land (Namara et al., 2011). Successive governments on realizing the potential of irrigation in increasing food productivity and ensuring food security have been intervening at various levels in this regard. In keeping with its resolve to modernize agriculture, in the 2011 budget statement for instance, government announced the completion of rehabilitation of 70 dams in the three Northern Regions which had been handed over to farmers (Budget Statement, 2011).

Public irrigation schemes such as the Bontanga Irrigation Scheme, which is a public-owned surface irrigation system, the largest of its kind in the Northern Region, and which contributes enormously to household income of the communities within its catchment area, has over the years been enjoying support from the government through the Ghana Irrigation Development

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Authority (GIDA). GIDA – a public entity mandated to operate and manage public irrigation facilities, currently manages and operates 22 existing irrigation schemes in this category. These schemes are operated and maintained by beneficiaries who pay fixed irrigation service charges for the delivery of water. Farmer's role in the management of these irrigation schemes became prominent since the time the country went through structural adjustment. GIDA's budget had suffered substantial cut as a result of the introduction of Participatory Irrigation Management (PIM) (Namara, et al., 2011). Under this arrangement, farmers were made to take part in the management of irrigation schemes by paying for irrigation service charges.

Under a Millennium Development Authority (MiDA) facility, government rehabilitated the Bontanga Irrigation and Golinga Irrigation schemes in the Northern region under its Northern Agriculture Zone Project at the cost of US$ 3,296,286.00 (GNA, 2012). Work done included expansions of the land under cultivation, upgrading of access roads leading to the laterals, construction of threshing floors, laying off-take pipes and gates and check structures on the new laterals. The intention is to replace the current management system with a large commercial anchor farmer, under a Public Private Partnership (PPP) agreement, which will provide improved irrigation services to the farmers in the catchment area. The decision of government acting through GIDA to switch from Participatory Irrigation Management (PIM) to Public Private Partnership (PPP) comes with a lot of challenges, which places heavy responsibility on farmers to pay realistic charges for improved Irrigation Service delivery (ISCs) (Namara et al., 2011).

One important requirement for success in irrigation water management and sustainable financing of irrigation schemes is sufficient knowledge about farmers' demand or willingness to pay for irrigation water. This information is important for adequate implementation of water pricing policies, for accurate cost-benefit analysis of investments in water supply or water market infrastructure, and also for determining an optimal distribution of the scarce resource between different users. Tang et al. (2013) in their assessment of willingness to pay for irrigation water in Northwest China, found gender, age and education not to have significant effect on WTP at 10% significance level, whereas, a study conducted in lower Moshi, Pangani Basin of Tanzania by Paul et al., (2013) found parameters of education, farm size and household income to be statistically significant at p=0.05 with farmers willingness to pay more for irrigation water charges. Also similar results was established by Aheeyar (2006) in his assessment of factors influencing farmers' willingness to pay for improved irrigation services in Mahaweli. Also a study on the 'factors affecting farmers' ability to pay for irrigation facilities in Nigeria by Bamidele et al. (2010) identified age of farmers, the type of education acquired by the farmer, farmers household income and the size of farmers household as determinants of farmers ability to pay for irrigation facilities at the Oshin irrigation scheme in Kwara State, Nigeria. Their study recommends a public-private partnership structure for irrigation service delivery in Nigeria.

Baidoo et al., (2012) in their assessment of Willingness to Pay for Improved Water for Farming in the Upper East Region of Ghana found that about 80% of the 282 respondents surveyed expressed willingness to pay for an improvement in their system of irrigation. They therefore recommended that, government and other bodies and agencies should help improve the system of irrigation in the area by upgrading the existing ones and gradually deducting as part of the cost of water since the respondents were willing to pay for such an improvement

Following the rehabilitation of the Bontanga Irrigation dam and other facilities and the upgrading of feeder roads leading to the irrigation site under the sponsorship of Millennium Challenge Account (MCA) facility, government acting through GIDA is intending to divest its interest in the scheme to a private sector operator under a Private Public Partnership (PPP) agreement (Budget Statement, 2011and Namara, et al., 2011). This called for additional financial commitment on the part of farmers to ensure sustainable management and operations of the irrigation scheme. This paper therefore examined factors affecting farmers at the Bontanga Irrigation Scheme willingness to pay for improved irrigation services. This was achieved by applying the Contingent Valuation Method (CVM), which is commonly used to value non-market environmental public goods or services.

RESEARCH METHOTHOLOGY

Study Area

The survey for this study was conducted at the Bontanga Irrigation Scheme which is located in the Northern Region of Ghana, in the newly created Kumbungu District. The District which was curved out from Tolon/Kumbungu District, lies between latitude 9^0 30" and 9^0 35"N and longitude 1^0 20"and 1^0 04"W (GIDA, 2011). The communities under the scheme's catchment area include Kumbungu, Kpalsogu, Zangbalung, Sakuba, Dalun, Tibung, Wuba and other adjoining smaller communities.

Construction of Bontanga Irrigation Project was started in 1978 and completed in 1983. The project which was funded by Ghana Government consists of an earthen dam that delivers water to the field by gravity from the reservoir. The project is an earth fill dam of height 12m with a crest level of 5.00m. The spillway level is at an elevation of 5.8m and the surface area at the spillway eleva-

tion is 770m^2. The reservoir capacity is 25.00Mm^3 and the dead storage elevation is about 1.52m with the dead storage capacity of 5.00Mm^3. The scheme supports about 525 farmers who are organized into a cooperative made up of 10 Farmer Based Organizations (FFBOs) with an average holding of 0.6 ha per farmer (MoFa, 2011). Figure 1 below is the Map of Bontanga Irrigation Scheme.

Sampling Techniques and Data Collection

There are 13 communities in the scheme's catchment area of which Six (6) communities were randomly selected for the study. From the list of farmers farming at the irrigation site in each of the six (6) communities, twenty (20) respondents from each community were randomly selected. Even though 120 farmers were the intended number to be interviewed, the number actually interviewed was 113 because some 7 selected farmers could not be contacted to be interviewed. Data were gathered by the use of semi-structured questionnaire, key informant interviews and focus group discussions. Semi-structured questionnaire is a written instrument that contains a series of questions or statements which have a general framework but not limited to an exact set pre coded answers to the questions that attempt to collect information on a particular topic. As such, Semi-Structured Questionnaire allows for pre coded and open-ended type of questions (Agyedu et al., 2007). The purpose of the Semi-structured questionnaire was to get detailed information about the concepts and issues being studied. In designing the questionnaire the objective associated with the study were clearly identified, facilitating the construction of the questionnaire items.

Contingent Valuation Technique was adopted to estimate the farmers' willingness to pay for improved irrigation services. Willingness to pay is the amount of money a person would be willing to pay, sacrifice or exchange for a good or service as such is the amount that must be taken away from the person's income while keeping his utility constant (Alberini and Cooper, 2000). The contingent valuation method (CVM) is a standard and most widely survey techniques use to elicit people valuation of non-market goods and services. It employs field interviews or questionnaire surveys in which respondents are required to make hypothetical market decision regarding the non-market goods such as water and other environmental goods and services.

Notwithstanding some criticism regarding the hypothetical nature of eliciting valuation for non market goods and service, CVM is widely used among academics and other research and development practitioners (Carson et al., 2001) and as such there is substantial literature explaining the theoretical and empirical application of CVM (Boyle et al., 1996; Hanemann, 1999; Loomis, 1987 and Venkatachalam, 2004). Among the various methods such as direct open-ended question, bidding games, referendum method, payment card method, contingent ranking and review and repeat procedures (Venkatachalam, 2004). The payment card method was used because it provides the farmer a range of prices for a chosen option. Direct inquiry on a farmer's willingness to pay for improved irrigation could be sensitive, as such farmers were reminded that their responses were strictly confidential and would not be shared with other farmers. The method involves displaying an array of prices in the form of a payment card and the respondents are asked to indicate their choice and willingness to pay (Boyle et al., 1996). The respondent is asked to simple peruse a range of values and to circle the highest (lowest) amount they would be willing to pay (accept), it is then inferred that the respondent's true point valuation lies somewhere in the interval between the circled value and the next highest (lowest) option.(Cameron and Huppert,1987).

This method however lends itself to strategic bias, where some farmers may deliberately understate their WTP for improved irrigation services assuming that the state or others will pay more or deliberately exaggerates the amount of money they would be willing and could afford to pay for a hypothetical service to ensure that the project goes on (Carson et al., 2001). In order to avoid these biases, it was made clear to those under estimating their WTP, that if they were not willing to pay realistic bids, then the desired improvement they want from the scheme will not happen. To those over estimating their WTP, they were also made to understand that there would be no subsidy from anywhere and that the amount they were quoting would be the actual amount they will be paying. These explanations were in line with the recommendation by Mitchell and Carson, (1989). Enumerators also took the pain to review the responses of respondents by going through the questionnaire one more time to further read to respondents their WTP choices and amendments allowed if respondents wanted to or were recorded in error. The questionnaires were also pre-tested so that other possible sources of bias were exposed to the enumerators ahead of the actual survey.

Data Analysis and Presentation

Data were analysed using descriptive statistics and multiple regression models and results presented in tables. The willingness to Pay (WTP) estimate was regressed with WTP as a function of selected independent variables in a model expressed below.

$Y=\alpha+ß_1x_1+ ß_2x_2+ ß_3x_3+ ß_4x_4+ ß_5x_5+ ß_6x_6+ ß_7x_7+ ß_8x_8+ ß_9x_9+\ldots ßx+e$

Where Y=WTP

α=constant term

ß=coefficients

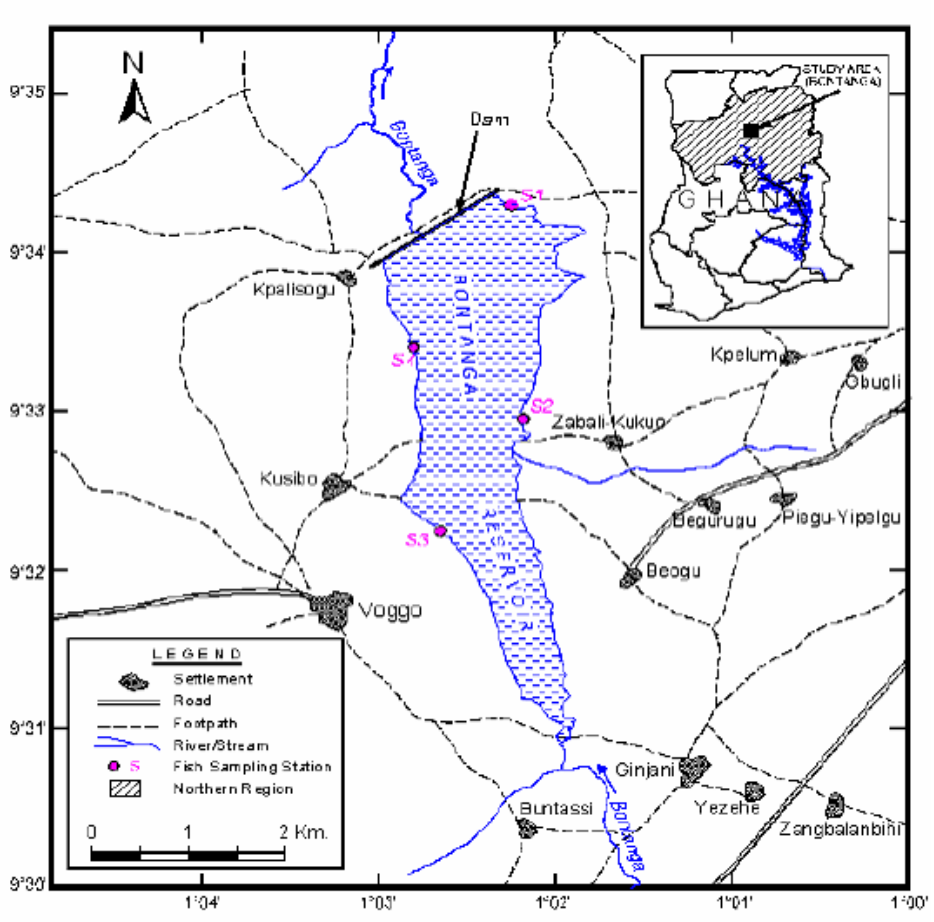

Figure 1. Map of Bontanga Irrigation Scheme (Abdul-Ganiyu et al., 2012).

x=independent variables; X_1 = Sex of respondents: X_2 = Marital Status; X_3 = status in household; X_4 = household size; X_5 = educational level; X_6 = years under the irrigation scheme; X_7; = cost of farming; X_8 = water delivery; X_9 = on-scheme income as ratio of household income; X_{10} = ready market; X_{11} = off-scheme income; X_{12} = Lateral number
e=error term.

RESULTS AND DISCUSSION

Demographic Characteristics

Out of the total of 113 farmers interviewed, 85% were male and the remaining 15% were female as shown in table 1. This gender disproportionate representation as shown in results of the survey can be attributed to gender insensitive land tenure system practised in northern Ghana as reported by (Aryeetey et al., 2007 and Apusigah et al., 2007). Also majority (81.4%) of the respondents were married with only 12.4% being single, thus never married. The survey also revealed some level of involvement of youth in irrigation farming as 23% of the 113 farmers interviewed were less than 35years with majority (56.6%) of them falling within the age category of 35 – 54years old and only19.5% of them being between the ages of 55-74years with the average age of 45years and a standard deviation of 1.4years.

The survey results show that large household sizes are common among farmers at the Bontanga Irrigation site, whilst the minimum household size was 2 that of the maximum were as high as 27 persons in one household. The average household size was 8.3 which is far more than the average household size of 5.3 in the Rural Savannah, 4.1 in Rural Forest zone and 3.6 in the Rural Coastal (3.6) (GSS ,2008). It is even twice of the national average of 4 persons per household as reported in the fifth round of Ghana Living Standard Survey (GLSS V) report, 2008. Most (74.3%) of the respondents were heads of their families while 12.4% were spouses of heads of households and 13.3% were family relations of heads of households.

There is a high level of illiteracy among respondents with only 27.4% having basic education while as high as 61.1% having no formal educational background.

Table 1. Showing Demographic Characteristics of Respondents.

Characteristic	Number	Percent (%)
Age Distribution		
Less than 35years	26	23.0
35- 54years	64	56.6
55 – 74years	22	19.5
Above 74years	1	0.9
Total	**113**	**100**
Average age = 45years; SD = 1.4		
Gender:		
Male	96	85
Female	17	15
Total	**113**	**100**
Marital Status:		
Single	14	12.4
Married	92	81.4
Widow	4	3.5
Widower	2	1.8
Divorced	1	0.9
Total	**113**	**100**
Position of Respondents		
Spouse of heads of HH	14	12.4
Heads of households	84	74.3
Relative of head of HH	15	13.3
Total	**113**	**100**
Av. HH size = 8.3 (SD = 0.55); Min. = 2; Max. = 27		
Educational Background:		
No formal Education	69	61.0
Basic Education	31	27.5
Secondary Education	9	8.0
Tertiary Education	4	3.5
Total	**113**	**100**
Experience in Irrigation farming (years)		
Av. exp. =13.9 (SD = 6.1); Min. = 1 ; Max. = 31		

Source: Field Survey, 2013
HH = Household; Av. = Average; SD = standard deviation; Min. = minimum; Max. Maximum and exp. = experience

Table 2. Distribution of Farm Size.

Location	Statistics			
	Average farm size (ha)	Standard Deviation(ha)	Minimum land size(ha)	Maximum land size(ha)
Within Irrigation Scheme	1.7	6.1	0.5	5.5
Outside the Irrigation Scheme	5.3	4.3	1.0	20.0

Source: Field Survey, 2013

However, 3.5% and 8% of respondents had tertiary and secondary education respectively. Farmers interviewed have been practicing irrigation farming for some time now. Whilst the most experience of them have been practicing irrigation farming for 31years now, the least experience has just started farming at the irrigation site a year ago. The average experience of irrigation agricultural among 113 farmers interviewed was found to be 13.9years.

Farm Size Within and Outside Irrigation Scheme

Farmers interviewed for this study practiced both irrigation farming and rain-fed agriculture and as such they owned farm lands at both irrigated site and outside the irrigation scheme. The total land area cultivated by the 113 respondents within the scheme in the last season as shown in the Table 2, was 197.5ha representing 34.6% of the total land under cultivation in the scheme.

Table 3. Showing Distribution of WTP bids.

WTP bid (GHS)	Intervals (GHS)	Number	%	Lateral Numbers
0	0-10	15	13.3	11-14 (down-stream)
10	10-20	23	20.4	8-10 (mid-stream)
20	20-30	43	38.1	5-7(up-stream)
30	30-50	13	11.5	1-4 (up-stream)
50	50-100	17	15.0	1-4 (up-stream)
100	100-150	2	1.8	1-4 (up-stream)
150	150+			
Total	-	113		
Mean = 22.92 (SD = 6.23); Min. = 6.0; Max. = 100;				

Source: field survey, 2013
WTP = Willingness to Pay.

The minimum land size held by respondents was found to be 0.5ha whilst the maximum being 5.5ha. The mean land size of the respondents was 1.7ha with a standard deviation of 6.1ha. About 43% of the respondents cultivated land above the mean land holding in the last season, whilst 57% have land size below the mean land size.

Even though farmers interviewed for the study attached so much important to irrigation farming, they still hold and cultivate land outside the irrigated site. A total of 598ha outside the irrigated site were recorded to have been cultivated by the 113 respondents in the last season, far in excess of what they cultivated at the irrigation site. The mean land size held per respondent outside the scheme was 5.3ha with a standard deviation of 4.3ha. The minimum land cultivated outside the scheme per respondent was 1ha and the maximum of 20ha.

Willingness to Pay Estimation

The Payment Card elicitation method was employed in administering the Contingent Valuation (CV) questionnaire. The prices suggested in the payment card were: 0, 10, 20, 30, 50,100 and 150 (all in GHS) per ha per season. The prices were arranged in intervals to cover all responses in line with the theory of Cameron and Huppert (1987).The intervals are listed as shown in Table 3 below. The study found that the mean WTP for improved irrigation service delivery per ha per season was GHS 22.92 with a standard deviation of 6.23. Whilst the highest WTP bids was GHS 100 the least WTP bids was pegged at GHS 6. Also the analysis of respondents WTP figures revealed that Only 34 people, representing about 30% of the respondents, were willing to pay above the mean WTP whereas the remaining 70% of them peg their WTP bids below the mean WTP.

As shown in the Table 3 above, more than one-third (38.1%) of the respondents are willing to pay between 20 to 30 GHS for improved irrigation services delivery with 13.3% and 20.4% indicating their WTP bids between 0 to 10 GHS and 10 – 20 GHS respectively. Only 15% and 1.8% respectively were willing to pay between 50 to 100 GHS and 100 to 150 GHS. This makes sense because when a question of whether or not an irrigation service charge above GHS 50.00 was reasonable, as proposed by the management, was put to the respondents, as high as 77.9% said it was unreasonable. It was also observed that the respondents who indicated their WTP bids between 0 and 10 GHS have their farm locations along the down-stream laterals. Conversely, those who stated higher WTP bids have their farms along up-streams and mid-streams. This suggests that farm locations within laterals influences farmers' willingness to pay.

Factors Influencing Farmers' WTP using Multiple Regression Model

Before proceeding to identify independent variables to be fed into the regression model a simple correlation of some selected variables was done to help identify and eliminate variables that are strongly correlated in order to reduce multicolinearity and errors. For instance the socio-economic and demographic factors were first analyzed to identify variables that are strongly correlated. The less correlated variables were then regressed. Factors affecting farmers' WTP and relationship between variables were analysed using multiple regression analysis. Table 4 below presents fifteen independent variables which were identified and regressed against WTP as dependent variable and their definitions or how the selected variables were operationalised in the model.

Discussion of Regression Results

The analysis yielded adjusted R^2 of 0.68 indicating that 68% of the variation in WTP is explained by the variation in the independent variables used in the model. This implies

Table 4. Showing Definitions of Variable of Multiple Regression Model.

Variable	Definition
wtp	Willingness to pay
sex	Dummy variable; 0=male,1=female
status in household	Dummy variable 0=head of household, 1=otherwise
Marital status	Dummy variable; 0=single, 1= otherwise
age	Age of respondents
Household size	Household size of respondents
Educational level	Dummy 0=formal education 1=no formal education
Years under~e	Years of farming under the scheme.
Cost of farmng	Cost of farming under the scheme.
Water deliv~y	satisfaction of water delivery: 0 = satisfied; 1 = otherwise
maintenance	Dummy variable; 0=poor maintenance 1=good maintenance
On scheme fize	On-scheme farm size (ha)
On-schm inc: hh inc.	On-scheme income: household income
Lateral number	location of the farmlands along the stream
Ready market	Ready market; 0 = ready market, 1 = otherwise
Off-scheme income	Off-scheme income

Source: Field survey, 2013.

that the model used best fit or counts for the variation in farmers' willingness to pay for improved irrigation services. Among the independents variables included in the model, only age and maintenance culture were found to be significant at 10% level, whiles on-scheme income as ratio of household income and off-scheme income were significant in influencing farmers' willingness to pay at both 5% and 10% levels of significant. Strangely, on-scheme farm size and satisfaction of water delivery which were expected to have statistical significant relation with farmers' willingness to pay were found not to be significant at both 10% and 5% levels of significant. Also educational level, experience in irrigation farming, cost of farming, availability of ready market, lateral number, gender, marital status and position within household were found not to be significant influencing farmers 'willingness to pay for irrigation services.

These findings agreed partly with Tang et al. (2013) in their assessment of willingness to pay for irrigation water in Northwest China, where they found gender, age and education not to have significant effect on WTP at the 10% significance level. However their study established a significant correlation between willingness to pay for irrigation services and household income, farm size and type of irrigation facility at 10% and 5% level of significant. Also Findings of a study conducted in lower Moshi, Pangani Basin of Tanzania by Paul et al. (2013), showed that parameters of education, farm size and household income were found to be statistically significant at p=0.05 with farmers willingness to pay more for irrigation water charges.

As shown in the Table 5, there is a positive significant relationship between WTP and age. This implies that the older and more experienced farmers within the scheme, who have benefited from the scheme over the years, have a higher inclination towards paying more for improved irrigation services. Negative significant relationship between WTP and maintenance indicates that poor maintenance culture negatively affects farmers' willingness to pay for improved irrigation services. On-scheme income as a ratio of household income estimates and WTP are significant and positively related. This means an increase in farmers' income generated from the scheme as a ratio of their total household income, leads to an increase in their WTP. The higher the ratio, the more willing farmers are to pay. It is understandable because if farmers make more income from the scheme relative to other sources of their household income they will be more willing to invest more on their on-scheme farms. Finally, income generated from farms outside the scheme is negatively related to WTP, meaning the less earnings farmers make from their farms outside the scheme, the more willing they are to invest in their farms in the irrigation scheme, as an alternative to raising more income.

A study conducted by Aheeyar (2006) on 'Willingness to pay for improved irrigation services in Mahaweli' found positive and significant coefficient of total family income in the regression model with willingness to pay as dependent variable, and it was interpreted as that beneficiaries having a higher income are willing to pay more for improved irrigation services. With similar results obtained for the total low land extent cultivated was also explained as that the farmers who cultivate a larger lowland extent have expressed greater willingness to pay.

Table 5. showing multiple regression results.

Wtp	Coef.	Std. Err.	t	P>t	[95% Confidence	Interval]
Sex	-0.0922775	5.432956	-0.02	0.986	-10.87519	10.69064
marital status	-0.9134233	3.240165	-0.28	0.779	-7.344253	5.517407
position of respondent	2.817688	2.934927	0.96	0.339	-3.00733	8.642705
Age	5.311186*	2.999106	1.77	0.080	-0.641209	11.26358
household size	-0.480081	0.423296	-1.13	0.26	-1.320206	0.3600441
educational level	0.6432079	1.320078	0.49	0.627	-1.976782	3.263198
years under the scheme	0.2188916	0.311841	0.70	0.484	-0.4000269	0.8378101
cost of farming	-0.0073496	0.006962	-1.06	0.294	-0.0211681	0.0064689
water delivery	-2.198124	3.997612	-0.55	0.584	-10.13228	5.736029
Maintenance	-7.087735*	4.126834	-1.72	0.089	-15.27836	1.102888
On-Scheme Farm Size	11.06327	12.58882	0.88	0.382	-13.92205	36.04859
on-scheme income: household income	0.0055462**	0.002708	2.05	0.043	0.0001713	0.0109212
ready market	-0.0015434	0.003117	-0.5	0.622	-0.00773	0.0046431
off-scheme income	-0.005747**	0.002701	-2.13	0.036	-0.0111084	-0.000386
lateral number	-0.19345	0.401056	-0.48	0.631	-0.9894341	0.6025341
_cons	8.446734	17.92906	0.47	0.639	-27.13748	44.03095

F (15,97)=1.78 Prob>F=0.0867 R-squre=0.5066 Adj. R-square =0.6839 Root MSE=18.904 ***significant at 1% level of significance **significant at 5% level of significance *significant at 10% level of significance.

CONCLUSIONS AND RECOMMENDATIONS

The study found that the mean WTP for improved irrigation service delivery per ha per season was GHS 22.92 ($10.51) with a standard deviation of 6.23, far below the 50.00 GHS ($22.94) proposed by management. An overwhelming majority (77.9%) described the GHS 50.00 management proposal as unreasonable. It was also observed that the respondents who indicated their WTP bids below 50.00 GHS have their farm locations along the down-stream laterals. And this could be protest against lack of/low access to regular and timely delivery of water to farms along those laterals. Conversely, those who stated higher WTP bids have their farms along up-streams and mid-streams. This suggests that farm locations within laterals influences farmers' willingness to pay. Also the regression analysis revealed a negative significant relationship between WTP and maintenance indicating that poor maintenance culture negatively affects farmers' willingness to pay for improved irrigation services. On-scheme income as a ratio of household income estimates and WTP were significant and positively related. This means an increase in farmers' income generated from the scheme as a ratio of their total household income, leads to an increase in their WTP. The higher the ratio, the more willing the farmers are to pay.

To address the concerns of farmers in distant laterals, management must immediately fix all broken canals and put in place a comprehensive routine maintenance schedule for all facilities to ensure timely delivery of water to merit farmers increase financial commitment towards sustainable management of the scheme. Management should endevour to involve farmers in decision making process so that their views and concerns can be captured at the policy conception stage, this will help ensure smooth implementation and farmers commitment in the running of the scheme. The purpose for estimating WTP in this study is to provide empirical information on how much farmers are prepared to pay for improve irrigation services. Therefore any proposed increment in Irrigation Service Charges (ISCs) must take into consideration the mean WTP of 22.92GHS ($10.51) per ha per season.

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