

The Effects of ICT Usage on Irrigation Farming in Bongo District of Upper East Region, Ghana

Francis Yao Anyan

Abstract— The study made an attitude assessment of irrigation farmers of Bongo District of Upper East Region of Ghana to find out the effect of ICT usage of on their farming activities. Structured questionnaire was used to gather information from one hundred and fifty five (155) farmers. The questionnaire completed by the farmer participants sought general demographic data which include gender, age and education level .Also information relating to land acquisition, irrigation and the use of ICT tools in their farming activities was sought. Responses from the study were analyzed using both descriptive and analytical statistical tools.

It was reveal from the study that the most common ICT tools used by the respondents include: Mobile phone, radio, television and computers. Another remarkable finding that the reveals was that ICT has no effect on irrigation farming in the study area.

Index Terms— Irrigation Schemes, Computers, Radio, Planting Strategy.

I. INTRODUCTION

Information and communication have always mattered in agriculture. Ever since people have grown crops, raised livestock, and caught fish, they have sought information from one another. What is the most effective planting strategy on steep slopes? Where can I buy the improved seed or feed this year? How can I acquire a land title? Who is paying the highest price at the market? How can I participate in the government's credit program? Producers rarely find it easy to obtain answers to such questions, even if similar ones arise season after season. Farmers in a village may have planted the same crop for centuries, but over time, weather patterns and soil conditions change and epidemics of pests and diseases come and go. Updated Information and Communication Technology allows the farmers to cope with and benefit from these changes. Providing such knowledge can be challenging, however, because the highly localized nature of agriculture means that information must be tailored specifically to distinct conditions. ICTs promote and distribute new and existing farming information and knowledge which is communicated within the agricultural sector since information is essential for facilitating agricultural and rural development and bringing about social and economic changes (Swanson & Rajalahti, 2010).

The agricultural sector has played a significant role and is expected to continue to play a major role in Ghana's economic growth and development in the short to medium term. It contributed the highest proportion to gross domestic product (GDP) since independence but has of recent being

overtaking by the services sector which contributed up to 32.8% against 32.4% of agricultural GDP contribution in 2010 (MOFEP 2011). Agriculture offers job avenues to the highest proportion of the economically active population, about 50% of the total labour force, mainly as farmers, farm labourers, and other workers in agricultural related activities (GPRS II Annual Progress Report, 2008).

Ghana, as a nation, has twenty-two public irrigation schemes spread across the length and breadth of the country. According to the 2010 population and housing census, Ghana has a population of 24,223,431 with an annual growth rate of 1.7%.

It has a total land area of 238,540 km^2 of which cultivable area is estimated to be 42% (10 million ha) of the total land area (FAO, 2005), yet it cannot produce enough food to feed its inhabitants.

Global water use increased fivefold during the 20th century. More than 5000 km^3 ($1 km^3 = 1 billion m^3$) are consumed per annum, 70% of that are used for agricultural irrigation, in addition to the rain water that is utilized by the agricultural crops (Playán E. and L. Mateos, 2004). The total arable land in the world is estimated as 1.5 billion hectares – one third of the total land on the globe. Of that, about 275 million hectares, 18% of the cultivated land, are irrigated. According to Playán E. and L. Mateos (2004) irrigated area yields 40% of the total agricultural produce.

Applying Information and Communication Technology to the lives and work of irrigation farmers in developing countries is not new, and has been an area of focus for many years with improvements in farming implements, irrigation methods and techniques. Applying ICT, and in particular mobile phone technology, is rarely seen on the agenda of development programmes however. Information and Communications Technology (ICT) can bring unprecedented potential to deliver information, provide links to markets and much more (Mukhebi, 2007).

Unwin (2004) laments the tendency to interpret ICT as being restricted to the newer technologies. He considers that our understandings for ICT use in professional development should be broadened to include the value of blended learning solutions which he defines as the 'combination of printed text materials, radio, video and face-to-face practical experiences alongside the use of computers and the internet (to enable) people to learn effectively in ways that are appropriate to their needs. In the study by Leach and Moon (2002) they defend the differentiation in interpretation between older and newer technologies in terms of their potential impact for educational transformation.

In line with several writers they believe that it is the reach of new cybernetic technologies that can provide new and potent opportunities to revolutionize both access to, and the quality of professional learning. The 'revolutionary' potency lies principally in new technology features such as web 2.0 where

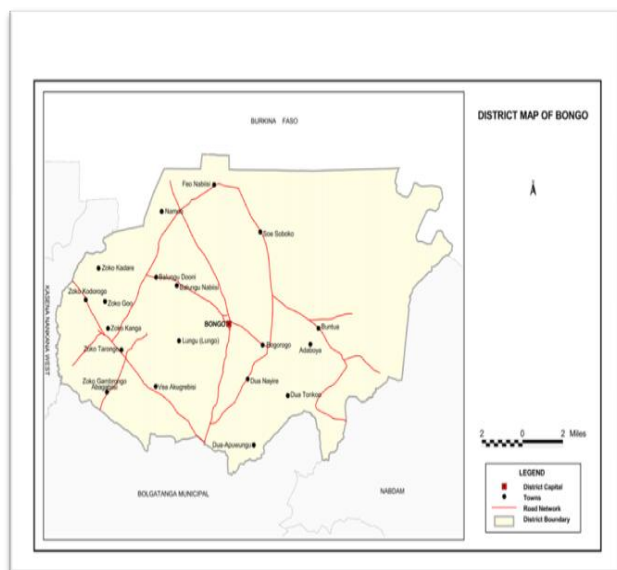
interactive written communication, multi-media text/image/sound/video combinations, hypertext creation, many-to-many communication in forms hitherto unthought-of, provide opportunities for learners to become producers of knowledge and not just consumers of information (Papert 1993, 2004; Leach and Moon 2002; Kirschner and Davis, 2003; Warschauer, 2006; Thompson, 2009)

The general objective of this study is to find out the extent to which farmers use ICT tools in irrigation farming. Specific objectives of the study include:

- To assess the levels of ICT tools usage by farmers in irrigation farming.
- To identify the types of ICT tools commonly used by farmers in irrigation farming
- Find out the effects of ICT on irrigation practice among farmers.

II. THE STUDY AREA

The study was conducted in the Bongo District of Upper East Region of the republic of Ghana. The Bongo District is one of the 13 districts in the Upper East Region. It was created by Legislative Instrument 1446 (LI 1446) in 1988 with Bongo as its capital. The district lies between longitudes 0.45o W and latitude 10.50o N to 11.09 and has a total land area of 459.5 square kilometres. The Bongo District shares boundaries with Burkina Faso to the north, Kassena-Nankana East to the west, Bolgatanga Municipal to the south west and Nabdum District to south east. Below is the map of Bongo District.



Source: Ghana Statistical Service,

The district lies within the Northern Savannah Zone with one rainy season. The amount of rainfall in the district is offset by the intense drought that precedes the rain and by the very high rate of evaporation that is estimated at 168 cm per annum. The vegetation is that of the Guinea Savannah type. Rivers and streams dry up during the dry season and the vegetation withers. During this period, farming activities are halted and livestock starve resulting in severe loss of animal weight, which in turn, affects household income.

Methodology

Purposive sampling technique was used in selecting respondents. One hundred and fifty five (155) farmers were purposely selected from the study area. The study made use of both primary and secondary data. Primary data were collected using structured questionnaire. The instrument elicited information from respondents on their demographic characteristics, land acquisition by farmers, types of crop cultivated, how farmers irrigate their land and ICT usage. Secondary sources of data include: Journals, publications, pamphlets, research projects and newsletters were also consulted to give the background information. Analytical tools such as simple descriptive statistics were used to analyze the data generated from the study. Descriptive tools such as frequency counts presented in tables, pie chart bar graphs and mean were used to present the data.

III. RESULTS AND DISCUSSIONS

Demographic Characteristics

The demographic characteristics of respondents which include Gender, Age, and Educational Status are presented in the table below:

Table 1: Respondents' Demographic Characteristics

| Demographic Characteristics | Frequency | Percentages (%) |
|-----------------------------|-----------|-----------------|
| Gender | | |
| Male | 98 | 63 |
| Female | 57 | 37 |
| Age (Years) | | |
| 20 – 30 | 92 | 59 |
| 31 – 40 | 39 | 25 |
| 41 – 50 | 6 | 4 |
| 51+ | 19 | 12 |
| Educational Status | | |
| No education/Primary | 57 | 37 |
| Middle School/J. H.S | 2 | 1 |
| S .H.S/O Level | 92 | 59 |
| Tertiary | 3 | 2 |

Table 1 above points to the fact that the total sampled population for the study was 155 and out of which 63% were male and 37% were female. It can also be observed from the table that majority (59%) of the respondents are between 20 – 30 years and 25% of the farmers ages are between 31 – 50 years, 4% of them are between 41-50 years and 12% are above 51 years. With respect to the respondents' educational status, majority (37%) of them have no formal or have just attained primary level education. Surprisingly only 1% of the respondents attained Middle School/J. H.S level of education, 59% are S.H.S/O Level leavers and only 2% had tertiary level education.

Land Acquisition, Farm Size and Source of Water.

The table below shows the distribution of land acquisition by respondents

Table 2: Acquisition of plot of land by respondents

| Do you own the plot of land for irrigation farming(Yes) | If yes, how did you acquire it? | | |
|---|---------------------------------|-----------|-------------|
| | Gift | Purchased | Inheritance |
| | 34 | 25 | 41 |

The respondents were asked by what means they acquired the plot of land for their irrigation farming activities. The table 2 above shows that majority(41%) of the respondents got their lands for irrigation farming through inheritance, 34% of them acquired their lands as a gift and 25% had their land through purchase.

The table below shows a cross tabulation of land ownership and farm size by farmers.

Table 3: Land ownership of farmers and farm Size.

Table 3: Land ownership of farmers and farm Size.

| Ownership of plot of land | | Size of farm land use for irrigation (acres) | | | | Total (%) |
|---------------------------|-------------|--|-----|-----|--------|-----------|
| | | 1 and below | 2-4 | 5-7 | Above7 | |
| | | Gift | 89 | 6 | 0 | |
| Purchased | | 13 | 0 | 87 | 0 | 100 |
| | Inheritance | 8 | 5 | 80 | 8 | 100 |

It can be observed from the table 3 above that 89% of the respondents who owned their farming land as a gift have farm size of below 1acre and 6% of them have their farm size of between 2-4 acres. Surprisingly none of the respondents who owns their farming from a gift cultivates between 5-7 acres. Only 7% cultivates above 7 acres of land. For farmers who purchased their lands for their farming activity only 13% cultivates 1 acre and below, 87% of them have a farm size of 5 -7 acres. Unfortunately none of them cultivates 2 - 4 and above 7 acres. For those who acquired theirfarm land through inheritance, majority (80%) of them have farm size of 5-7 acres, and few (8%) of them have farm size of 1 acre and below.

The distribution of the main source of water used by respondents to irrigate their farm is illustrated in the table 4 below.

Table 4: Main source of water

| Water source | Numbers of responses | Percentages |
|--------------|----------------------|-------------|
| Dam | 96 | 62 |
| Reservoir | 54 | 35 |
| River | 5 | 3 |
| Total | 155 | 100 |

From the above table 4 about 62% of the respondents irrigates their farms from Dams in the study area as compare to 35% and 3% who irrigates their farm from reservoir and river respectively.

Usage of ICT tools by Irrigation Farmers

The table 5 below shows the distribution of ICT usage by respondents.

Table 5: Usage of ICT tools byirrigation farmers *

| ICT Tools/Users Percentages | Number of users | |
|-----------------------------|-----------------|-----|
| Computers | 152 | 98 |
| Mobile phone | 152 | 98 |
| Radio | 149 | 96 |
| Television | | |
| Internet | 155 | 100 |
| | 150 | 99 |

*Multiple responses

It can be seen from the tableabove that almost all the respondents in the study area uses computers, mobile phones, radio, television and the internet.

When respondents were asked the types of information and the means by which they access the information using ICT, their responses are illustrated in the table below.

Table 6: Access and types of information obtained by respondents using ICT

| Information obtained | Percentages |
|---------------------------------------|-------------|
| Marketing information | 36 |
| Farming techniques | 34 |
| Farm products | 5 |
| Pricing | 25 |
| Means of access to information | |
| Radio station/TV | 52 |
| Mobile phone | 29 |
| Newspapers | 6 |
| Extension officers | 10 |
| Word of mouth | 3 |

According to table more than one - third (36%) of the farmers use ICTs to obtained marketing information. This is followed by 34% of farmers in the study are using ICT in accessing information on their farming techniques. 25% of respondents uses ICT to obtained information on pricing and only 5% obtained information on farm products by using ICT. On the means by which respondents access information, 52% access information on radio station/TV. Also 29% uses mobile phone in accessing information, 10% of them got information from extension officers and with 9% of these farmers together, only had access to information through newspapers and word of mouth.

The table below shows the responses on ICT usage by farmers

Table 7: Distribution of ICT usage by respondents in farming

| | Responses | |
|--|-----------|----------|
| | YES | NO |
| Do you have access to internet service | 53(34%) | 102(65%) |
| Does ICT usage improves productions in general | 64(41%) | 91(59%) |
| ICT tool in irrigating your farm | 35(23%) | 120(77%) |

From the table above it can be seen that majority (65%) of the respondents do not have access to internet and 34% have access to the internet. As to whether ICT usage improves their productions 59% responded in the negative and 41% responded yes. On using ICT tools in irrigating their farms an overwhelming majority (77%) of the respondents in the study area responded in the negative while only 23% said yes. The data obtained from the study area was further tested to find out whether ICT usage by respondents has effect on their farming activities. A hypothesis to that effect was therefore stated as:

H₀: There is no significant effect of ICT on irrigation farming.

H₁: There is a significant effect of ICT on irrigation farming.

Table 8: Chi-square analysis of effect of ICT usage by respondents

| | Value | Df | Asymp.sig. (2 – sided) |
|-----------------------|---------|----|------------------------|
| Pearson Chi-square | 114.576 | 12 | .000 |
| Likelihood Ratio | 73.362 | 12 | .000 |
| Linear-by-Linear Ass. | 7.702 | 1 | .006 |

From the table above it can be observed that the p - value (0.00) is less than the alpha level (0.05) we therefore reject the null hypothesis and hence conclude that information obtained through ICT has a significant effect on irrigation farming.

The table below shows the strength and relationship between the source of fertilizer and information obtained in ICT.

Table 9: Correlation between types of information obtained and means of accessing the information

| | Values | Error | Approx. Sig |
|----------------------|--------|-------|-------------|
| Pearson’s R | -0.224 | .068 | .005 |
| Spearman Correlation | -0.254 | .077 | .001 |

As can be seen from the correlation table above here exist a negative correlation between types of information obtained and means of accessing the information.

IV. CONCLUSIONS

Irrigation farming in Bongo district and the Upper East region as a whole remains the major source of employment through crop cultivation in the dry season. Irrigation farming provides employment and income for communities. Farmers use river, wells, dams, pumping machines, and running water from rivers to provide supplementary water supply to crops during dry seasons.

The study reveals that almost all the respondents in the study area uses ICT tools such as television, radio, mobile phones, and the internet. A conclusion can therefore be drawn to the effect that the commonly used ICT tools by farmers in the study area are television, radio, mobile phones, and the internet.

Also we can conclude that there no significant effect of ICT tools on irrigation farming in the study area.

REFERENCES

- [1] Babbie, E. (2007). The Practice of Social Research (11th edition). Belmont, USA: Thomson Wadsworth Inc.
- [2] FAO. 2005. Aquastat-FAO’s Information System on water and Agriculture. Food and Agriculture Organization of the United Nations. Water Report No. 29.
- [3] Ghana Statistical Service, (2000) Ghana living Standard Survey: Report of the Fourth Round. Ghana Statistical Service Accra.
- [4] Kuma, R. (1999), Research methodology: A step by step guide for beginners; New Delhi, India; SAGE Publications
- [5] Ngworgu, B.G. (1991), Educational Research; Basic Issues and Methodology, Wisdom publishers limited, Nigeria
- [6] Playán E. and L. Mateos.(2004) Modernization and optimization of irrigation systems to increase water productivity. In Proceedings of the 4th International Crop Science Congress Brisbane, Australia, 26 Sep – 1 Oct 2004
- [7] Swanson, B. and Rajalahti, R. 2010. Strengthening agricultural extension and advisory systems: Procedures for assessing, transforming, and evaluating extension systems. Agriculture and Rural Development Discussion Paper 44. ARD, Washington, DC, USA: World Bank.
- [8] Yilma, T., Berg, E., Berger, T., 2008. The Agricultural Technology-Market Linkage under Liberalization in Ghana: Evidence from Micro Data. Journal of African Economies.17, 62- 84.
- [9] Yilma, T., Berger, T., 2006. Complementarity between Irrigation and Fertilizer Technologies – A Justification for Increased Irrigation Investment in the Less-Favored Areas of SSA, Paper presented at the International Association of Agricultural Economist Conference, Gold Coast, Australia.