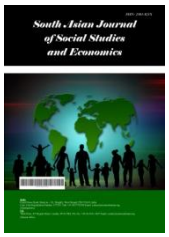

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Effects of Communication Barriers on Adoption of Climate Smart Agriculture Technologies in Kenya: A Case of Agro-pastoralists in West Pokot County

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Over the last two decades, agricultural researchers have been developing technology-based systems to aid farmers in various aspects of farming. However, information about these agricultural research technologies has not been effectively disseminated to farmers, thus, low uptake of agricultural technologies among farmers. In Kenya, one of the major factors identified to contribute to the low uptake of agricultural technologies among farmers is communication barriers among agricultural researchers, policy makers, value chain actors, and farmers concerning the availability, applicability, and how to adopt the agricultural technologies for high production. The general objective of this study, therefore, was to explore how barriers to communication influenced the uptake of climate-smart technologies among farmers in West Pokot County, Kenya. The study employed a Pragmatism approach, specifically sequential QUAN→QUAL mixed method. The target population of the study looked at the entire group of objects having common observable characteristics and a population that tends to have a wide geographical spread but not the total or universal population. The population sample was therefore based on practice, the expense of data collection, and the need to have sufficient statistical power, precision level, the level of confidence of risk, and the variability degree in the attributes being measured. This sample size of farmers from West Pokot who participated in this study, therefore, was 494 farmers and 29 selected key informants from various agricultural institutions. Procedures of sampling were used at a

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characteristic level of a material specification or task list. Cluster random sampling and purposive sampling methods were used to select the respondents for the study. Farmers were grouped into four clusters based on the four Sub-Counties of West Pokot County. The selected key informants were assumed to have adequate experience in matters communication of agricultural information towards successful uptake of climate-smart agriculture in West Pokot County. The administration of questions guided by questionnaires through an online data kit app and conducting of in-depth interviews guides. Data collected through questionnaires was quantitative (closed-ended) with a few qualitative (open-ended) questions. One of the results showed that major barriers are the language barrier, poor road network, and poor telecommunications infrastructure.

Keywords: Communication barriers; climate-smart agriculture; inadequate capability; agricultural productivity.

1. INTRODUCTION

Agriculture sector is vital in the eradication of extreme poverty and hunger and supports the livelihoods of close to 1.5 billion people worldwide living in Agro pastoralists areas [1]. Despite its vital importance, the sector is highly sensitive and susceptible to climate change and variability [2-5], and Agro pastoralists farmers are disproportionately affected, as a result of poverty, high dependency on natural resources and inadequate capability to adopt new livelihood strategies [6].

Climate-smart agriculture is among the long-term agricultural-based technologies that have been in existence for over a decade. They are designed and developed to enhance sustainable agricultural development; in particular, promoting climate-smart agriculture, especially in Agro pastoralists. Further, climate-smart technologies seek to spearhead sustainable agricultural development by addressing food security and climate challenges [7].

There are several changes in agricultural practices that have been difficult to implement because the new farming practices often bring unknown risks to the agricultural industry, which already deal with many uncertainties, including pest pressures, weather variability, and the influence of local and international markets. This implies that farmers must trust and adopt the new agricultural practices and technologies, which are being developed by agricultural researchers/scientists. Building this trust with farmers requires a personal relationship and understanding of the challenges that each farmer faces [8]. This can be achieved through effective communication in the dissemination of scientific information between the agricultural scientists and farmers/citizens/stakeholders in the agricultural sector.

Communication of agricultural research information can be described as the participatory process where information and knowledge that is beneficial for development are exchanged between farmers and information providers either from person to person or through media channels. Rabin, Brownson, Haire-Joshu, Kreuter, and Weaver [9] stated that it is an active and targeted approach to sharing information or knowledge via determined channels using planned strategies to a specific audience. Through sharing of information, the rate of adoption and implementation of innovation is accelerated.

Agricultural communication is critical and includes exchanging information between farmers farmers or even with experts or researchers [10]. Sustainable development in the agricultural sector depends on the generation of appropriate technologies and the creation of an effective communication strategy for disseminating recommended techniques to end-users and eliminating the barriers that might hinder communication. In Kenya, there are numerous communication approaches to farmers, including individual visits to the farmers and cooperative extension. The change in information dissemination is an intervention to ensure knowledge and information on technologies, methods, and practices are put into the proper use by farmers [10]. However, there still exists a communication barrier between scientists/researchers and end-user stakeholders, thereby slowing the adoption of valuable technologies, innovations, and futuristic agricultural practices [11]. This is mainly due to changing dynamics of agricultural research and the ever-increasing societal demands for understanding the research implications, which has ignited a strong need for enhanced

communication for engaging a wide spectrum of stakeholders [12].

The communication barrier has been mentioned by communication researchers as the key challenge faced by researchers and scientists in communicating agricultural information to farmers. A study by Mubofu and Elia [13] in Tanzania, found that barriers to farmers' access to agricultural research information were; inadequate numbers of extension officers, inadequate funding, inadequate sources of information, no availability of electricity, political interference and the absence of information centers. Ogola [14] conducted a study to establish the challenges watermelon farmers in Yimbo East Ward experience while accessing the information. The study found challenges that farmers experience while accessing information were mainly costs of acquiring data and lack of feedback. Lwoga, Stilwell and Ngulube [15] found that farmers 'Illiteracy level posed a challenge to the dissemination and use of agricultural research information in Tanzania. Isaya [16] conducted research in Tanzania on how information was disseminated among women farmers in Hai and Kilosa districts. The study results revealed that farmers in the study area faced challenges such as inadequate knowledge on how to apply the information acquired from extension officers and researchers, lack of credit to purchase farm inputs, and improved seeds and chemical fertilizers. Additionally, Mokotjo and Kalusopa [18] in their study on the challenges faced in agriculture on information dissemination found that language barriers and misinterpretation of information may also affect how farmers use the information they have received.

In Kenya, one of the major factors that are highly contributing to the low uptake of agricultural technologies among farmers is the communication barrier between agricultural researchers/officers, policymakers, value chain actors, and farmers concerning the availability, applicability, and how to use the agricultural technologies. Jan, Sultan, and Ali [18] posited that communication influences change and progress in modern agriculture. Subsequently, GSMA [19] noted that one of the problems hindering the potential growth of the agricultural sector in Kenya is communication barriers in communicating to farmers about available modern technologies and how to use them to improve agricultural productivity. This implies that in the 21st century, still farmers lack access to critical services such as relevant, actionable, and timely agricultural information needed to improve productivity due to communication barriers.

Pastoralism often refers to extensive husbandry of herds of different species (cattle, sheep, goats, camels, and equines) requiring periodic migration to access pasture. A commonly used definition in literature is that pastoralist households are those in which at least 50% of household gross revenue (including income and consumption) comes from livestock or livestock-related activities [20] (Swift 1998). Agro-pastoralism describes the coexistence of both agricultural and grazing activities, although there may be different degrees of integration of these activities, with specific consequences for land use. An economic definition is that agro-pastoralists derive more than 50% of household gross revenue from livestock and 10-50% from farming [20].

West Pokot County is among the Counties that practice agro-pastoralism. The agricultural knowledge among the farmers in West Pokot has been low as reported by Akuto, [21]. The lack of access to reliable and current information coupled with wide communication barriers between researchers and farmers are presently a significant impediment to the adoption of smart farming by agro-pastoralist in West Pokot County [22].

Some of the methods used by researchers and extension officers to communicate to agro-pastoralist include; include broadcast (television and especially radio), group (video, tape-slides, sound film- strips, audio-cassettes, overhead projections, flip-charts, posters, pamphlets, and leaflets; as well, traditional folk media such as puppets and live theatre may be included), and Interpersonal channels (community leaders, contact farmers, extension workers) [23]. In using the above, methods to communicate with agro-pastoralist, a lot of barriers are experienced that hinder communication and therefore, low uptake of climate-smart agriculture among agro-pastoralist. Therefore, conducting the current study is justified in analyzing how barriers to communication such as the language used in communication affect the uptake of climate-smart agricultural technologies among agro-pastoralist in Kenya, with a particular focus on West Pokot County. The hypothesis tested was that the communication barriers do not influence the uptake of climate smart agriculture in West Pokot County.

2. MATERIALS AND METHODOS

2.1 Research Approach

The study employed a mixed approach, specifically a sequential QUAN→QUAL mixed method design where both quantitative and qualitative approaches were utilized concurrently. To ensure that the convergent parallel mixed-method process is systematic and rigorous, the researcher designed and conducted a sequential QUAN→QUAL mixed method design whereby there was an initial quantitative approach compared to a subsequent qualitative approach.

The study was conducted in West Pokot County. According to the 2019 census, the County has a population of 621,241. West Pokot County, whose Headquarters is Kapenguria, is mainly inhabited by the Pokot community and minority community of Sengwer (West Pokot County website, 2018). Agriculture and animal (livestock) keeping are the backbone of the County's economy with more than 80% of the population engaging in farming and animal (livestock) keeping activities. The County lies within Longitudes 34° 47'and 35° 49' East and latitudes 1° and 2° North and covers an area of approximately 9,169.4 km^2 (West Pokot County website, 2018). The County has four sub-counties, namely West, Central, North, and South (West Pokot County website, 2018).

The main food crops produced include maize, beans, sorghum, finger millet, green grams, irish potatoes, sweet potatoes, and bananas (West pokot county website, 2018). the farmers also grow horticultural crops, which include fruits (mangoes, pawpaw, oranges, tree tomato, and passion fruit) and vegetables both exotic and local (onions, cabbages, kales, pumpkins,

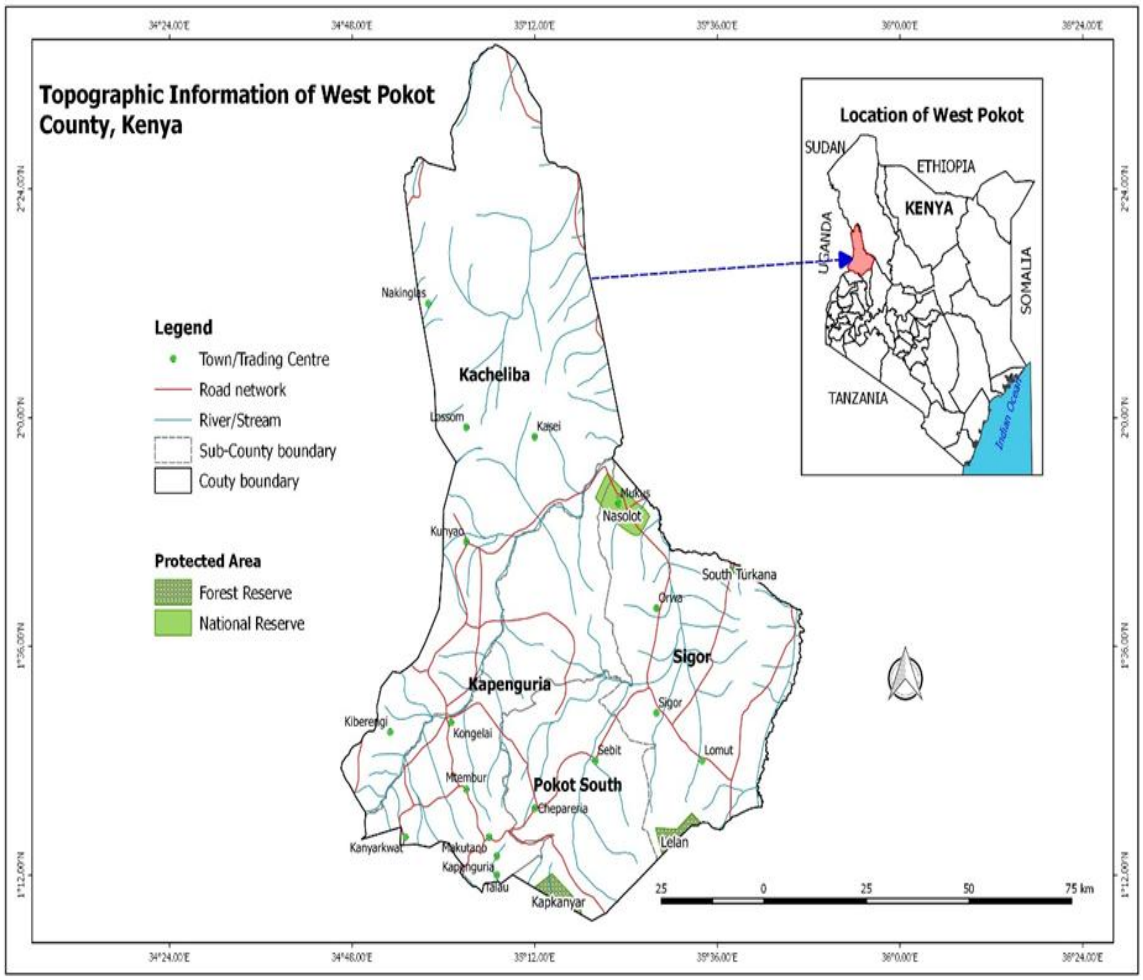

Fig. 1. Topographical information of west Pokot country, Kenya

sucha, cowpeas, saga, peas, and carrots, among others) (West Pokot County website, 2018). Fruits and vegetables contribute immensely to food security as farmers use it for food and generate income for households [21].

Based on the 2019 census, the urban population accounts for only 8% of the total population in the County, making West Pokot one of the least urbanized counties in Kenya [24]. Being one of the least urbanized counties implies a lack of proper infrastructure to fuel communication and implement smart-climate projects in the County. West Pokot is also a beneficiary of the Kenya Climate Smart Project funded by the World Bank and implemented by the Ministry of Agriculture, Livestock and Fisheries, and the 27 County Governments. This formed the rationale to conduct the study in the County since it will be convenient in generalizing other counties that are not urbanized.

2.2 Survey and sampling

The study was conducted in West Pokot County in Kenya, the county was selected to represent the 27 county governments where Kenya's climate Smart projects have been supported by World Bank. To understand how barriers of communication adopted by agricultural researchers affect the uptake of climate-smart technology among pastoralists in West Pokot, a mixed approach was used with closed-ended questionnaires supported by open-ended questions to obtain both quantitative and qualitative data

The sample size for quantitative data was calculated using a formula adapted from Fishers (1992). The formula is presented in equation (1).

$$n = [Z^2 – (pq)] / d^2 \quad (1)$$

n = the desired sample size if the targeted population is greater than 10000
Z= the standard normal derived at the required confidence level (The value for Z is found in statistical tables which contain the area under the normal curve)
d = the desired level of precision (an acceptable level of sampling error),
p = the estimated proportion of an attribute that is present in the population,

q = 1-p.

Using this Fisher [23] formulae, the researcher used 30% as the estimated proportion of the farmers in West Pokot to have the characteristics of interest and calculate the sample size (n) for the study using the desired confidence level of precision (d) of 5% (0.05) and the Z- statistics of 1.96 (at a generally acceptable level of 95% confidence level) Therefore, the sample size was calculated as shown in equation (2);

$$n = (1.96^2 \times 0.3 \times 0.7) / 0.05^2 = 494 \quad (2)$$

Using Fisher's [23] formulae, a total of 494 farmers were sampled in West Pokot County from the four sub-counties, (West Pokot 148, Central Pokot 105, North Pokot 148, and South Pokot 93). Purposive sampling was used to select 29 respondents for the key informant interviews. The respondents were selected based on their knowledge of the barriers to communication on the uptake of climate-smart agriculture among agro pastoralists of West Pokot.

2.3 Data Collection

Open-ended and closed-ended questionnaires were used to collect data. 494 farmers filled out questionnaires and returned them for further analysis while 29 key informants were interviewed. The discussions involved how agricultural researchers have effectively used communication principles such as; clarity, attention, feedback, consistency, and ways of communication, among others to impact the uptake of climate-smart technology among agro pastoralists in West Pokot.

2.4 Data Analysis

Tables were used to show the percentage, the mean, and standard deviation to show how barriers to communication such as language barriers and infrastructure have affected the adoption of climate-smart agriculture among agro-pastoralist in West Pokot. While Pearson's correlation analysis (Hugn et al., 2018) was used to check for the relationship between the barrier of communication used by agricultural researchers (language barrier, infrastructure, illiteracy among others) and the uptake of climate-smart agriculture among pastoralists. Statistical significance was considered at α=0.05. The dependent variable was the uptake of climate-smart agricultural technologies and predictors (Constant) were communication barriers. The association and differences between farming practices and Sub Counties in

West Pokot were evaluated using the Chi-Square test of association. Reliability of the data was assured through internal consistency which was measured using the Cronbach's coefficient while for the validity of the data, 5 experts in the field of communication and agriculture evaluated the questionnaire and the interview guides that were used to collect data.

The inferential statistics that were conducted included correlation and linear regression models. The two inferential statistics determined the relationship between each of the independent variables with the dependent variable. A regression analysis of Variance (ANOVA) was conducted to establish whether the whole regression models significantly fit the data. The regression equation that was used to test the statistical significance of the relationship between independent and dependent variables of the study hypotheses is:

$$Y = \beta_0 + \beta_1 X_1 + \varepsilon$$

Where:

Y = Uptake of climate-smart agricultural technologies

X1 = Communication barriers

β0, β1, = Regression coefficients of changes included in Y by each X value

ε= Error term, which normally is distributed with a mean and variance of zero.

3. RESULTS AND DISCUSSION

3.1 Socio-demographic Characteristics

The majority of the respondents (53%) were male while (47%) were female (Table 1) this implies that there was more male involved in the study than female. Most males were readily available for the study as compared to females. The majority of the respondents in West Pokot had attended primary school (22%), while (26%) had not gone to school. Those who have gone to Secondary school were (19%) (Table 2). This indicates that the majority of the respondents who participated in this research were not educated and only a few have gone through secondary and post-secondary studies.

This implies that most of the respondents were affected by barriers to communication used by researchers and extension officers. The barriers were the use of English to communicate in both broadcast and print media as most the agro-pastoralist did not go to school and therefore, do not understand English. This limited their uptake of climate-smart agricultural practices communicated by agricultural researchers. The majority (79%) of the farmers reported practicing mixed farming. A chi-square test of dependence found that there is a significant relationship between the Sub counties and main agricultural activity ($X^2 = 29.246^a$, $p<0.001$.) (Table 3). The chi-square test confirmed that West Pokot people are agro-pastoralists as they both grow crops and also keep livestock in both sub-counties of West Pokot counties.

The results indicated that there is a limited number of agricultural extension officers to disseminate information about climate-smart agriculture (48.0%) of the agro-pastoralist strongly agree with this (Table 4). This shows that the number of agricultural extension officers is not adequate within West Pokot County to disseminate information to farmers. This implies that some farmers are not able to get information on time on climate-smart technology such as new crops or livestock breeds that can do well in their areas. The study findings were similar to a study by Mubofu and Elia [13] who also found out that farmers in Tanzania were not able to get agricultural services due to the limited number of extension officers.

The results indicated that language used to disseminate climate-smart agricultural information affects how agro-pastoralists use the information they receive about climate-smart agriculture (38.3%) of the agro-pastoralist agree with this (Table 4). This implies that farmers fail to implement some of the information communicated by agricultural officers and researchers such as new breeds, information on fertilizers, and types of crops due to the language barrier. Some of the extension officers, researcher officers, and print media use English that farmers do not understand.

Table 1. Gender of the respondents

	Frequency	Percentage
Female	232	47.0
Male	262	53.0
Total	**494**	**100.0**

Table 2. Level of education

	Gender					
	Female		Male		Total	
	Count	Column N %	Count	Column N %	Count	Column N %
Certificate	44	19.0	23	8.8	67	13.6
Diploma	12	5.2	34	13.0	46	9.3
Masters	1	0.4	1	0.4	2	0.4
None	65	28.0	64	24.4	129	26.1
Primary	58	25.0	65	24.8	123	24.9
Secondary	45	19.4	67	25.6	112	22.7
Undergraduate	7	3.0	8	3.1	15	3.0
Total	**232**	**100.0**	**262**	**100.0**	**494**	**100.0**

Table 3. Main agricultural practice

	Gender					
	Female		Male		Total	
	Count	Column N %	Count	Column N %	Count	Column N %
Mixed farming	180	77.6	208	79.4	388	78.5
Crops farming	32	13.8	24	9.2	56	11.3
Livestock farming	20	8.6	30	11.5	50	10.1
Total	**232**	**100.0**	**262**	**100.0**	**494**	**100.0**

Table 4. Barriers of communication on uptake of climate-smart agriculture

Statement	1	2	3	4	5	M
	SA	A	N	D	SD	
There is a limited number of agricultural extension officers to disseminate information about climate smart agriculture	237 48.0%	145 29.4%	24 4.9%	36 7.3%	52 10.5%	2.0
The language used to disseminate climate-smart agricultural information affects how farmers use the information they receive	136 27.5%	189 38.3%	82 16.6%	44 8.9%	43 8.7%	2.3
The sources of information are inadequate hence hindering the effective dissemination of agricultural research information on climate-smart agriculture	160 32.4%	176 35.6%	71 14.4%	51 10.3%	36 7.3%	2.2
There are no information centers in West Pokot County where farmers can easily access and timely information about climate-smart agricultural agriculture	107 21.7%	153 31.0%	80 16.2%	99 20.0%	55 11.1%	2.7
There is a limited agricultural information infrastructure, such as; communication networks, electricity, etc., which run electronic media such as radio, TV, and mobile phones that can accelerate and promote the transfer of information on CSA to the farmers	183 37.0%	171 34.6%	51 10.3%	36 7.3%	53 10.7%	2.2
There is political interference in the dissemination of climate-smart agriculture	99 20.0%	104 21.1%	94 19.0%	92 18.6%	105 21.3%	3.0

From the key informant interview, Ward Agriculture officers and Ward agriculture extension officers who interact mostly with the farmers said that some of the scientific terms used by the scientist are not easy to translate therefore it is not easy to translate. They also said that most of the farmers do not understand English or Kiswahili so the best language is their mother language which at times when translated some meanings are lost. One of them said, “Most of our farmers do not understand English or Kiswahili, therefore the best language to communicate to them is the local language, for me, I don’t speak their local language so I need someone to translate and you know when we translate, some meaning might be lost. I think most of the farmers have not implemented climate-smart agriculture because of language.” The findings were similar to a study that was done by Mokotjo and Kalusopa [17] who also found that language barriers and misinterpretation of information may also affect how farmers use the information they have received.

The results indicated that the sources of information are inadequate hence hindering the effective dissemination of agricultural research information on climate-smart agriculture (35.6%) of the agro-pastoralist agree with this (Table 4). This implies that most the agro-pastoralists do not access information on climate-smart agriculture therefore, this slows their uptake on climate-smart activities such as; the use of quality seeds and planting materials of well-adapted crops and varieties, biodiversity management, integrated Pest Management, improved water uses and management, sustainable soil and land management for increased crop productivity, and sustainable mechanization among others. The study findings were in line with Mubofu and Elia's [13] study who also found that inadequate sources of information were a barrier in Tanzania among farmers in accessing information on agricultural information.

The results indicated that there are no information centers in West Pokot County where farmers can easily access timely information about climate-smart agricultural agriculture (31.0%) of the agro-pastoralist agree with this (Table 4). This implies that agro-pastoralists are not able to access information centers to get information concerning climate smart climate technology as there is a limited number of information centers. This has slowed the uptake of climate-smart agriculture as farmers are not able to access information centers. The same was observed by Mubofu and Elia [13] in Tanzania, who also found that the absence of information centers is a barrier to communication with farmers.

The results indicated that there is limited agricultural information infrastructure, such as; communication networks, electricity, etc., which run electronic media such as radio, TV, and mobile phones that can accelerate and promote the transfer of information on CSA to the farmers (37.0%) of the agro-pastoralist strongly agree with this (Table 4). In West Pokot County, most of the farmers are agro-pastoralists, most of the farmers do not have access to information infrastructure like television, which has limited their access to agricultural information on climate-smart agriculture.

The results indicated that there is political interference in dissemination of climate-smart agriculture (21.3%) of the agro-pastoralist strongly disagree with this (Table 4). The agro Pastoralists in West Pokot County indicated that politics doesn’t interfere with the dissemination of information on climate-smart agriculture. The language used to disseminate climate-smart agricultural information affects how agro-pastoralists use the information they receive about climate-smart agriculture (38.3%) of the agro-pastoralist agree with this (Table 4). The sources of information are inadequate hence hindering the effective dissemination of agricultural research information on climate-smart agriculture. The study findings disagree with the findings of Mubofu and Elia [13] in Tanzania, who found out that politics interfere with the dissemination of agricultural research information to farmers. In West Pokot, politics does not play a role in communicating climate-smart agriculture and most of the respondents did not see it as a major problem. It's true in Kenya that politics might interfere with other economic sectors but in West Pokot, it did not interfere with the communication of climate-smart agriculture to the farmers therefore it was not a major barrier mentioned by farmers.

From the key informants, poor communication was also mentioned by those who were interviewed as a communication barrier in disseminating information to farmers. According to an Associate Professor from the University of Nairobi, “Most of us researchers use poor communication techniques to communicate our

findings to Main target audience. Most of us do not share our reports with the extension officers, or farmers; instead, we only publish and assume that farmers will read our published articles. I think we should organize a face to face visits which entail field demonstrations, farmer training, Barazas etc., and even share our findings with the farmers on their farms."

Pearson's correlation analysis on the relationship between the barriers to communication and uptake of climate-smart technology among agro-pastoralists. Analysis of how the uptake of climate-smart agriculture by farmers in West Pokot County is affected by barriers to Communication was run through testing the research hypothesis. The model summary table generated models reflective of the predictors. The coefficient of determination (R2) of the model provided the lowest fit (R2= 0.050) (Table 5) meaning that the model explained 5.0% of the variations in barriers of communications on uptake of climate-smart agriculture among agro-pastoralists and was considered to provide a good fit as illustrated above in the model summary Table 5. R2; 0.058 = 5.8% (Table 5). An analysis of the ANOVA shows that the F value was 2615.7, p-value 0.001 ($p<0.001$) (Table 6), and therefore, significant. This implies that there is a linear relationship between uptake of climate-smart agriculture (UCA) and the independent variable (Barriers of communication-BoC. Changing barriers of communication with one unit would enhance uptake of climate-smart technologies by up to 21.9%. Barriers of communication (BoC) significantly influence the uptake of climate-smart agriculture (UCA) ($p<0.001$) (Table 7). The significance level for the t-statistic was less than 0.001 ($P<0.001$) as indicated hence the study upholds the alternative hypothesis which states that barriers to communication have a significant effect on the uptake of climate-smart technologies in West Pokot County. Despite being significant, the barriers predicted the uptake of climate-smart technologies among farmers negatively. From the results, eliminating barriers in West Pokot County among Agro pastoralists will increase farmers' increases of uptake climate-smart agriculture such as; soil management, drought tolerant maize, dairy development, and rainfall forecasts among others in West Pokot, Kenya.

Table 5. Model summary of the correlation analysis

Model	R	R Square	Adjusted Square	RStd. Error of the Estimate
1	.225[a]	.050	.049	.915
a. redictors: (Constant), Barriers of communication				

Table 6. An overall assessment of the significance of the regression model using ANOVA

ANOVAa						
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	21.877	1	21.877	26.157	.000[b]
	Residual	411.494	492	.836		
	Total	**433.370**	**493**			

a. Dependent Variable: Uptake of climate smart agricultural technologies
b. Predictors: (Constant), Barriers of communication

Table 7. An overall assessment of the significance of the regression model using Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	**Std. Error**	**Beta**		
1	(Constant)	4.132	133		31.019	.000
	Barriers of communication	-.268	.052	-.225	-5.114	.000

a. Dependent Variable: Uptake of climate smart agricultural technologies

4. CONCLUSION

The study found that communication barriers that affect the uptake of climate-smart agriculture among agro-pastoralists include; language barriers, poor communication techniques, inadequate information centers, limited numbers of extension officers in the field, and inadequate information infrastructures to facilitate communication. This has hindered agro-pastoralist adoption of climate-smart agriculture such as; the use of quality seeds and planting materials of well-adapted crops and varieties, biodiversity management, integrated Pest Management, improved water uses and management, sustainable soil and land management for increased crop productivity, sustainable mechanization among others. Therefore, the study concludes that there is a need for scientists and agricultural officers, and agents to find ways to eliminate the barriers mentioned to ensure that farmers are able to receive information on climate-smart agriculture on time. This will ensure more adoption of climate-smart agriculture among farmers in West Pokot, Kenya.

5. RECOMMENDATIONS

The study recommends that agricultural officers/agents should be those who understands and communicate to farmers using the local language that farmers understand. Print media written in English about climate smart technology can be translated to famers' languages. Information about climate smart agriculture can also be passed through local radio stations that speak local language that farmers understand better. This calls for the scientists/researchers to apply Science communication for effective uptake of climate smart agriculture technologies.

CONSENT

As per international standard or university standard, Participants' written consent has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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