

EFFECTIVENESS OF MASS MEDIA CHANNELS ON THE ADOPTION PROCESS OF HERMETIC BAGS STORAGE TECHNOLOGY BY SMALL SCALE MAIZE FARMERS IN NAKURU COUNTY

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Abstract

Post-harvest losses have led to frequent food shortages in Kenya hence impacting on food security. Hermetic bags storage technology was introduced in Kenya to reduce post-harvest losses in maize which is Kenya's main staple food without use of pesticides. Therefore there is need for effective flow of information to farmers through communication channels for effective adoption of hermetic bag storage technology. Since mass media has been utilized as one of the channels to facilitate adoption of the hermetic bag technology, this study sought to establish the effectiveness of mass media channel on adoption process of hermetic bags storage technology in Nakuru County. The study employed correlation research design. Target population was 108,130 and accessible population 10,660 small scale maize farmers in Molo, Njoro and Rongai sub-Counties. A sample of 120 small scale maize farmers was attained through proportionate simple random sampling technique and researcher administered questionnaires were used to collect data from small scale maize farmers. Validity was examined by subjecting research instrument to critique by experts in the department of Applied Community Development Studies at Egerton University while reliability was estimated through a test-retest method and found to be 0.848. Data was analyzed using both descriptive and inferential statistics (Pearson correlation coefficient) at significant level of $\alpha = 0.05$. The study established that mass media channels utilized did not influence adoption process of hermetic bag technology at the decision and implementation stages. However, they influenced the adoption process of hermetic bag storage technology at awareness, persuasion and adoption stages. The study recommended that national government, department of agriculture should increase funding to support mass media channel in facilitating the adoption process.

Keywords: Adoption process, Hermetic bag storage technology, mass media channel, small scale farmers, post-harvest losses, maize storage

Introduction

In Africa, maize is one of the most important food crops, yet it is also susceptible to insect infestation, microbial attack and mycotoxins contamination which cause significant economic losses and deleterious health effects to humans and animals (Namusalisi, 2019). Despite being the most relied staple food in Africa, situation of the escalating post-harvest maize grain losses in Sub-Saharan Africa has reached the highest levels in recent history which has been catalyzed by introduction of the storage pest (Larger Grain Borer) into Eastern and Western Africa (Ognakossan, Tounou, Lamboni & Hell, 2013). Therefore losses resulting from poor post-harvest management of grains, estimated at 20–30%, amounting to more than US\$4 billion annually is one of the key constraints to improving food security in Africa (FAO, 2010). Maize producers in Sub-Saharan Africa have been plagued by post-harvest losses from insects, rodents, molds and fungi infestations with small scale farmers representing the most vulnerable population (Mdangi et al., 2013). Likewise according to Nukenine, Adler and Reichmuth (2010) some of these losses are caused by insects and fungi with the speed at which these multiply being influenced by prevailing environmental conditions. Despite this, it is significant

to mention that Maize is the most important and relied upon staple food in Eastern and Southern Africa (Gitonga, Groote, Kassie&Tefer, 2013).

Although maize has seasonal production in Kenya, it has relatively constant consumption over the year and hence farmers have to store maize to bridge seasons and ensure continuous supply for food security (Gitonga et al., 2013). Food shortage as a result of post-harvest maize losses therefore calls for adoption of an innovation that directs its effectiveness on achieving total grain preservation without any postharvest losses due to storage pests (Gitonga et al., 2013). Purdue Improved Crop Storage (PICS) technology was therefore introduced in Kenya in 2013 as the first hermetic bag storage technology. Since then, other certified hermetic bags have been launched for maize storage which includes: ZeroFly, Elite, GrainPro and AgroZ Storage Bags. Hermetic storage bags technology is a low cost, chemical free triple-layer bag composed of woven polypropylene (Murdock & Baoua, 2014). The bag serves as an air-tight (hermetic) way to store grains. It prevents insect damage by having polyethylene plastic that insects cannot pierce and it kills any bugs already inside through suffocation.

According to Akça and Özer (2014) lack of access to relevant agricultural information by farmers in Kenya has led to low agricultural productivity and has affected the entire agriculture and production process. Information is therefore the first and indispensable step of an adoption process (Mwangi & Kariuki, 2015). In this case adoption process includes knowledge, persuasion, decision, implementation and confirmation stages. Singh, Sachan and Pahuja (2016) indicated that communication help to sensitize, mobilize, persuade, engender and sustain people's new ideas, practices or technologies that are likely to bring about holistic improvement in their wellbeing. Ayoade (2010) also noted that, farmers' information exposure is most likely to be an important factor influencing their adoption behavior as greater exposure is likely to enhance awareness about the latest recommendations and to lead farmers putting these recommendations into practice. Communication channels are therefore very important in the flow of information in the various stages of the adoption process. This suggests that, how far people progress in whatever they are doing in agriculture depends largely upon the availability and access to accurate and reliable information in all the stages of adoption process which must be via various communication channels to the intended farmers (Nnenna, 2013).

Nakuru County was picked due to its representation of small scale maize farmers using hermetic bags in the country who are the target population of the study. Effectiveness of mass media channel on adoption of hermetic bag storage technology is the main focus of this study. This is because mass media channels have been utilized in Nakuru County which is the focus area of study.

Objective of the Study

To determine the effectiveness of mass media channels on the adoption process of hermetic bags storage technology by small scale maize farmers in Nakuru County.

Hypotheses of the Study

Ho₁: There is no statistically significant effect of mass media channels on the adoption process of hermetic bags storage technology by small scale farmers in Nakuru County

Literature Review

Mass media channels are all those means of transmitting messages that entail medium such as radio, television, newspapers and magazines, which enable one or few individuals to reach a large audience (Rogers, 2003). Zolait and Sulaiman (2017) found out that, mass media are often the most rapid and efficient means of informing an audience of potential adopters about the existence of an innovation, that is, to create awareness-knowledge. These include all the media of transmitting messages such as the radio, television, newspapers and the Internet. In situations where rural farmers are not faced with constraints in accessing agricultural information, media such as rural radio, has been effectively used in delivering agricultural messages to rural farmers (Opara, 2008).

Study by Toole, Cha and González (2012) found that, media influences during later stages were very strong accounting for a two to four fold increase in the number of people who adopted web application. Study by Azumah, Donkoh and Awuni (2018) concluded that, mass media mechanisms are strong platforms for the dissemination of knowledge, skills, and improved technology to rice farmers. Such media play influential roles in providing extension services, especially in view of the public extension agencies' ineffectiveness in providing the much-needed agricultural extension services to farmers. Broadcast media have been considered the most cost-effective means of reaching target populations in the developing world, with the combination of both radio and ICTs greatly increasing not only awareness but also adoption of new farming practices (Hudson, 2014). By utilizing new media technologies, it is conceivable to upgrade the potential of radio as a proficient circulation channel beyond mere expression. This is because radio programs urge rural dwellers to take interest in development by embracing new innovations. Finding of study by Nazari and Hassan (2011) shown that education intervention through TV program resulted in a significant knowledge enhancement and hence concluded that mass media offer effective channels for communicating agricultural messages which can increase knowledge and influence behavior of audience members.

According to Jabir (2011) mass media play an important role in creating awareness about new agricultural technologies among farming communities across the world. Sanusi, Petu-Ibikunle and Mshelia (2010) underscored that the agricultural information passed by the media enhances agricultural productivity of farmers when they have access to it but in disseminating this information, it is imperative that the specific information needs of the large audience are taken into consideration so as to ensure that their needs and aspirations are met. Ifukor (2013) noted that television, radio and newspaper are channels of information that are used to acquire and disseminate information among rural dwellers.

Study by Sousa, Gian and Home (2016) revealed that, though there existed a challenge for researchers and other developers of new technologies in agriculture is to find ways of communicating their results and recommendations to farmers, the challenge was particularly acute in regions in which farmers had limited access to education and where illiteracy was widespread, such as in the rural areas of Mali .Study by Mwombe, Mugivane, Adolwa and Nderitu (2014) found out that, Radio, television and the mobile phone were the most accessible and were often used to access information on production or/and marketing of bananas.

In passing messages on PICS technology which was the first hermetic bags storage technology, Purdue University financed several media activities including television spots, radio advertisements, newspaper messages and media coverage of OBCs (open bags ceremonies) to

stimulate demand of PICS by farmers (Coulibaly et al., 2012). Sushil (2017) indicated that mass media i.e radio and television disseminate information by broadcasting the agricultural, forest, health and handicrafts information. He also indicated that radio and television raises awareness in people through news announcements, talks by experts ,questions and answer session as part of phone –in programs (recorded and live), demonstration and success story. This tools provide information on technology, critical farming practices relevant to season scheme of governments, Advertisement on new products, commodity prices, market status, talks of new technology by experts. This support the need to utilize mass media channel in facilitating adoption of agriculture technologies by farmers.

In summary, it is evident that using these mass media technologies in different countries brought positive results in agriculture development. It is also clear that in remote areas radio is still favorite tool of communication which broadcasts many agriculture programs while television also contributes much in disseminating information about agriculture in developing countries. Therefore, mass media channels are very important means of disseminating information to a large number of people irrespective of their distance from the information source. This hence supported the need for comparative study to investigate its effectiveness on adoption process of hermetic bags storage technology in Nakuru County.

Methodology

The study adopted Correlational study design and was conducted in Nakuru County, Rongai, Molo and Njoro sub-counties. The target population comprised of all the 108,130 small scale farmers who grew maize in Nakuru County. From the accessible population of 10,660 small-scale maize farmers who had been supplied with hermetic bags, the study utilized proportionate simple random sampling technique to attain the required sample size of 120 which was derived at as follows; $SS = Z^2 * (p) * (1-p) / C^2$ where by $SS = (1.96)^2 (0.5) (0.5) / (0.0895)^2 = 120$ ($Z = Z$ value (in this case 1.96 for 95% confidence level) $p =$ estimated proportion of an attribute that is present in a population. The variability of a population that will adopt Hermetic technology is not known thus assumed maximum variability i.e. $p=0.5$ $c =$ confidence interval (or the desired level of precision), expressed as decimal, in this case 0.0895). $SS = (1.96)^2 (0.5) (0.5) / (0.0895)^2 = 120$. These were farmers who used hermetic bags to store their maize. Researcher administered questionnaires was utilized to collect data from the farmers. The pilot sample for the Cronbach alpha coefficient was used to check for reliability of the research instruments and a coefficient of 0.7 or above was considered appropriate whereby the Cronbach's alpha reliability coefficient for the small scale maize farmers' instrument was 0.848. To assess content and face validity, the instrument was subjected to critique by experts in the department of Applied Community Development Studies Egerton University who assessed the instrument items and terminology to ensure it was clear and logical. The data was analyzed through the use of descriptive statistics (frequencies, mean, minimum, maximum and standard deviation) and inferential statistics (Pearson moment correlation coefficient). The descriptive statistics were used to summarize the ordinal data and inferential statistics were used to analyse composite data and test hypotheses. Pearson correlation coefficient analysis was used to test the hypotheses at significant level of $\alpha = 0.05$ to show the relationship between the independent and the dependent variable (mass media channel and adoption process).

Findings

Effectiveness of mass media channels on the awareness stage of the adoption process of hermetic bags storage

The respondents were asked to indicate the mass media channel that they utilized to access information on existence of the hermetic bag storage technology and the effectiveness of the mass media channels on the awareness stage of the adoption process of hermetic bags storage technology. The results were as shown in Tables 1 and 2.

Table 1: Type of mass media channel utilized at the awareness stage of the adoption process of hermetic bags storage technology

Mass media channels	Frequency	Percent
Radio	35	30.0
Television	35	30.0
Mobile Phone	17	15.0
Print media such as newspaper	9	8
None of the above/others	20	17
Total	116	100.0

From the findings, out of 83% of farmers who accessed information on hermetic bag storage technology through mass media channel, 30% of the respondents indicated that they were made aware of hermetic bag storage technology through radio. Furthermore 30% indicated that they were made aware of hermetic bag storage technology through television and 15% through mobile phones. This agrees with Opara (2008) who found out that in situations where rural farmers are not faced with constraints in accessing agricultural information, media such as rural radio, has been effectively used in delivering agricultural messages to rural farmers. Similarly, Murty et al. (2012) also indicated that radio is one of the best sources of diffusing agricultural, technical and scientific information to the farmers. The same revealed that, radio brought changes in different sectors of society such as radio broadcast agriculture programmes and latest information for farmers as well as providing new approaches and knowledge to millions of people in remote areas.

Table 2: Effectiveness of mass media channels on the awareness stage of the adoption process of hermetic bags storage technology

Mass media channels on the awareness	VE	E	I	VI	Mean	Std
Knowing the existence of hermetic bag storage technology	46%	4%	4%	6%	4.64	0.876
Giving information quickly	43%	52%	2%	3%	4.82	0.765
Giving accurate information	41%	52%	2%	5%	4.46	0.567

Scale: **VE**=Very Effective, **E**=Effective, **I**=Ineffective, **VI**=Very Ineffective

From the findings 90% of the respondents stated that mass media is effective in knowing the existence of hermetic bag storage technology while 10% of the respondents stated that mass media is ineffective in knowing the existence of hermetic bag storage technology with a mean of 4.64 and std dev of 0.876. In addition 95% of the respondents stated that mass media is effective in giving information quickly while 5% of the respondents stated that mass media is

ineffective in giving information quickly with of a mean of 4.82 and std dev = 0.765. Furthermore 93% of the respondents stated that mass media is effective in giving accurate information while 7% of the respondents stated that mass media is ineffective in giving accurate information with mean of 4.46 and std dev = 0.567. The results agrees with findings by Zolait and Sulaiman (2017) who found out that, mass media are often the most rapid and efficient means of informing an audience or potential adopters about the existence of an innovation, that is, to create awareness. These include all the media of transmitting messages such as the radio, television, newspapers and the Internet. Similarly Shahzad et al. (2011) noted that media is considered as significant mean to transfer modern agricultural technologies to literate and illiterate farmers alike.

The fact that there is overarching role of media today in entertainment, majority of people spent large share of their free time on media. This means that media can inform people of significant news and issues that are happening or already happened in the world and society. This thus explains why media could reach a high number of farmers with messages on new agriculture technologies including awareness on hermetic bag storage technology. Access of these farmers to the information on hermetic bag storage technology though mass media could also be attributed to the fact that, users of media have access to platforms like Mkulima Young, Young Farmers Market, Digital Farmers Kenya and Mkulima Hub Kenya. Therefore, this explains how small scale maize farmers in Nakuru County could easily obtain information from these social media platforms. These platforms educate and inform on agricultural matters as well as facilitating the buying and selling of agricultural produce and related products. The users exchange information and discuss issues concerning agriculture based on experience and knowledge. They also buy and sell agricultural produce and inputs and use pictures, links and videos to facilitate this awareness of agricultural produce and inputs such as hermetic bags storage

Effectiveness of mass media channels on the persuasion stage of hermetic bag storage technology adoption process

The respondents were asked to indicate the type of mass media and its effectiveness in persuasion towards adoption of hermetic bag storage technology by answering questions on how effective mass media is in convincing, building confidence and presenting information on hermetic bag storage technology to small scale maize farmers. The results are as shown in Table 3 and 4.

Table 3: Type of mass media used in persuading farmers on the use of hermetic bag

Mass media channels	Frequency	Percent
Television	56	47
Radio	17	15
Mobile Phone	9	8
Print media such as newspaper	3	3
Others/None of the above	31	27
Total	116	100.0

Findings of the study show that out of all the small scale maize farmers who were persuaded to adopt the hermetic bag storage technology by mass media channel, 47% were through television and 15% through radio. This is in support of study by Azumah et al. (2018) that broadcast media play influential roles in providing extension services, especially in view of the public extension agencies' ineffectiveness in providing the much-needed agricultural extension services to farmers. Nazari et al. (2011) also stated that education intervention through TV program resulted in a significant knowledge enhancement and hence concluded that mass media offer effective channels for communicating agricultural messages which can increase knowledge and influence behavior of audience members.

Table 4: Effectiveness of mass media channels on the persuasion of the adoption process of hermetic bags storage

Mass media channels on the persuasion	VE	E	I	VI	Mean	Std. Dev.
Convincing on importance of hermetic bags	47%	33%	7%	10%	4.17	0.641
Building confidence on the hermetic technology	52%	33%	4%	9%	4.23	0.643
Presenting information on hermetic bags in an appealing way	56%	34%	4%	6%	4.45	0.876

Scale: **VE**=Very Effective, **E**=Effective, **I**=Ineffective, **VI**=Very Ineffective

From the findings 80% of the respondents stated that mass media is effective in convincing on importance of hermetic bags while 17% of the respondents stated that mass media is ineffective in convincing on importance of hermetic bags with of a mean of 4.17 and std dev = 0.641. In addition 85% of the respondents stated that mass media is effective in building confidence on the hermetic technology while 13% of the respondents stated that mass media is ineffective in building confidence on the hermetic technology with of a mean of 4.23 and std dev = 0.643. The findings also indicated that 90% of the respondents stated that mass media is effective in presenting information on hermetic bags in an appealing way while 10% of the respondents stated that mass media is ineffective in presenting information on hermetic bags in an appealing way with of a mean of 4.23 and std dev = 0.643. The findings also concurs with finding of study by Nazari and Hassan (2011) that showed that education intervention through TV program resulted in a significant knowledge enhancement and hence concluded that mass media offer effective channels for communicating agricultural messages which can increase knowledge and influence behavior of audience members. The potential of mass media in persuading farmers towards adoption of hermetic bag storage technology can also be attributed to the fact that as many people seek media for information and entertainment, the advertisers often use media framing to organize stories and uncover meaning which is a means of persuading their customers.

Effectiveness of mass media channels in decision making stage of the adoption process of hermetic bags storage

The study further sought to determine the type of mass media and their effectiveness in helping farmers make decision on adoption of hermetic bag storage technology by having the farmers answer questions on effectiveness of mass media in giving opportunity to ask questions,

answering all questions and helping understand all benefits of hermetic bag storage technology for adoption. The results were as shown in Table 5 and 6.

Table 5: Type of mass media used in helping farmers decide on the use of hermetic bag

Mass media channel	Frequency	Percent
Radio	17	15.0
Television	23	20.0
Internet	12	10.0
Mobile Phone	23	20.0
Print media such as newspaper	14	12.0
Others/None	27	23.0
Total	116	100.0

From the findings 15% indicated that messages through radio helped them make decision on the adoption, 20% through television, 10% through internet, 20% through mobile phones and 12% through print media.

Table 6: Effectiveness of mass media channels in decision making stage of the adoption process of hermetic bags storage technology

Mass media channels on the decision making	VE	E	I	VI	Mean	Std
Giving opportunity to ask questions on hermetic bag technology	49%	39%	10%	1%	4.351	0.767
Answering all the questions that triggered use of hermetic bag storage technology	48%	39%	6%	7%	4.345	0.692
Helping to understand the benefits of using hermetic bags which led you decide to use the bag	47%	43%	2%	8%	4.22	0.453

Scale: **VE**=Very Effective, **E**=Effective, **I**=Ineffective, **VI**=Very Ineffective

From the findings 88% of the respondents stated that the mass media they utilized was very effective and effective in giving opportunity to ask questions on hermetic bag technology while 11% of the respondents stated that mass media was very ineffective and ineffective with a mean of 4.351 and std dev of 0.767. In addition 87% of the respondents stated that mass media is effective in answering all the questions that triggered use of hermetic bag storage technology with a mean of 4.345 and std dev = 0.692. Furthermore 90% of the respondents stated that mass media was effective in helping to understand the benefits of using hermetic bags which led to decision on use the bag while 10% of the respondents stated that mass media was ineffective with regard to helping them understand the benefits of using hermetic bags with mean of 4.22 and std dev = 0.453. The findings also concur with those by Coulibaly et al. (2012) whose study found that messages passed on PICS technology through television spots, radio advertisements, newspaper stimulated demand of PICS by farmers in West and Central Africa. In addition, commercial messages were broadcast during harvest and storage period with main focus on availability of the bags in different locations in the county. The effectiveness of mass media in decision making could be as a result of the amount of time people spend on media. Every time people watch television show and news, browse their social media accounts or listen to the radio, there will always be advertisements about a certain product or service and almost all the time what people hear and see especially from internet will decide what product or service to choose hence influencing their decision.

Effectiveness of mass media channels in implementation stage of the adoption process of hermetic bags storage

The study further sought to determine the effectiveness of mass media channels in the implementation stage by having farmers answer questions on whether demonstration on use of hermetic bags was effective and whether mass media channel used led to understanding on proper use of the hermetic bags.

The results were as shown in Table 7 and 8.

Table 7: Type of mass media used during the implementing of hermetic bag storage technology

Mass media channel	Frequency	Valid Percent
Radio	38	33
Television	49	42
Internet	6	5.0
Mobile Phone	6	5.0
Others/None	17	15.0
Total	116	100.0

From the findings 33% and 42% respectively admitted that radio and television led to their use of the hermetic bag storage technology while 10% and stated that they used hermetic bag due to influence of messages passed through internet and messages on mobile phones.

Table 8: Effectiveness of mass media channels in the implementation stage of the adoption process of hermetic bags storage technology

effectiveness of mass media channels on proper use and understanding of hermetic bag	VE	E	I	VI	Mean	Std
Demonstrating proper use of the hermetic bag storage technology	56%	34%	3%	7%	4.46	0.321
Giving understanding on the proper use of hermetic bag storage technology	47%	34%	7%	13%	4.20	0.432

Scale: **VE**=Very Effective, **E**=Effective, **I**=Ineffective, **VI**=Very Ineffective

From the findings 90% of the respondents stated that mass media is effective in demonstrating proper use of the hermetic bag storage technology while 10% of the respondents stated that mass media is ineffective in demonstrating proper use of the hermetic bag storage technology with a mean of 4.46 and std dev of 0.321. In addition 80% of the respondents stated that mass media is effective in giving understanding on the proper use of hermetic bag storage technology while 20% of the respondents stated that mass media is ineffective in giving understanding on the proper use of hermetic bag storage technology with of a mean of 4.20 and std dev = 0.432. The study findings are in line with Cohen, Godfrey, Jeune and Kindornay (2021) who revealed that if donors can partner with a private sector actor directly and establish a business case, the use of media channels becomes viable hence the long-term success of implementation of the adoption process of hermetic bags is more likely. Feedback not only supports the implementation process of hermetic bags storage but also helps to access whether or not the hermetic bags storage technology is meeting their purpose or aim. Likewise Norton and Alwang (2020) revealed that broadcast media have been considered the most cost-effective means of reaching target populations in the developing world, with the combination of both radio and ICTs greatly increasing not only awareness but also adoption of new farming

practices. The above results could also be established on the facts that media is present all around population and media influences the thoughts, manners and the way people behave. This is because people believe information channeled via different types of media and act on it.

Effectiveness of mass media channels in the adoption stage of the adoption process of hermetic bags storage technology

The researcher further sought to determine the type of mass media and their effectiveness on adoption stage of the adoption process of hermetic bags storage technology by asking questions on how effective mass media is in providing follow up and advice in utilization of hermetic bag. The results were as shown in Table 9 and 10

Table 9: Type of mass media used during the adoption stage of hermetic bag storage technology

Mass media channel	Frequency	percentage
Radio	37	32
Television	50	43
Internet	2	2
Others/None of the above	27	23
Total	116	100.0

The study revealed that 43% were led to continued use of the hermetic bag storage technology through messages conveyed by television, 32% through radio and 2% through internet.

Table 10: Effectiveness of mass media channels in the adoption stage of hermetic bags storage technology

Mass media channels on the adoption process	VE	E	I	VI	Mean	Std
Providing continuous follow up to avoid discontinuation	50%	45%	3%	2%	4.26	0.231
Promoting continuous use of hermetic bag storage technology	47%	39%	9%	5%	3.89	0.345
Providing advice in the course of utilization of the hermetic bag	44%	38%	7%	11%	4.273	0.689

Scale: **VE**=Very Effective, **E**=Effective, **I**=Ineffective, **VI**=Very Ineffective

From the findings 95% of the respondents stated that mass media is effective in providing continuous follow up to avoid discontinuation while 5% of the respondents stated that mass media is ineffective in providing continuous follow up to avoid discontinuation with a mean of 4.26 and std dev of 0.231. In addition 86% of the respondents stated that mass media is effective in promoting continuous use of hermetic bag storage technology while 14% of the respondents stated that mass media is ineffective in promoting continuous use of hermetic bag storage technology with a mean of 3.89 and std dev = 0.345. Furthermore 82% of the respondents stated that mass media is effective in providing advice in the course of utilization of the hermetic bag while 18% of the respondents stated that mass media is ineffective in providing advice in the course of utilization of the hermetic bag with a mean of 4.273 and std dev = 0.689. This is in consistence with study by Toole et al. (2012) who established that, media influences during later stages of the adoption process were very strong accounting for a two to

four fold increase in the number of people who adopted web application. Similarly according to study by Murty et al. (2012) it is evident that radio broadcast new approaches, ideas, research findings and scientific information for farmers which increase their knowledge and skills and farmer adopt such techniques for development and increased productivity. The results also supports findings by Aker (2011) which revealed that the rapid spread of mobile phone coverage in developing countries provides a unique opportunity to facilitate technological adoption via information and communication technology (ICT)based extension programs. This means that through its influence media can affect ones attitude, thoughts and actions which leads to adoption or discontinuance.

Correlation between the effectiveness of mass media channel in the various stages of the adoption process

A correlation analysis was conducted to establish the relationship between the effectiveness of mass media channel in the various stages of the adoption process of hermetic bags storage technology. This was possible through transformation of the ordinal data acquired from the questionnaire by SPSS into a composite data. This is because both the independent and dependent variables had been measured as latent variables and correlation analysis requires continuous data. The findings are shown in table 11.

Table 11: Correlation between the effectiveness of mass media channel in the various stages of the adoption process of hermetic bags storage technology

		Awareness stage	Persuasion stage	Decision stage	Implementation stage	Adoption stage
Awareness stage	Pearson	1				
	Correlation					
	Sig. (2-tailed)					
Persuasion stage	N	116				
	Pearson	.073	1			
	Correlation					
Decision stage	Sig. (2-tailed)	.653				
	N	116	116			
	Pearson	-.174	-.324*	1		
Implementation stage	Correlation					
	Sig. (2-tailed)	.283	.041			
	N	116	116	116		
Adoption stage	Pearson	-.345*	-.254	.082	1	
	Correlation					
	Sig. (2-tailed)	.029	.114	.616		
Adoption of hermetic bag	N	116	116	116	116	
	Pearson	-.048	-.178	-.115	.166	1
	Correlation					
Adoption of hermetic bag	Sig. (2-tailed)	.769	.272	.481	.306	
	N	116	116	116	116	116
	Pearson	.136**	.074**	-	-.015**	.266**
Adoption of hermetic bag	Correlation			.460**		
	Sig. (2-tailed)	.016	.049	.003	.028	.037
	N	116	116	116	116	116

The findings revealed that there was a weak statistically significant positive relationship ($r = 0.136$, $p < 0.05$) between mass media as a communication channel and awareness stage. This implies that mass media channel helps in creating awareness on hermetic bag storage technology to maize farmers. Furthermore the study revealed that there is a weak statistically significant positive relationship ($r = 0.074$, $p < 0.05$) between mass media as a communication channel and persuasion stage. This means that mass media facilitates conviction of farmers on use of hermetic bag storage technology. In addition the study revealed that there is a moderate statistically significant negative relationship ($r = -0.460$, $p < 0.05$) between mass media as a communication channel and decision stage. This states that mass media has no influence in driving farmers into decision on use of hermetic bag storage technology. The study also stated that there is a weak statistically significant negative relationship of ($r = -0.015$, $p < 0.05$) between mass media as a communication channel and implementation stage which means that mass media communication channel do not influence farmers into use of hermetic bag storage technology. Furthermore the study revealed that there is a weak statistically significant positive relationship ($r = 0.266$, $p < 0.05$) between mass media as a communication channel and adoption stage. Meaning that mass media is responsible for adoption or continuous use of hermetic bag storage technology by small scale maize farmers.

The results in Table 11 indicate that the relationship between mass media and adoption process was statistically significant at $P < 0.05$ for three stages (awareness, persuasion and adoption) out of the five adoption stages considered. The null hypothesis was however accepted for the two stages namely: decision and implementation stages. It was therefore concluded that mass media channels that were utilized: namely Radio, television, print media and internet did not influence adoption process of hermetic bag storage technology at the decision and implementation stages. The mass media channels (radio, television, print media and internet) however, influenced the adoption process of hermetic bag storage technology at awareness, persuasion and adoption stages.

The study sought to test the hypothesis that: H_{01} : There is no statistically significant influence of mass media channels on the adoption process of hermetic bags storage technology by small scale farmers in Nakuru County. From the findings the p-value was 0.018 which was less than the 0.05 significant levels. Therefore, based on the rule of significance, the study rejects the null hypothesis (H_{01}) and concluded that mass media as a communication channels has a significant influence on the adoption process of hermetic bags storage technology by small scale farmers in Nakuru County. The results are similar to those of Shahzad, et al. (2011) who noted that media is considered as significant mean to transfer modern agricultural technologies to literate and illiterate farmers alike.

Conclusion

Mass media channel is effective in the adoption process of hermetic bags storage technology. This is because mass media (radio and television) has positive influence on the awareness, persuasion and adoption stages of the adoption process of the hermetic bag storage technology by small scale maize farmers in Nakuru County. Therefore this suggests that small scale maize farmers who have access to mass media channels have higher chance of being aware of the hermetic bag storage technology, are more likely to be persuaded to adopt the hermetic bag storage technology, and likely to be influenced to use and continue in use of the hermetic bag storage technology compared to those who do not have access to mass media channels.

Utilization of mass media channel (radio and television) is hence paramount in the awareness, persuasion and adoption stages of the adoption process since it has the potential of reaching farmers with information on hermetic bags storage technology, persuading them on use of the hermetic technology with conviction on continued use of the technology. This means that mass media is best utilized for reaching most farmers with information on hermetic bags storage technology and influencing farmers to use and continue in use of the hermetic bag storage technology.

Recommendation

The study recommended that national government, department of agriculture that is mandated to deal with small scale farmers should come up with policies inclined to increase funding in support of the mass media channels. This will enhance improvement of the extension service delivery to small scale farmers in the country which will foster adoption of hermetic bag storage technology by farmers and hence improve food security.

References

- Akça, Y., & Özer, G. (2014). Diffusion of innovation theory and an implementation on enterprise resource planning systems. *International Journal of Business and Management*, 9(4), 92.
- Aker, J. C. (2011). Dial “A” for agriculture: a review of information and communication technologies for agricultural extension in developing countries. *Agricultural Economics*, 42(6), 631-647.
- Ayoade, A. R. (2010). Effectiveness of information sources on improved farm practices among cowpea farmers in Oyo State. *Global Journal of Human Social Science*, 10(4), 39-45.
- Azumah, S. B., Donkoh, S. A., & Awuni, J. A. (2018). The perceived effectiveness of agricultural technology transfer methods: Evidence from rice farmers in Northern Ghana. *Cogent Food & Agriculture*, 4(1), 1503798.
- Cohen, M. J., Godfrey, C., Jeune, H., & Kindornay, S. (2021). “Flash blending” development finance: how to make aid donor–private sector partnerships help meet the SDGs. *Development in Practice*, 31(7), 946-960.
- Coulibaly, J., Nouhoheflin, T., Aitchedji, C., Damisa, M., D’Alessandro, S., Baributsa, D., & Lowenberg-DeBoer, J. (2012). *Purdue Improved Cowpea Storage (PICS) Supply Chain Study*.
- FAO (Food and Agricultural Organization of the United Nations). (2010). *FAO/World Bank Workshop on Reducing Post-Harvest Losses in Grain Supply Chains in Africa: Lessons Learned and Practical Guidelines*.
- Gitonga, Z. M., De Groote, H., Kassie, M., & Tefera, T. (2013). Impact of metal silos on households’ maize storage, storage losses and food security: An application of a propensity score matching. *Food Policy*, 43, 44-55.

Ifukor, M. O. (2013). Channels of information acquisition and dissemination among rural dwellers. *International Journal of Library and Information Science*, 5(10), 306-312.

Mdangi, M., Mulungu, L. S., Massawe, A. W., Eiseb, S. J., Tutjavi, V., Kirsten, F., ... & Dlamini, N. (2013). Assessment of rodent damage to stored maize (*Zea mays* L.) on smallholder farms in Tanzania. *International Journal of Pest Management*, 59(1), 55-62.

Murdock, L.L., & Baoua, I.B. (2014). On Purdue Improved Cowpea Storage (PICS) technology: background, mode of action, future prospects. *Journal of Stored Products Research*, 58, 3-11.

Murty, D. T., & Abhinov, T. (2012). Electronic media in rural agricultural business-A promotional injection. *Abhinav National Monthly Refereed Journal of Research in Science & Technology*, 1(11), 63-68.

Mwangi, M., & Kariuki, S. (2015). Factors determining adoption of new agricultural technology by smallholder farmers in developing countries. *Journal of Economics and Sustainable Development*, 6(5), 208-217.

Namusalisi, J. (2019). Evaluation of Hermetic Technologies in the Control of Insect Infestation, Mold Proliferation and Mycotoxin Contamination of Stored Maize in Kenya (Doctoral dissertation, UoN).

Nazari, M. R., & Hassan, M. S. B. H. (2011). The role of television in the enhancement of farmers' agricultural knowledge. *African Journal of Agricultural Research*, 6(4), 931-936.

Nnenna, E. A. (2013). Access and application of information and communication technology (ICT) among farming households of South east Nigeria. *Agriculture and Biology Journal of North America*. doi, 10.

Norton, G. W., & Alwang, J. (2020). Changes in agricultural extension and implications for farmer adoption of new practices. *Applied Economic Perspectives and Policy*, 42(1), 8-20.

Nukenine, E. N., Adler, C., & Reichmuth, C. (2010). Bioactivity of fenchone and *Plectranthus glandulosus* oil against *Prostephanustruncatus* and two strains of *Sitophilus zeamais*. *Journal of Applied Entomology*, 134(2), 132-141.

Ognakossan, K. E., Tounou, A. K., Lamboni, Y., & Hell, K. (2013). Post-harvest insect infestation in maize grain stored in woven polypropylene and in hermetic bags. *International Journal of Tropical Insect Science*, 33(01), 71-81.

Opara, U. N. (2008). Agricultural information sources used by farmers in Imo State, Nigeria. *Information Development*, 24(4), 289-295.

Rogers, E. M. (2003). *The diffusion of innovation* 5th edition.

Sanusi, M. A., Petu-Ibikunle, A. M., & Mshelia, C. M. (2010). The influence of Information and Communication Technology (ICT) on the dissemination of agricultural information among urban farmers in the Northern Guinea Savannah Zone of Nigeria. *African Scientist*, 11(2), 135-145.

Shahzad, M., ul Islam, F., Umber, S., Khan, I. A., Abdal, M., & Raza, M. A. (2011). Role of agricultural publications in disseminating agricultural information among farming community of district Faisalabad. *Pak. J. Agri. Sci*, 48(3), 221-224.

Singh, S., Sachan, R., & Pahuja, S. (2016). Communication for Sustainable Rural and Agricultural Development. *Journal of Global Communication*, 9(conf), 93-99.

Sousa, F., Gian, N., & Home, R. (2016). Information technologies as a tool for agricultural extension and farmer-to-farmer exchange: Mobile-phone video use in Mali... *International Journal of Education and Development Using Information and Communication Technology*, 12(3), 19-36.

Sushil, G. (2017). Digital aids: Transfer of technologies for dissemination of agricultural information. *Journal of Pharmacognosy and Phytochemistry*, 6(6), 2126-2127.

Toole, J. L., Cha, M., & González, M. C. (2012). Modeling the adoption of innovations in the presence of geographic and media influences. *PloS one*, 7(1).

Zolait, A. H. S., & Sulaiman, A. (2017). The influence of communication channels on internet banking adoption. *AJBA*, 2(1&2), 115-134