Journal of Humanities and Social Sciences Studies
ISSN: 2663-7197
DOI: 10.32996/jhsss
Journal Homepage: www.al-kindipublisher.com/index.php/jhsss

JHSSS
AL-KINDI CENTER FOR RESEARCH AND DEVELOPMENT

| RESEARCH ARTICLE

Effect of Ease of Access to Information on Technology Usability on Household Food Security among Smallholder Farmers in Bungoma North Sub-County, Kenya

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| ABSTRACT
Smallholder farming is the livelihood of a large proportion of the population in developing countries, and agricultural innovations have the potential of enhancing productivity. In Sub-Saharan Africa, maize is a major staple; however, farmers experience heavy losses in post-harvest operations, especially storage. Hermetic storage technologies can preserve grain in quality and quantity, thus ensuring food availability while maintaining their exchange value. Extracting benefits from technology is premised on their adoption and use by farmers. Technology adoption is a process that starts with the diffusion of information about the existence of innovation. The study examined the effect of ease of access to information on technology usability on household food security in Bungoma North Sub-County, in Kenya. This study employed a cross-sectional design, where 394 households were sampled from across all the six locations of Bungoma North Sub County and questionnaires administered. From the factor analysis, household food security was loaded onto two components: food availability and food consumption, while ease of access to information on technology usability was loaded onto one component. Simple linear regression was used to estimate the effect of the independent variable on the dependent variables. Ease of access to information on technology usability had a positive and significant effect on both food availability and food consumption. This study is important in strategizing for productivity enhancement among smallholder farmers and recommends increased awareness on the availability of agricultural technologies.

| KEYWORDS
Access to Information, Household Food Security, Smallholder Farmers, Technology Adoption

| **ARTICLE DOI:** 10.32996/jhsss.2022.4.1.19

1. Introduction
One-third of food produced for human consumption globally gets lost during post-harvest operations annually (FAO, 2011). In high and medium-income countries, food is to a great extent wasted, primarily resulting from actions of retailers and consumer preferences, manifesting in their behavioural decisions about food (FAO, 2019). In developing countries, especially in Sub-Saharan Africa, significant losses in both quality and quantity occur in the mid-stages of the agricultural value chain, especially in farm-level post-harvest processing and storage (FAO, 2011; Ridolfi et al., 2018). According to FAO (2019), in SSA, the highest losses are seen in cereals and pulses, especially in maize, wheat, and rice, with a big impact on the food and income security of many farming households. Grain losses in the region are estimated at 20-40%, worth US $4 billion annually (World Bank, 2011). Almost all agricultural activities are conducted conventionally, leading to an estimated 15% post-harvest quantitative loss in the field, up to 20% during processing and approximately 25% in storage (Manadhar et al., 2018). In Kenya, up to 40% of the maize grain is lost in post-harvest handling, especially during storage (FAO, 2014), pushing the maize import needs of the country by up to 5 million bags annually (USAID, 2016).

Storage plays a critical role in household food and income security, given that agricultural commodities are consumed all year round while production is seasonal. It allows producers to optimize the timing of bringing their produce to the market and to make critical consumption decisions, especially during the off-season (FAO, 2019). Reducing food losses during post-harvest operations, including on-farm storage, is a critical strategy towards meeting the increasing demand for food and securing the livelihoods of smallholder farmers largely because storage losses greatly impact available food volume and quality, as well as the exchange value of the farm, produce (FAO 2011; Tefera et al., 2011; Sheahan & Barrett, 2017). Effective storage of cereal grains is important for smoothing seasonal production (Manadhar et al., 2018) and evening out fluctuations from one harvest season to another (Sharon et al., 2014). Farmers can feed their families all year round and given the freedom to decide when to offload surplus harvest (Tefera et al., 2011), especially when faced with substantial seasonal price fluctuations (Kotu et al., 2019)

Agricultural innovations have the potential to improve food security and contribute towards poverty reduction by enhancing rural farmers' command over food staples and the exchange value of their commodities (Conceição et al., 2016). Technological advances in storage practices, including the use of improved systems, enable smallholder farmers to maintain the quantity and quality of their grain while in storage (Tefera et al., 2011; World Bank, 2011; Kumar & Kalita, 2017). In developing countries, the most widespread intervention strategy disseminated to smallholder farmers involves the use of hermetic storage technology (HST), which make use of airtight sealing to limit reproduction cycles of pests and pathogens, thereby eliminating the need for synthetic chemicals (Sheahan & Barrett, 2017). It involves the use of metal silo, plastic barrel, and the hermetic bag, popular its versatility and affordability. This technology uses a combination of several layers of high-density polyethylene and polypropylene bags to store grain (Kharel et al., 2018). The inner polyethylene layers create hermetic conditions by eliminating oxygen permeability, while the outer polypropylene casing aids in providing mechanical strength (Manadhar et al., 2018). The most common of the hermetic bags is the Purdue Improved Crop Storage (PICS) bags developed by a team of researchers at Purdue University (USAID, 2016). Other options include the SuperGrainbags™ developed by Grain Pro Inc., ZeroFly®, AgroZ and Elite storage bags.

1.1 Statement of the Problem

Innovative technologies can play a significant role in increasing agricultural productivity and food security; however, their ultimate value, including raised yields and improved quality of produce, is premised on their adoption and use (Bukchin & Berret, 2018; Uguchukwu & Philips, 2018). However, in Sub Saharan Africa, the agricultural sector is characterized by traditional systems and low-level technology adoption, leading to low productivity (Akudugu et al., 2012; Mgendi et al., 2019; Takahashi et al., 2019), thus impacting food and income security of many households. To sustain their livelihood, smallholder farmers need to innovate their agricultural production activities as an adaptive measure in a rapidly changing environment characterized by climate change, urbanization, and globalization (Sinyolo, 2020). In Bungoma County, in Kenya, where production is mainly carried out in small farm holdings, farmers possess a great potential to increase their yields through the adoption and use of productivity-enhancing technologies, including hermetic storage technologies (GOK, 2014; Kamau & Nyongesa, 2017). The hermetic technology and particularly the PICS bag has been promoted in the county alongside other major maize producing counties through the Kenya Agricultural Value Chains Enterprises (KAVES) project since 2013, spearheaded by the Feed the Future (FTF) program of the United States Agency for International Development (USAID) in partnership with other state and non-state organisations (USAID, 2016). One of the players in the promotion of hermetic technology is One Acre Fund (OAF), a membership-based agricultural organization offering productivity-enhancing and labor-saving practices and technologies to smallholder farmers and which has been operating in Bungoma County since its inception in 2006. Decisions to adopt productivity-enhancing technologies by small-holder farmers is mainly incumbent upon economic considerations, based on their access to information about existing technologies. To what extent has the popularization of hermetic storage technology impacted the food security status of households in Bungoma North Sub-County?

1. 2. Research Objective

To examine the effect of ease of access to information on technology usability on food security among smallholder farmers in Bungoma North Sub-County, Kenya

2. Theoretical Review

2. 1. Diffusion of Innovations Theory

Technology adoption is a process that entails information-seeking and processing, decision-making, and implementation. Accordingly, potential adopters of innovation must first get to know about the existence of innovation, be persuaded on the merits of adopting and incorporating the innovation in their activities, after which they decide to adopt, put the innovation into use, and confirm the decision to adopt the innovation, either directly or after some adaptations (Rogers, 1983). Innovation is not adopted at the same rate by everyone in a social system but takes a gradual spread over time. Attributes of the innovation are important in the diffusion process, which is an uncertainty reduction process, and adoption tends to happen when the level of uncertainty about innovation has been reduced to the lowest level possible (Sahin, 2006). The newness of innovation naturally elicits some degree of uncertainty which needs to be overcome through information about the innovation courtesy of different sources, including extension agents and other farmers, before it is accepted and deployed by the targeted users (Uguchukwu & Philips, 2018).

2. 2. Sustainable Livelihood Framework

The agricultural production system is premised on the assumption that a change originating from one component may lead to a structural change in the entire system, assets supporting food production being one component and the other being the people that depend on what is being produced (FAO, 2018). Livelihood outcomes such as food security and a better income are a result of dynamic strategies, including technology adoption and related investment decisions that farmers take while making use of available assets or capitals (Alinovi et al., 2010). A major influence in the deployment of these strategies is the level of access to and control of assets that one has, conditioned by the complex social, economic, and institutional contexts alive in each environment (Scoones, 1998). This approach allows us to study the assets at the disposal of farmers and how they are influenced in making investment decisions when an agricultural intervention is introduced, and the outcomes they aspire from such decisions. The sustainable livelihoods approach shows that livelihoods are composed of assets and enhancements from their different combinations that allow farming households to deploy a combination of strategies, influenced by internal and external conditions and circumstances, with the purpose of sustaining or improving their food security status and income levels (Connolly-Boutin & Smit, 2015; Ndhlovu, 2018).

3. Empirical Review

The adoption process understood from the context of technological innovation involves replacing one production process with another or adding a new component to the existing system or process (Sanchez-Toledano et al., 2018). Access to information about the existence of innovation, benefits accruing from its deployment and how to use it helps farmers make informed decisions on whether to adopt, how and when (Obayelu et al., 2017; Cafer & Rikoon; 2018). The quality of the information received by farmers may affect their adoption decisions. However, accessing information about technology does not automatically translate to its improved adoption rate. Farmers may hear about technology and perceive it differently from the innovators due to subjective analysis of the technology (Mwangi & Kariuki, 2015) or due to personal preferences. The agricultural extension helps to inform farmers about the existence of innovations and reduces levels of ambiguity and uncertainties about them (Akudugu et al., 2012) by allowing farmers to see them in action before committing scarce resources in adopting them. Training and sustained extension contact positively influence adoption decisions (Sanchez-Toledano et al., 2018), based on a study in Southern Mexico on the adoption of improved maize seeds. Other studies have recorded similar findings on how extension services influence the adoption of technology (Khan et al., 2008; Mwangi & Kariuki, 2015; Milkias & Abdulahi, 2018). According to Khan et al. (2008), the greatest impact of extension contact is in the early stages of the diffusion process when information disequilibrium is greatest. In a differing opinion, Ngowi and Selejio (2019) argue that the effect of extension services remains significant throughout the diffusion process; however, the ratio of extension agents to farmers is very low in many developing countries, thereby limiting their reach.

Farmers interact amongst themselves, exchanging ideas and information based on trust (Bandeira & Rasul, 2002; Mwangi & Kariuki, 2015). How people believe others view certain technologies influence their actions and behaviour, including the adoption and use of such technologies (Mulugo et al., 2019). Although the usefulness of innovation influences the decision to adopt, Naspetti et al. (2017) state that the opinion of others, including family members and fellow farmers, strongly influences farmers' perception of innovation. Membership in farmer groups enables members to be exposed to information about the existence of technologies (Odendo et al., 2009). Consistently, Ntshangase et al. (2018), in a study of the adoption of no-till conservation agriculture, found that non-adopters did not participate in group activities. Similarly, membership to a social group increased the likelihood of adoption by 26%, in a study of the adoption of ICT tools by smallholder farmers in Bungoma County (Wawire et al., 2017). It is thus expected that information is disseminated easily and faster in farmer groups making them better informed (Nzomoi et al., 2007). Mwaura (2014) argues; however that membership to a group does not necessarily promote technology adoption, based on a study of farmer groups and technology adoption in Uganda which found almost similar adoption levels in high yielding banana and sweet potato cultivars among group farmers and non-group farmers, respectively. Members of a social group may also delay adoption decisions as they free ride on information and knowledge from earlier adopters (Bandeira & Rasul, 2002).

4. Methods

The study adopted a cross-sectional design, also known as a survey. Surveys provide a quantitative description of the association or relationship between variables in a given population by studying a sample of that population (Bryman, 2012; Creswell & Creswell, 2018). The survey design helped answer questions about the relationship that exists between variables. The study involved the collection of quantifiable data on multiple subjects at a given point in time, which was analyzed using statistical procedures to detect possible relationships between variables and their degree of association. This design is appropriate for using results from the representative sample to make inferences about the characteristics of the general population (Gray et al., 2007; Creswell & Creswell, 2018).

The study was carried out in Bungoma North Sub-County in Bungoma County (in Kenya). The sub-county, alongside Kimilili, Mt. Elgon, Tongaren and Sirisia sub-counties, is a major maize-producing region in the county (Kamau & Nyongesa, 2017). Most of the production is undertaken in small farms averaging 2.5ha (County Government of Bungoma, 2018). It is bordered by Tongaren Sub-County to the east, Kimilili and Webuye East sub-counties to the west, Lugari Sub-County (Kakamega County) to the south and Kiminini Sub-County (Trans Nzoia County) to the north. It covers $192km^2$ with a population of 121,317 people distributed in 24,998 households. 20,848 of these are farming households, out of which 19,059 are primarily involved in maize production (KNBS, 2019).

The target population for this study were the 24,998 households in Bungoma North Sub-County distributed in six locations (KNBS, 2019). This study adopted a formula proposed by Taro Yamane (Israel, 1992) to calculate the sample size, the used stratified random sampling to determine the sample size per location, as shown in Table 1.

$$n = \frac{N}{1 + Ne^2}$$

Where:
n = desired sample size
N = total population
e = the error term estimated at 5% level of significance
Therefore,

$$n = \frac{24{,}998}{1+ [24{,}998(0.05)^2]}$$

= 394 households

Table 1: Sample Distribution by Location

Division	Location	Number of Households	Sample Size
Central	Milima	4,246	67
	Mukuyuni	4,174	66
	Naitiri	4,559	72
Mbakalo	Kabuyefwe	4,555	71
	Kibisi	4,057	64
	Mbakalo	3,407	54
	Total	**24,998**	**394**

5. Results and Discussion

5. 1 Response Rate

394 questionnaires were administered to household heads or members of households involved in farming activities in Bungoma North Sub-County. A total of 296 completed questionnaires were returned, representing a return rate of 75.1%. According to Mugenda and Mugenda (2012), a response rate of 50% and above is adequate for data analysis and reporting.

5. 2 Demographic Information

The study collected and analysed the demographic information of the farmers in the study as presented in Table 2.

Table 2: Respondents' Demographic Information

		n	%
Gender	Male	144	48.6
	Female	152	51.4
	Total	**296**	**100.0**
Age	20 – 29 Years	32	10.8
	30 – 39 Years	79	26.7
	40 – 49 Years	109	36.8
	50 – 59 Years	48	16.2
	60 Years and Above	28	9.5
	Total	**296**	**100.0**
Marital Status	Single	21	7.1
	Married	251	84.8
	Divorced	4	1.3
	Widowed	20	6.7
	Total	**296**	**100.0**
Level of Education	No Formal Schooling	1	.3
	Primary School	40	13.5
	Secondary School	140	47.3
	College Certificate/Diploma	98	33.1
	University Degree	17	5.7
	Total	**296**	**100.0**
Size of Farm	Less than 1 Acre	47	15.9
	1 – 3 Acres	176	59.5
	3 – 5 Acres	63	21.3
	More than 5 Acres	10	3.4
	Total	**296**	**100**
Main Crops	Maize	126	42.6
	Maize + Beans	133	44.9
	Sorghum	28	9.4
	Millet	4	1.4
	Other	5	1.7
	Total	**296**	**100.0**
Adoption of Hermetic Technology	Yes	239	80.7
	No	57	19.3
	Total	**296**	**100.0**

5. 3. Household Food Security

The dependent variable in the study was household food security. Results from the study on household food security are presented in Table 3. A five-point Likert scale was used, where 1 – Strongly disagree, 2 – Disagree, 3 – Neutral, 4 – Agree, and 5 – Strongly agree. Additionally, M – Mean and SD – Standard Deviation.

Table 3: Descriptive Summary of Household Food Security

Statement	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	M	SD
In the last 12 months, there was always enough food available for my household consumption	3.8	2.8	14.7	62.2	16.4	3.70	1.118
Use of the storage bag to store grain guarantees that the household has enough food to meet the basic food needs	3.5	5.6	19.1	59.4	12.5	3.61	1.076

Use of the storage bag to store grain guarantees safety of food for household consumption	2.5	3.2	15.8	58.6	20.0	3.75	1.124
In the last 12 months, my household was able to access a variety of healthy and nutritious food	4.5	4.5	20.3	56.2	14.5	3.63	1.074
Sale of stored grain guarantees farm households enough money to acquire enough food to meet the basic food needs	8.0	15.7	24.4	43.6	8.4	3.18	1.218
My household is not threatened because of a lack of money and other resources to acquire food	11.8	18.4	21.5	39.2	9.0	3.06	1.281
In the last 12 months, every member of my household consumed food that was sufficient in quantity and quality	3.8	11.1	49.1	27.3	8.7	3.17	1.037
No member of my household ate less than they should or went without eating because there wasn't enough food	3.8	9.4	50.0	24.7	12.2	3.22	1.085
Food consumed by every member of the household was well balanced	4.2	8.7	55.4	22.1	9.7	3.16	1.029

1-1.79 = Strongly disagree, 1.80-2.59 = Disagree, 2.60-3.39 = Neutral, 3.4-4.1 = Agree, 4.20-5.00 = Strongly agree

5. 3. 1. Factor Analysis of Household Food Security

Factors analysis for household food security extracted along with their eigenvalues, the percent of variance attributable to each factor, the cumulative variance of the factor, and the previous factors is shown in Table 4. The first factor accounted for 50.402% of the variance and the second 17.206%. All the remaining factors were not significant.

Table 4: Factor Analysis of Household Food Security

Total Variance Explained

Comp.	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.536	50.402	50.402	4.536	50.402	50.402	3.274	36.376	36.376
2	1.549	17.206	67.608	1.549	17.206	67.608	2.811	31.232	67.608
3	.794	8.821	76.429						
4	.585	6.504	82.933						
5	.446	4.951	87.885						
6	.366	4.061	91.946						
7	.320	3.553	95.499						
8	.216	2.404	97.903						
9	.189	2.097	100.000						

Extraction Method: Principal Component Analysis.

From the principal component analysis, the initial nine variables were loaded on two different variables: food availability and food consumption, as shown in Table 5. These components will be used as variables for subsequent descriptive and inferential analysis.

Table 5: Component Matrix of Household Food Security

Component Matrix[a]	Food Consumption	Food Availability
In the last 12 months, there was always enough food available for my household consumption	-.090	.349
Use of the storage bag to store grain guarantees that the household has enough food to meet the basic food needs	-.047	.285
Use of the storage bag to store grain guarantees safety of food for household consumption	-.086	.330
In the last 12 months, my household was able to access a variety of healthy and nutritious food	-.123	.343
Sale of stored grain guarantees farm households enough money to acquire enough food to meet the basic food needs	.294	-.117
My household is not threatened because of a lack of money and other resources to acquire food	.327	-.149
In the last 12 months, every member of my household consumed food that was sufficient in quantity and quality	.235	-.010
No member of my household ate less than they should or went without eating because there wasn't enough food	.241	-.024
Food consumed by every member of the household was well balanced	.245	-.016

Extraction Method: Principal Component Analysis

a. 2 components extracted

5. 3. 2. Descriptive Analysis of Household Food Security

A descriptive analysis of the variables based on the nature of loading on the component matrix was done to determine the mean, Cronbach's Alpha index and standard deviation, as shown in Table 6. The results show a mean of 3.810 and 3.284 and a standard deviation of .877 and 1.010, respectively, for food availability and food consumption, respectively. This suggests that ease of access to information on technology usability has a greater influence on food availability than on food consumption.

Table 6: Descriptive Analysis of Household Food Security

Variable	N	Cronbach's Alpha	Mean	Standard Deviation
Food Availability	4	.824	3.810	.877
Food Consumption	5	.858	3.284	1.010

1-1.79 = Strongly disagree, 1.80-2.59 = Disagree, 2.60-3.39 = Neutral, 3.4-4.1 = Agree, 4.20-5.00 = Strongly agree

5. 4. Ease of Access to Information on Technology Usability

The objective of the study was to examine the effect of ease of access to information on technology on household food security in Bungoma North Sub County. The results are from the study on ease to access information on technology usability are presented in Table 7. A five-point Likert scale was used, where 1 – Strongly disagree, 2 – Disagree, 3 – Neutral, 4 – Agree, and 5 – Strongly agree. Additionally, M – Mean and SD – Standard Deviation.

Table 7: Descriptive Summary of Ease of Access to Information on Technology Usability

Statement	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	M	SD
Extension agents have regular contact with farmers	7.5	3.4	13.0	62.5	13.7	3.66	1.082
Extension agents talk to farmers about the storage bag	3.4	3.1	11.6	62.7	19.2	3.85	.988
Farmers learn about storage bags from extension agents	5.9	3.1	13.1	62.6	15.2	3.68	1.116
I belong to a farmers' group or association	5.8	4.1	10.2	62.7	17.3	3.79	1.009
The storage bag is discussed in farmers' group meetings	6.4	2.7	12.2	63.2	15.5	3.77	.983

Adoption of the storage bag is influenced by information shared in group meetings	5.5	3.8	12.3	62.8	15.7	3.74	1.031
I talk about the storage bag with fellow farmers	3.7	4.1	10.8	62.4	19.0	3.86	.940
Farmers are influenced by other farmers to use the storage bag	4.4	2.4	13.3	61.4	18.4	3.82	.994
Farmers adopt the storage bag because another farmer they know has adopted it	5.5	6.1	12.6	62.1	13.7	3.67	1.048

1-1.79 = Strongly disagree, 1.80-2.59 = Disagree, 2.60-3.39 = Neutral, 3.4-4.1 = Agree, 4.20-5.00 = Strongly agree

5. 4. 1. Factor Analysis of Ease of Access to Information on Technology Usability

Factors analysis for ease of access to information on technology usability extracted along with their eigenvalues, the percent of variance attributable to the factor, and the cumulative variance of the factor is shown in Table 8. There was only one factor that accounted for 66.118% of the variance. All the remaining factors were not significant.

Table 8: Factor Analysis of Ease of Access to Information on Technology Usability

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.951	66.118	66.118	5.951	66.118	66.118
2	.753	8.369	74.486			
3	.688	7.642	82.128			
4	.524	5.822	87.950			
5	.364	4.046	91.996			
6	.214	2.378	94.374			
7	.186	2.066	96.441			
8	.183	2.034	98.474			
9	.137	1.526	100.000			

Extraction Method: Principal Component Analysis.

From the principal component analysis, the initial nine variables were loaded on one variable, as shown in Table 9.

Table 9: Component Matrix for Ease of Access to Information on Technology Usability

Component Matrix[a]

	Ease of Access to Information on Technology Usability
Extension agents have regular contact with farmers	.720
Extension agents talk to farmers about the storage bag	.822
Farmers learn about storage bags from extension agents	.804
I belong to a farmers' group or association	.800
The storage bag is discussed in farmers' group meetings	.794
Adoption of the storage bag is influenced by information shared in group meetings	.861
I talk about the storage bag with fellow farmers	.854
Farmers are influenced by other farmers to use the storage bag	.856
Farmers adopt the storage bag because another farmer they know has adopted it	.797

Extraction Method: Principal Component Analysis.
a. 1 component extracted.

5. 4. 2. Descriptive Analysis of Ease of Access to Information on Technology Usability

A descriptive analysis of the variable based on the nature of loading on the component matrix was done to determine the mean, Cronbach's Alpha index and a standard deviation, as shown in Table 10. The results show a mean of 3.809 and a standard deviation of .938, implying that respondents agreed that ease of access to information on technology usability affected household food security.

Table 10: Descriptive Analysis of Ease of Access to Information on Technology Usability

Variable	N	Cronbach's Alpha	Mean	Standard Deviation
Ease of Access to Information on technology Usability	9	.930	3.809	.938

1-1.79 = Strongly disagree, 1.80-2.59 = Disagree, 2.60-3.39 = Neutral, 3.4-4.1 = Agree, 4.20-5.00 = Strongly agree

5. 4. 3. Correlation Analysis of Ease of Access to Technology Usability on Household Food Security

The study sought to establish the nature of the relationship between ease of access to information on technology usability and household food security (Component 1: Food consumption, and Component 2: Food availability), using correlation coefficients to test the linearity of the variables. Pearson Correlation (r) was used to test whether the relationship between the variables was significant at a 95% level of confidence. The correlation between ease of access to information on technology and food availability is denoted by r = 0.65; p<0.05, implying a strong, positive, and significant relationship between the variables. The correlation between ease of access to information on technology and food consumption is denoted by r = 0.205; p<0.05, implying a weak, positive, and significant relationship between the variables.

Table 11: Correlation Analysis

		Ease of access to information on technology usability	Food consumption	Food availability
Ease of access to information on technology	Pearson Correlation	1	.205**	.651**
	Sig. (2-tailed)		.000	.000
	N	296	296	296

**. Correlation is significant at the 0.01 level (2-tailed).

5. 4. 4. Simple Regression Model Summary

A combined regression model summary for the simple regression was computed to establish the relationship between ease of access to information on technology usability and food availability and food consumption. An R squared of 0.423 indicates that 42.1% variation in food availability can be explained by variances in ease of access to information on technology usability. Similarly, and R squared of 0.042 indicates that 4.2% variation in food consumption can be explained by variances in ease of access to information on technology usability.

Table 12: Simple Regression Model Summary

a. Dependent Variable: Food Availability

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.651[a]	0.423	0.421	0.76283322

a. Predictors: (Constant), Ease of access to information on technology usability

b. Dependent Variable: Food Consumption

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.205[a]	0.042	0.039	0.98038068

a. Predictors: (Constant), Ease of access to information on technology usability

5. 4. 5. Test of Model Fitness

Analysis of Variance (ANOVA) was used to check the ability of the regression model to predict the relationship between the variables. Using the F-statistic and the mean square differences, the results were computed and presented in Table 13. F (1, 267) = 195.377; p<0.05, and F (1, 295) = 12.925; p<0.05, respectively, show that ease of access to information on technology usability significantly predicts both food availability and food consumption. Therefore, the null hypothesis is rejected in both cases.

Table 13: Analysis of Variance

a. Dependent Variable: Food Availability

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	113.693	1	113.693	195.377	.000[b]
	Residual	154.789	266	.582		
	Total	268.482	267			

a. Dependent Variable: Food availability

b. Predictors: (Constant), Ease of access to information on technology usability

b. Dependent Variable: Food Consumption

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	12.423	1	12.523	12.925	.000[b]
	Residual	282.577	294	.961		
	Total	295.000	295			

a. Dependent Variable: Food consumption

b. Predictors: (Constant), Ease of access to information on technology usability

5. 4. 6 Simple Regression Coefficients

The study further sought to determine the regression model based on the coefficient beta values. The results are presented in Table 14. There is a strong, positive, and significant relationship between ease of access to information on technology usability and food availability, as supported by p<0.05 and a beta coefficient of 0.677. There also is a weak, positive, and significant relationship between ease of access to information on technology usability and food consumption as supported by p<0.05 and a beta coefficient of 0.205.

Table 14: Simple Regression Coefficients

a. Dependent Variable: Food Availability

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.019	.047		-.399	.690
	Ease of access to information on technology	.677	.048	.651	13.978	.000

a. Dependent Variable: Food availability

b. Dependent Variable: Food Consumption

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-3.580E-017	.057		.000	1.000

Ease of access to information on technology	.205	.057	.205	3.593	.000

a. Dependent Variable: Food Consumption

6. Conclusion

The objective of the study was to examine the effect of ease of access to information on technology usability among smallholder farmers in Bungoma North Sub-County, in Kenya. Findings from the study show that ease of access to information on technology usability has a positive and significant effect on both food availability and food consumption in Bungoma North Sub-County; however, the influence is higher on food availability than on food consumption. To gain a deeper understanding of how access to information on technology usability affects food security, it is suggested that the current study be extended to other grain-growing areas in the region. As a way to enhance productivity, the study recommends the broadening of community knowledge about the availability of agricultural technologies; by strengthening rural agricultural extension services and the creation of farmer information centres to disseminate information on appropriate technologies and their potential benefits.

Funding: The study received no external funding.
Conflict of Interest: The authors declare no conflict of interest.

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