



# Eastern Africa Journal of Contemporary Research (EAJCR)

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### Article information:

To cite this article:

Gwademba, G., Muthee, D.W., & Wamae, P. (2020). Implications of ICT Usage in Agricultural Extension Information Service Delivery in Tana River County, Kenya. *Eastern Africa Journal of Contemporary Research*, 2(1), 24-33.

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# Implications of ICT Usage in Agricultural Extension Information Service Delivery in Tana River County, Kenya

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## Abstract

*This study sought to establish the effects of ICT usage in agricultural extension information service delivery to farmers in Tana River County. Specifically, the study assessed the distribution of farmers across zones with varying ICT agricultural extension information services access within Tana River County; the nature and level of ICT agricultural extension information services accessed by farmers; and the extent to which agricultural production levels by farmers in Tana River County has been enhancement by access to ICT extension information services. The findings of this study indicate that a wide range of agricultural extension information services such as agricultural insurance, access to supplies credit and mobile banking as well as information on weather patterns, crop/livestock husbandry, markets, production forecasts and record keeping are effectively disseminated to farmers through ICT platforms such as cell phones, the internet, radio and television through customized messaging and this greatly empowers farmers to adopt better farming practices and improves agricultural productivity. It is recommended that agricultural extension officers should encourage and where possible facilitate more farmers to subscribe to ICT extension service platforms to enhance agricultural productivity. The findings of this study indicate that ICT tools such as cell phones, internet, radio and television, when properly applied in agricultural extension services, could greatly inform farming decisions and thereby enhance agricultural productivity. There is therefore need for agricultural extension officers to encourage and where possible facilitate more farmers to subscribe to ICT extension information services platforms to enhance agricultural productivity.*

**Keywords:** ICT in Agriculture, Agricultural Extension Services, Agricultural Productivity, Agricultural Extension Information Systems, Rural Development



## 1. Introduction

The United Nations Sustainable Development Goals (SDGs) aim at increasing agricultural productivity for smallholder farmers at least twofold and thereby double incomes particularly for the vulnerable groups such as women, pastoralists and those engaged in fishing, through safe and fair access to production resources such as land, inputs, knowledge, financial services, markets and prospects for value addition and non-farm occupation by the year 2030 ([UN General Assembly, 2015](#)). However, to achieve this goal, advances in food security and sustainable agriculture should focus on enhancing smallholder farmers' access to agricultural information.

In giving credence to the importance of transforming agricultural extension, a food security assessment by the International Fund for Agricultural and Development ([IFAD, 2012](#)) and Food and Agriculture Organization of the United Nations ([FAO, 2017](#)), observe that between two thirds and three quarters of the food insecure people in the world live in rural areas and have no access to technology and information geared towards enhancing agricultural productivity. In the same reports, IFAD and FAO argue that in order to be able to offer sustainable livelihoods for everyone, sub-Saharan Africa countries need to increase food production five-fold by the year 2050, so as to be able to handle the food requirements of the projected population growth.

Increasing Agricultural productivity requires working on each aspect of the agricultural production chain from restoring exhausted soil, adhering to safe use of pesticides, using better and certified propagation materials and breeding stock, besides observing crop and livestock nutrition through use of fertilizers and feeds. To achieve this, there is need to significantly improve the quality of public extension services that support agriculture through intensifying the use of ICT, in order to provide timely farming information that will contribute to improving the efficiency of decision making among smallholder farmers ([Rao, 2007](#)).

[Wambura et al. \(2012\)](#) observe that while digital transformation of public extension services may be an essential part of an effective extension information system owing to the fact that it may revolutionize the way public agricultural extension services are provided, there are still several challenges that hinder application of ICT in agriculture in Kenya among them being the policy environment, illiteracy, infrastructure and capacity problems.

It is in respect to the challenges in applying ICT in transforming agricultural extension that [Davis et al. \(2010\)](#) and [Baig and Aldosari \(2013\)](#) note that while extension is said to be supporting over one billion smallholder farmers all over the world there is still need to improve extension service delivery through use of ICT in order to reach out to farmers and impart relevant skills in agricultural sciences and technology that will eventually change their farming systems for increased quantity and quality yields thereby generating desirable changes in the agricultural sector.



Bachhav (2012) argues that the use of ICT in agricultural extension information enhances farming productivity through providing information on best practices in farming, weather trends and market information which help farmers to know where to buy inputs or to sell their products. Zarmai et al. (2014) concur that in agricultural environs, appropriate and well-timed information will help farmers make right decisions to sustain growth of agriculture. Agricultural information is therefore relevant to agricultural productivity and rural transformation processes, especially for millions of smallholder farmers who remain the bedrock of agricultural and food supply chains in developing countries.

While significant efforts have been made by the government to transform the agricultural extension information systems for smallholder farmers, low agricultural productivity has continued to be experienced in Tana River County. This decline in productivity is of great concern considering that smallholder farmers are supposed to account for more than 75 per cent of the total agricultural yield and 70 per cent of sold agricultural produce in order to sustain the food requirements of the county.

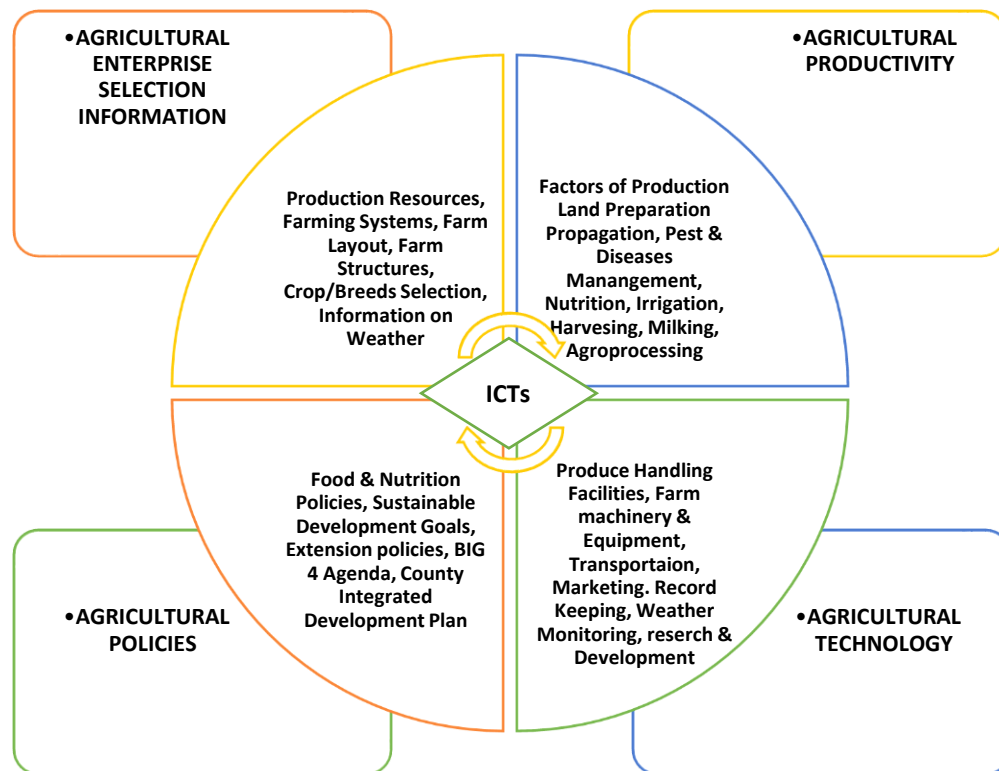
Despite the fact that the role of smallholder farmers in food security and environmental protection is acknowledged, most farmers continue to live in ecologically delicate locations with little or no access to agricultural extension information services. These challenges, therefore inhibit their ability to produce substantially. Much as the Tana River County has good soils, suitable climate and adequate rainfall and is also endowed with the largest river in Kenya, i.e. Tana River, agricultural productivity has remained poor. There is therefore need to examine the influence agricultural extension information programs have on smallholder farmers' sustainable agricultural productivity. The essence of this research was therefore to quantify and qualify how ICT application could be used in the transformation of agricultural extension information service delivery in Tana River County.

### 1.1 Focus of the Study

Digital transformation of Public Service has become a key government agenda. This study sought to establish the effects of ICT usage in agricultural extension information service delivery to farmers in Tana River County. The extent of ICT agricultural extension information services access by farmers in Tana River County; the nature and level of ICT agricultural extension information services accessed by farmers; and the extent to which agricultural production levels by farmers in Tana River County has been enhancement by access to ICT extension information services.

The study was guided by proposition that agricultural productivity is influenced by a number of factors key among them being access to timely agricultural information. Application of ICT can help in timely dissemination of agricultural information. Figure 1 depicts the Agricultural Life Cycle Model and how ICTs can be used to transform agricultural productivity by enhancing seamless access to information which greatly informed the conceptualization of this study.





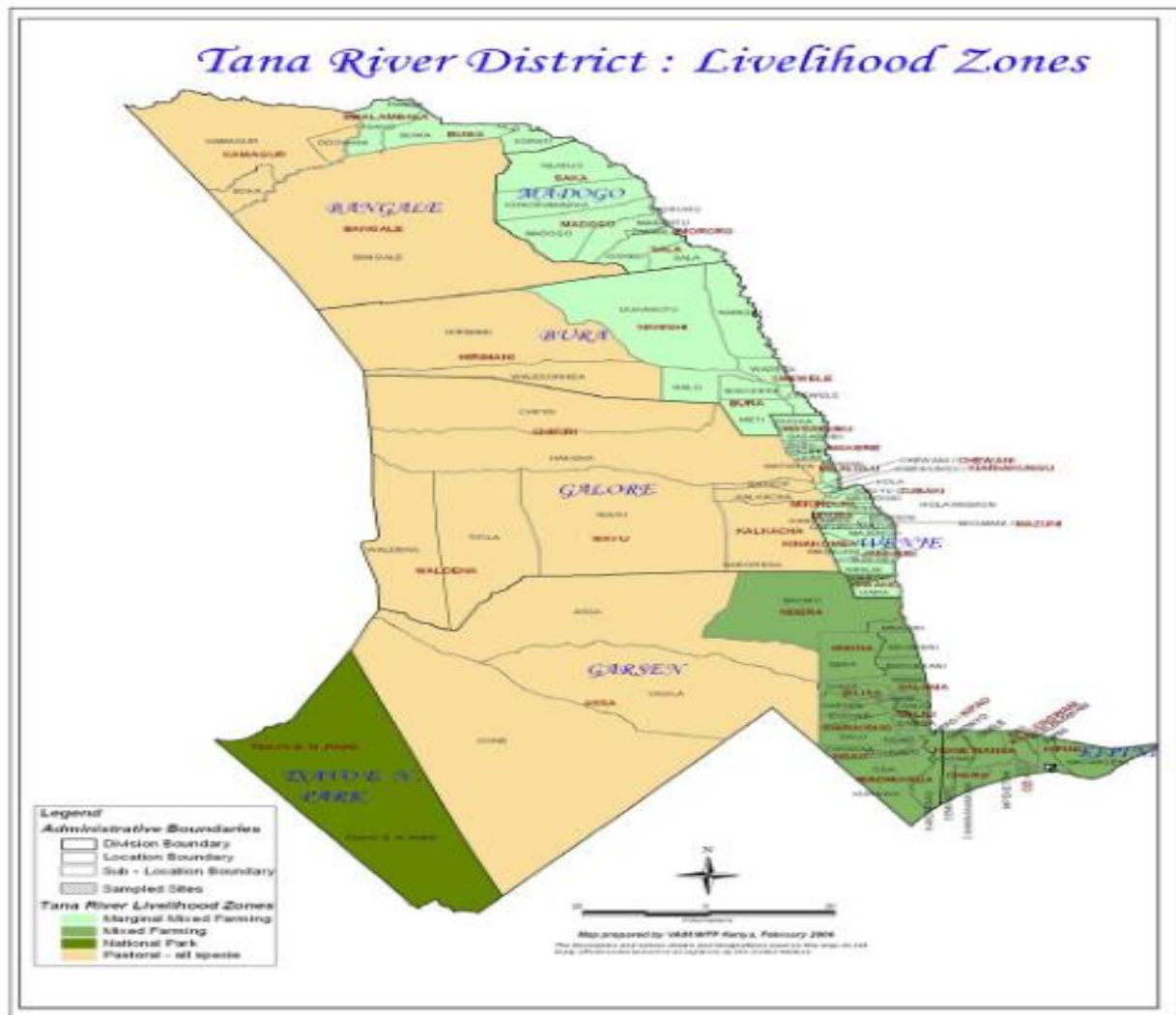
**Figure 1: Agricultural Life Cycle Model**

**Source:** Researcher, 2019

Figure 1 outlines the life cycle of farming activities and shows that for farming activities to be carried out successfully, relevant agricultural information is necessary. The fundamental principle of this model is that relevant and timely information is required at each and every stage of agricultural production and ICTs can be used to enhance the dissemination of information. Application of ICT can therefore enhance agricultural extension information service delivery thereby increasing smallholder farmers' agricultural productivity. Through effective application of ICT, farmers can have access to information on agricultural production requirements and relevant linkages between the farmers, policy makers and researchers can also be created.

## 2. Methodology

A total of 456 farmers from Galole (HOLA), Bura, Madogo and Garsen schemes in the Tana River County Livelihoods Zones as shown in the study location map in Figure 2 were randomly selected for the study.



**Figure 2: Location Map of Tana River County Livelihood Zones**

Data was collected with the help of six trained enumerators through a recall method to gather production information for the baseline year 2017 and subsequent year 2018. A structured questionnaire and formal interview schedule served as the data collection instruments. The researchers also formally interviewed public agricultural extension officers and as well as agricultural input suppliers. Descriptive statistics were used to analyse the research data.

### 3. Results and Discussions

#### 3.1 Distribution of Famers Across ICT Agricultural Extension Information Services Access Zones in Tana River County

The findings on the distribution of farmers across zones with varying ICT agricultural extension information services access within Tana River County is highlighted in Table 1.

**Table 1: Distribution of Farmers across Agricultural Extension Information Service Zones**

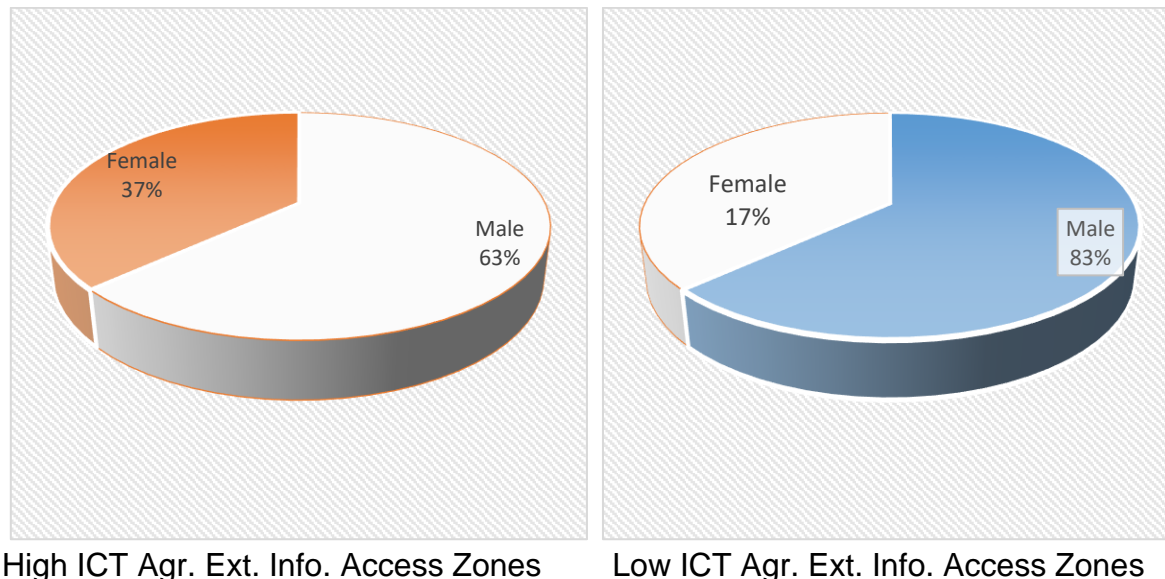
Zone Classification	Number of Respondents	Percentage
High ICT agricultural extension information services access zones (Galole (Hola) and Bura Schemes)	203	44.5%
Low ICT agricultural extension information services access zones (Madogo and Garsen schemes)	253	55.5%
<b>Total</b>	<b>456</b>	<b>100%</b>

**Source:** Research Data (2019)

Table 1 indicates that 44.5% of the respondent farmers were located within zones with a high access level of ICT agricultural extension information services namely the Galole (Hola) and Bura Schemes while 55.5% of the respondent farmers were located in Madogo and Garsen schemes which are classified as zones with low access level of ICT agricultural extension information services.

### 3.2 Gender Classification of the Farmers

The farmers within the different zones of ICT agricultural extension information access were further classified in terms of their gender. Figure 3 outlines the relevant results.



**Figure 3: Gender of the Respondents**

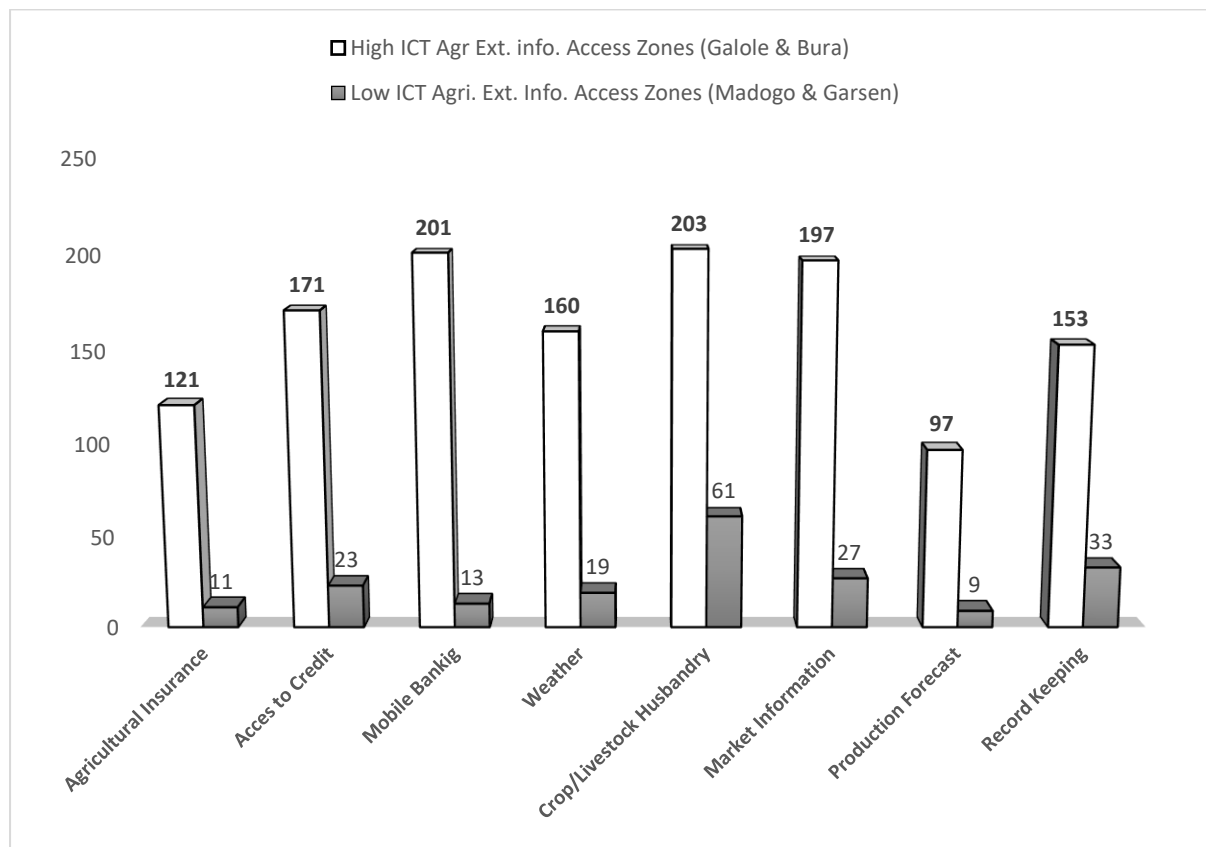
**Source:** Research Data (2019)

Figure 3 indicates the representation of male and female farmers in the two ICT agricultural extension information service zones. In the high ICT agricultural extension information service access zones, there were 63% male and 37% female respondents

while there were 83% male and only 17% female respondents in the low ICT agricultural extension information access zones. This analysis reveals that a high level of ICT agricultural extension information service access had influenced more female farmers to engage in agricultural activities

### 3.3 Nature and Level of ICT Agricultural Extension Information Services Accessed by Farmers

A wide category of agricultural extension information services is available to farmers in the Tana River County. This information includes agricultural insurance, access to credit, mobile banking, weather patterns, crop/livestock husbandry, market information, production forecasts and record keeping. The extent to which this information reaches the farmers under the two zones of high ICT agricultural extension information service zones and low ICT agricultural extension information service zones is highlighted in Figure 4.



**Figure 4: Nature and Level of ICT Agricultural Extension Information Services Access**

**Source:** Research Data (2019)

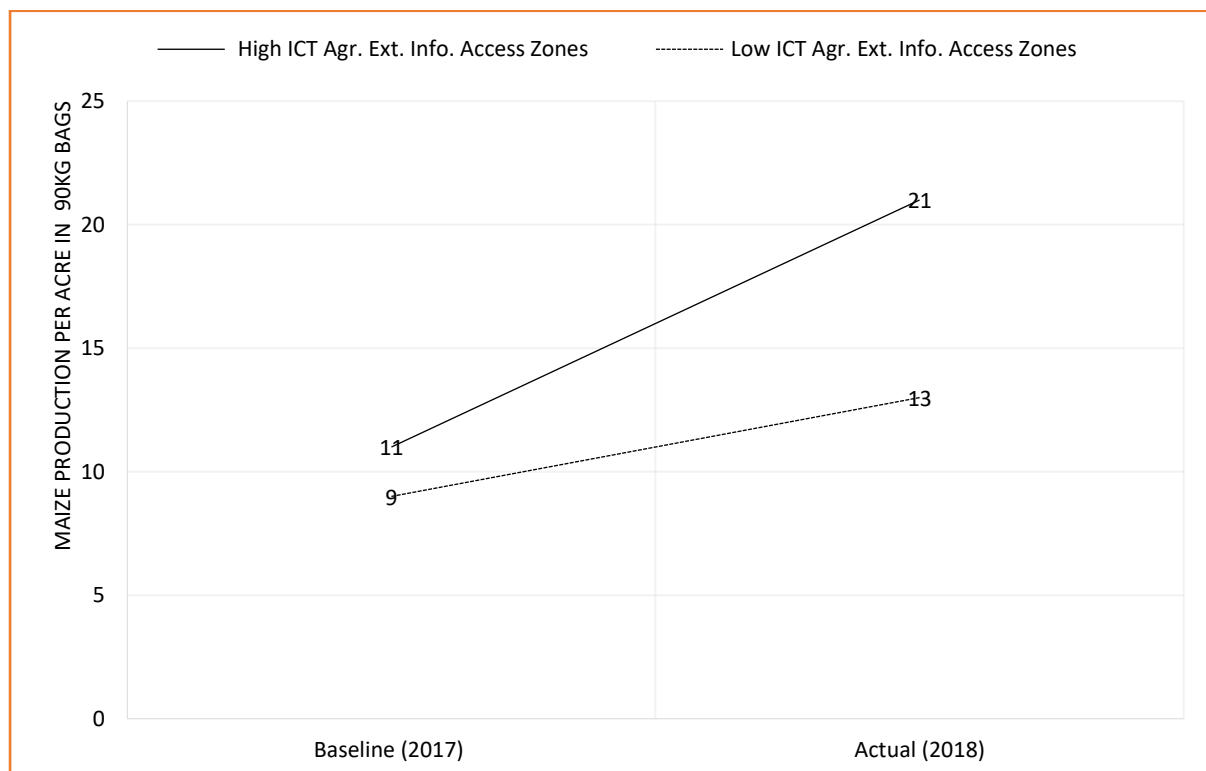
Figure 4 indicates that farmers in the high ICT agricultural extension information access zones received a great extent of agricultural extension information on all studied categories compared to respondent farmers in low ICT agricultural extension information access zones.



Since the smallholder farmers in the high ICT agricultural extension information access zones obtained more timely agricultural information as compared to those in the low ICT agricultural extension information access zones, they were more likely to run vibrant agricultural value chains. Agricultural extension service providers in the high ICT agricultural extension information service access zones were also able to run effective information dissemination programs propagated through the ICT platforms compared to those in the low ICT agricultural extension information service access zones.

### 3.4 Agricultural Production Enhancement by ICT Extension Information Services

The study also analyzed the impact of ICT extension information services on agricultural production by evaluating the maize production levels over a two-year period within the two ICT agricultural information access zones. Maize farmers from the high ICT agricultural extension information service access zones and the low ICT agricultural extension information service access zones were asked to give through the recall method the number of maize bags they had harvested per acre of land in years 2017 and 2018. Figure 5 shows the comparative findings.



**Figure 5: Comparative Maize Production Levels across ICT Agricultural Extension Information Service Access Zones**

**Source:** Research Data (2019)

The results in Figure 5 show that much as the maize production levels had increased for farmers both in the high ICT agricultural extension information zones (from 11 to

21 bags) and low ICT agricultural extension information zones (from 9 to 13 bags), the level of maize production increment was higher in high ICT agricultural extension information zones compared to non-that in the low ICT agricultural extension information zones. This is attributable to the fact that the farmers in the high ICT agricultural extension information zones were better equipped with timely agricultural extension information and were therefore able to make better farming decisions such as land preparation, pest and diseases control, harvesting, post harvesting handling and marketing and other important decisions regarding crop husbandry thus enhancing their maize production levels.

#### 4. Conclusions and Recommendations

The findings of this study indicate that a wide range of agricultural extension information services such as agricultural insurance, access to supplies credit and mobile banking as well as information on weather patterns, crop/livestock husbandry, markets, production forecasts and record keeping are effectively disseminated to farmers through ICT platforms such as cell phones, the internet, radio and television through customized messaging and this greatly empowers farmers to adopt better farming practices and improves agricultural productivity. It is recommended that agricultural extension officers should encourage and where possible facilitate more farmers to subscribe to ICT extension service platforms to enhance agricultural productivity. The findings of this study indicate that ICT tools such as cell phones, internet, radio and television, when properly applied in agricultural extension services, could greatly inform farming decisions and thereby enhance agricultural productivity. There is therefore need for agricultural extension officers to encourage and where possible facilitate more farmers to subscribe to ICT extension information services platforms to enhance agricultural productivity.

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