

Research Application Summary

Access and usage of e-Extension Services among Smallholder farmers in Nakuru County, Kenya

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Abstract

Smallholder farmers in Kenya are faced with low agricultural productivity and need access to timely, relevant and cost effective agricultural information through effective and efficient extension service delivery. This study determined ICT resources accessed and used by smallholder farmers to access e-extension services in Nakuru county, Kenya. Data were collected from randomly selected sample of smallholder farmers in a descriptive survey, using structured questionnaires and focus group discussions. Over 70 percent of the respondents had access to mobile phones, radio and TV while only 27.7 percent had access to the internet. The respondents that had access to YouTube, twitter and computers however, were less than 20 percent. The findings of the study revealed a significant ($P<0.05$) influence between access to ICT resources and usage of e-extension services among smallholder farmers. It is therefore, concluded that the accessible ICTs can be used to provide e-extension services to smallholder farmers. Creation of awareness on availability of e-extension services however, needs to be promoted more widely.

Keywords: Agricultural information, e-Extension services, Kenya, smallholder farmers

Résumé

Les petits exploitants agricoles au Kenya sont confrontés à une faible productivité agricole et ont besoin d'accéder à des informations agricoles opportunes, pertinentes et rentables grâce à une prestation de services de vulgarisation efficace et efficiente. Cette étude a déterminé les ressources TIC accessibles et utilisées par les petits exploitants agricoles pour accéder aux services de vulgarisation en ligne dans le comté de Nakuru, au Kenya. Les données ont été recueillies auprès d'un échantillon de petits exploitants agricoles sélectionnés au hasard dans le cadre d'une enquête descriptive, à l'aide de questionnaires structurés et de discussions de groupe. Plus de 70 % des personnes interrogées avaient accès à des téléphones portables, à la radio et à la télévision, tandis que seulement 27,7 % avaient accès à Internet. Les répondants qui avaient accès à YouTube, Twitter et les ordinateurs étaient cependant moins de 20%. Les résultats de l'étude ont révélé une influence significative ($P<0,05$) entre l'accès aux ressources TIC et l'utilisation des services de vulgarisation en ligne chez les petits exploitants agricoles. Il est donc conclu que les TIC accessibles peuvent être utilisées pour fournir des services de vulgarisation en ligne aux petits exploitants agricoles. La sensibilisation à la disponibilité des services de vulgarisation électronique doit cependant être encouragée plus largement.

Mots-clés : informations agricoles, services de vulgarisation en ligne, Kenya, petits exploitants agricoles

Introduction

World population is expected to surpass the 9 billion mark by 2050, and agriculture has to increase the production of nutritious food to meet the growing demand and ensure food security for all. Most of the increase in food production will have to take place in developing countries (Food and Agriculture Organization [FAO], 2017a). African countries rely heavily on the agricultural sector as the mainstream for economic growth, employment creation and foreign exchange earnings. There are approximately 1.5 billion smallholder farmers in the world and they provide approximately 80 percent of the food in many developing countries Kenya included. Despite this fact, these farmers tend to be under-resourced and lacking access to improved inputs, rural services and markets, leading to low productivity and a lack of opportunity to break the cycle of poverty. Smallholders in many developing countries remain disadvantaged when it comes to accessing quality Extension and Advisory Services (EAS) (Davis and Franzel, 2018). One way of bridging the gap of reaching large number of farmers is by using information communication technologies (ICTs). The development of ICTs has facilitated the dissemination of knowledge and information and has been identified as a major driver of economic growth (FAO, 2017b). e-Extension is a system which depends on ICT's such as mobile telephony, innovative community radio and television programs, mobile phones in combination with radio, video shows, information kiosks, web portals, rural tele-centers, farmer call centers, video-conference, offline multimedia CDs and open distance learning (Asenso-Okyere and Mekonnen, 2012). Kenya has embraced the provision of e-extension services in the delivery of extension and advisory services to farmers' due to increased mobile penetration and internet connectivity which stands at over 90 percent as at 2019 (Communications Authority [CA], 2019). Access and usage of e-extension services among smallholder farmers in Kenya has however, not been evaluated empirically. The objectives of this study were specifically to: determine access to ICT resources among smallholder farmers in Nakuru county, Kenya; establish the type of agricultural information that smallholder farmers access through e-extension services in Nakuru county, Kenya; determine the availability of agricultural e-content to smallholder farmers through e-extension services in Nakuru County, Kenya; and determine the type of e-extension platforms that smallholder farmers most prefer in accessing e-extension services in Nakuru County, Kenya.

Materials and Methods

Conceptual framework. Access to extension and advisory services among smallholder farmers is crucial to increasing their agricultural productivity. Figure 1 presents the conceptual framework adapted for this study. Underlying assumption is that smallholder farmers can effectively access agricultural information if ICT resources are accessible, and the type of agricultural information disseminated though the ICTs can meet their need and the agricultural e-content is available to them in a preferred e-platform.

The independent variable of the study included access to ICT resources by smallholder, e-content availability to the farmers and the types of e-Extension platforms available to the smallholder farmers. The dependent variables on the other hand is the usage of e-Extension services measured in terms of frequency of use of ICT resources and preference for e-platforms. The intervening variables of the study included education level, age, gender, income and group membership level of smallholder farmers.

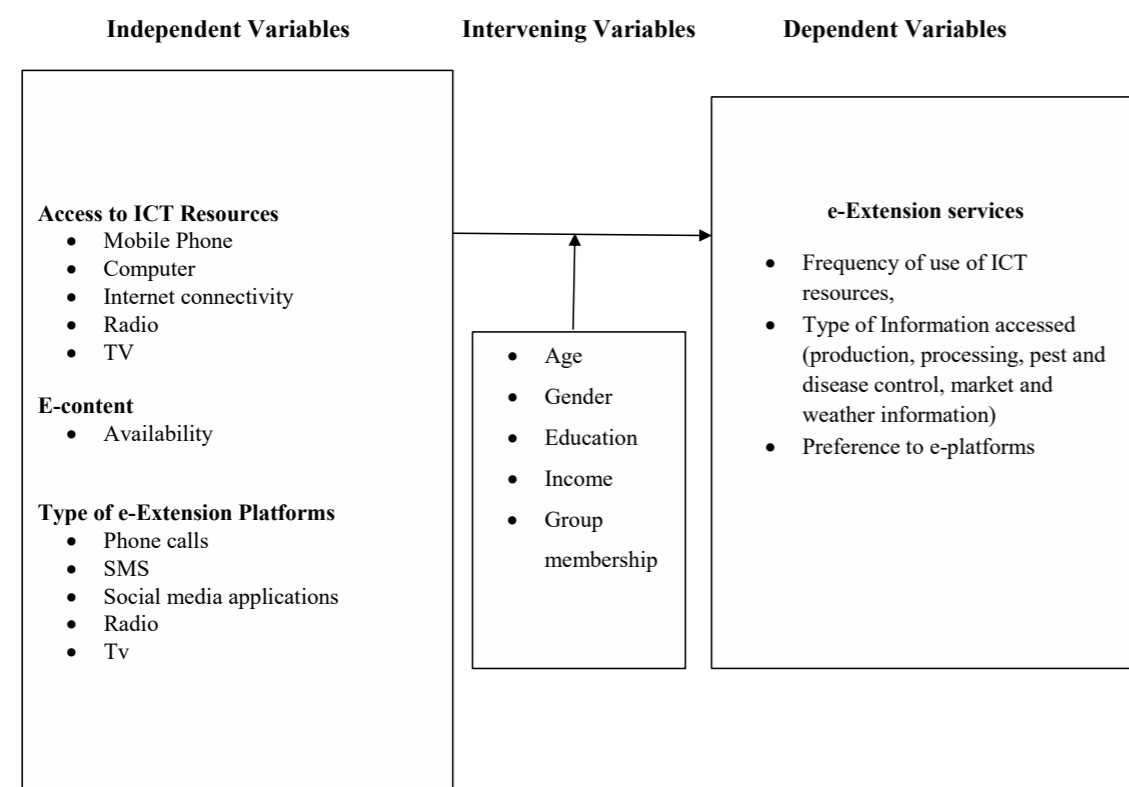


Figure 1. Conceptual framework showing the relationship between variables

Study Site. The study was carried out in Nakuru county, Kenya. The County is cosmopolitan with farming communities carrying out diverse agricultural activities hence having varied information needs and information accessed by farmers through e-Extension services. The County has also initiated a farmer call center which is serving farmers in the entire county by providing e-Extension services and is the only call center currently available in the country. Three sub counties were selected to represent the three agro-ecological zones of high, medium and low potential in the county.

Research design and data collection. Data required were obtained in a descriptive survey in which simple random sampling technique was applied to obtain a representative sample of smallholder farmers. The study targeted farmers with small farm holdings. A structured questionnaire was administered to the farmers (130) to obtain data on level of access to ICT resources, type of agricultural information accessed through e-extension services, type of agricultural e-content available to them and the type and preferences for e-extension platforms. For each ICT resources accessed, respondents rated on a Likert scale of 1 to 5 (1 = low to 5 = high) the type of agricultural information accessed, type of agricultural e-content available to them and the type and preference to e-Extension platforms.

Data analysis. Data were analyzed to obtain frequencies, percentages, means and standard deviations. Ordinal logistic regression was used to determine the level of access to ICT resources and availability of e-content on usage of e-extension services among smallholder farmers in Nakuru county, Kenya.

Results and Discussion

Table 1 shows the characteristics of the smallholder farmers in the study area.

Table 1. Characteristics of the sampled smallholder farmers

| Scale | Characteristic | Percentage |
|---|--------------------|------------|
| Gender (n = 130) | Male | 43.1 |
| | Female | 56.9 |
| Age (n = 130) | Less than 25 years | 5.4 |
| | 26-35 | 20.8 |
| | 36 – 45 | 19.2 |
| | 46 – 55 | 27.7 |
| | 56-65 | 12.3 |
| Highest level of education (n = 130) | 65 years and above | 14.6 |
| | None | 5.0 |
| | Primary | 66.1 |
| | Secondary | 45.2 |
| | Tertiary | 9.0 |
| Farm Size (n = 130) | University | 9.0 |
| | 0.1-1.99 | 53.3 |
| | 2-3.99 | 39.2 |
| | 4-6.99 | 6.2 |
| | 7-10 | 1.5 |
| Farmer Group Membership (n=130) | Yes | 63.0 |
| | No | 37.0 |

Source: Field Survey 2020

As seen in Table 1, 43.1 percent of respondents were male and 56.9 percent were female. Past studies have been used to show gaps in the adoption of ICTs due to the influence of gender differences. Majority of the respondents (27.7%) were between ages 45 - 55 years with a mean age of 48 years. This shows that most of the respondents were middle aged which may imply possibility of little dependency since they are robust and productive and can actively participate in farming and other economic activities and are more likely to adopt ICT tools. The distribution of respondents by education level indicates that 66 percent had attained primary level of education, 45 having attained secondary level and only 9 percent reaching the tertiary and university level. However, 5 percent of the respondents had no education at all. The overall findings therefore shows that majority of the respondents had attained primary level of education and were able to read and write which could influence their ability to use ICT tools to access agricultural information. The average farm size where the farmers practiced their farming activities was 1.9 acres (0.8ha) with 92.3 percent of the respondents' farms falling between 0.1-3.99 acres. Only 7.7 percent had land that was more than 4 acres (1.8 ha) while 1.5 percent had farms that were more than 7 acres. This suggests that a large majority of the respondents were smallholders. Group membership as depicted by the results indicated that 63 percent of respondents were members of a farmer group organisation while 37 percent were not affiliated to any farmer group organisation.

Level of Accessibility to ICT Resources among Smallholder Farmers. Table 2 presents the results of the respondent's access to the various ICT resources scored using a 5 point Likert Scale of 1 = No Access to 5 = Very high access.

Table 2. Level of Farmers' Accessibility to ICT Resources

| ICT Resource | N | Mode | Median | Mean | Std. Dev |
|--------------|-----|------|--------|------|----------|
| Mobile Phone | 98 | 5 | 5.0 | 4.4 | 0.84 |
| Computer | 12 | 3 | 3.0 | 2.6 | 1.16 |
| Internet | 36 | 4 | 4.0 | 3.5 | 1.03 |
| Radio | 113 | 4 | 4.0 | 4.2 | 0.70 |
| TV | 94 | 3 | 3.0 | 3.1 | 0.84 |
| YouTube | 25 | 2 | 3.0 | 2.9 | 1.26 |
| WhatsApp | 43 | 4 | 4.0 | 3.7 | 1.14 |
| Facebook | 34 | 3 | 3.0 | 3.1 | 1.05 |
| Twitter | 7 | 1 | 2.00 | 2.7 | 1.60 |

Source: Field Survey (2020)

Table 2 indicates that mobile phone was the most accessible ICT resource with a mode and median of 5 and a mean of 4.4 (Very high access); the internet, radio and WhatsApp also scored high with mode and median of 4 (high access) for both of them. Accessibility to TV, Computers and Facebook, were moderate with all the three having a mode and median of 3. YouTube had a low level of access with a mode of 2 and a median of 3 indicating low to moderate access to the ICT resource. Twitter had the lowest level of accessibility with a mode of 1 and a median of 2 indicating very low access among the respondents. The high accessibility to ICT resources such as radio, mobile phones and TV and applications like WhatsApp as depicted by the results regardless of the rural nature of the populace is an indication that these resources could provide opportunities for utilizing them to provide e-extension services to farmers.

Type of Agricultural Information Farmers Seek for Using ICTs Resources. The research aimed to understand the type of agricultural information that farmers search for using ICT resources. The respondents made selections from five categories namely; Production information, processing and value addition, weather information, pest and disease control and market Information. They were also allowed to make multiple selections for each ICT resource used.

Table 3 shows that production information was the most sort out information with 63 percent selection frequency. Market information came in second with a total selection frequency of 38.7 percent. Focus group discussions indicated that farmers sought to obtain production and market information to increase their production, secure reliable market and best prices for their produce. Pest and disease control information was selected 25 percent times while information concerning the weather had a selection frequency of 15.8 percent. Processing and value addition was least selected having only a 7.7 percent selection frequency. Mobile phone, radio and TV was the most frequently used ICT resources to access production information. The respondents through focus group discussions indicated that they either made phone calls or texted to receive information such as inputs availability and listened to radio and TV programmes on agricultural sustainable practices such as input application rates, weed control, soil conservation, diversification, among others.

Table 3. Type of agricultural information accessed from ICT tools

| ICT Resource | Production information (%) | Processing and Value addition (%) | Weather Information (%) | Pest and Disease Control (%) | Market Information (%) |
|----------------------------|----------------------------|-----------------------------------|-------------------------|------------------------------|------------------------|
| Mobile Phone | 71.4 | 1.0 | 29.6 | 33.7 | 52.0 |
| Computer | 58.3 | 16.7 | 0.0 | 16.7 | 50.0 |
| Internet | 63.9 | 5.6 | 2.8 | 22.2 | 33.3 |
| Radio | 87.6 | 6.2 | 31.9 | 35.4 | 48.7 |
| TV | 81.9 | 7.4 | 28.7 | 27.7 | 36.2 |
| YouTube | 60.0 | 8.0 | 16.0 | 28.0 | 16.0 |
| WhatsApp | 67.4 | 7.0 | 4.7 | 32.6 | 37.2 |
| Facebook | 61.8 | 2.9 | 14.7 | 14.7 | 32.4 |
| Twitter | 14.3 | 14.3 | 14.3 | 14.3 | 42.9 |
| Average Percentage (n=130) | 63.0 | 7.7 | 15.8 | 25.0 | 38.7 |

Source: Field Survey (2020)

Level of availability of Agricultural e-content among smallholder farmers. Table 4 presents the scores of the level of accessibility of agricultural e-content among respondents which was scored using a 5 point Likert scale of 1= No Access 2 = Low access 3 = Moderate access 4 = High access 5 = Very high access.

Table 4. Central tendencies of level of availability of agricultural e-content among smallholder farmers

| Agricultural e-Content | Mode | Median | Lower bound | Higher Bound |
|--------------------------------|------|--------|-------------|--------------|
| Texting | 4 | 4.00 | 1 | 5 |
| Phone calls | 4 | 4.00 | 1 | 5 |
| Radio | 4 | 4.00 | 1 | 5 |
| TV | 4 | 4.00 | 1 | 5 |
| Pictures (Accessed from ICTs) | 3 | 2.00 | 1 | 5 |
| e-books/journal/blogs/websites | 2 | 2.00 | 1 | 5 |

(n=130) Source: Field Survey (2020)

The results in Table 4 shows that the farmers had high access to texting, phone calls, radio, and TV with all of them having a median and mode of 4. There was poor to moderate availability of pictures with a median and mode of 2 and 3, respectively, while e-books/journal/blogs/websites had a poor accessibility level with both median and mode of 2.

Agricultural e-content availability and its influence on usage of e-extension services among smallholder farmers. Ordinal regression model was used to test the level of influence of e-content availability on usage of e-extension services among smallholder farmers. The results are presented in Table 5.

Table 5. Model Summary of Ordinal Regression between availability of e-content and usage of e-content for e-extension services

| e-Content | N | Sig value | Goodness-of-value Fit sig | R value | R ² Value |
|-----------------------------------|-----|-----------|------------------------------|---------|----------------------|
| Texting | 61 | .000 | .200 | .673* | .453 |
| Phone calls | 78 | .000 | .616 | .538* | .289 |
| Radio | 102 | .005 | .277 | .387* | .150 |
| TV | 88 | .050 | .091 | .336* | .113 |
| Pictures | 23 | .315 | .545 | .443NS | .196 |
| ebooks/journal/ blogs/websites | 5 | .578 | .225 | .461NS | .212 |

NS=Non-significant and * indicate significance of values at P=0.05 and 0.01 goodness of Fit
Source: Field Survey (2020)

The ordinal regression test results in Table 5 show a positive relationship ($r = 0.336 - 0.673$) between availability of e-content on the usage of e-extension services by smallholder farmers which were statistically significant for all the ICT resources at $\alpha = 0.05$ significance level except for pictures and ebooks/journal/websites. Pictures and ebooks/journal/websites had a p-value of .315 and .578, respectively, which is greater than the chosen level of significance of 0.05 under which the hypotheses of this study were investigated.

The results further revealed that the predictor variables accounted for different variations for availability of e-content on usage of e-extension services using Pearson's goodness of fit of $\alpha = 0.01$ to test whether the observed data were consistent with the fitted model. The goodness of fit for all the ICT resources under study had a significance value which was greater than $\alpha = 0.01$ as seen in Table 5. The results also revealed that the predictor variables accounted for different variations in usage of e-extension services with R² ranging from 0.113 to 0.453 for the available e-content. This implies that that the variations accounted for 11.3 to 45.3 percent in usage of different available e-content among the respondents.

The finding therefore suggests that availability of e-content has an influence on usage of e-extension services among smallholder farmers. This implies that farmers use the available e-content to access agricultural information for various farming activities. The results further suggest that pictures and e-books/journals/websites did not influence usage and this could be due to the low level of accessibility to these types of e-content.

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