Research Application Summary

Assessment of the effectiveness of communication channels in dissemination of fall armyworm information on maize production in Kenya

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Abstract

Effective communication channels have played an imperative role in the dissemination of critical information to farmers. This study sought to assess effectiveness of information communication channels used in dissemination of fall armyworms in maize production amongst farmers in Lugari-Kakamega County, Kenya. The study employed a descriptive research design based on diffusion theory by Rodgers. Qualitative and quantitative data was collected through key informant's interviews, household questionnaires and focused group discussions. Radio was rated as the most effective channel. Extension agents were rated as accessible and disseminated authentic information to farmers. The study established a strong relationship between the formally employed farmers and phone, television ownership which provided necessary income for acquisition of technologies. There was also a positive relationship between youth and computer/laptop ownership. The study recommends County governments to enhance dissemination of information via radio in both local and Kiswahili languages. There is need for re-tooling of extension agents on modern pest control methods.

Key words: Dissemination of information, fall armyworms, information communication channels, Kenya, maize production

Résumé

Les canaux de communication efficaces ont joué un rôle impératif dans la diffusion d'informations essentielles aux agriculteurs. Cette étude a cherché à évaluer l'efficacité des canaux de communication utilisés dans la diffusion de l'information sur les chenilles légionnaires d'automne dans la production de maïs parmi les agriculteurs du comté de Lugari-Kakamega, au Kenya. L'étude a utilisé un modèle de recherche descriptif basé sur la théorie de la diffusion de Rodgers. Les données qualitatives et quantitatives ont été recueillies par le biais d'entretiens avec des informateurs clés, de questionnaires destinés aux ménages et de discussions de groupe. La radio a été considérée comme le canal le plus efficace. Les agents de vulgarisation ont été jugés accessibles et ont diffusé des informations authentiques aux agriculteurs. L'étude a établi un lien étroit entre les agriculteurs employés officiellement et la possession d'un téléphone ou d'un téléviseur, ce qui leur a procuré les revenus nécessaires à l'acquisition de technologies. Il existe également une relation positive entre les jeunes et la possession d'un ordinateur/portable. L'étude recommande aux gouvernements des comtés d'améliorer la diffusion de l'information par la radio dans les langues locales et le kiswahili. Il est nécessaire de réorienter les agents de vulgarisation vers les méthodes modernes de lutte contre les parasites.

Mots clés : Diffusion de l'information, légionnaires d'automne, canaux de communication de l'information, Kenya, production de maïs.

Introduction

Information communication channels play an imperative role in information dissemination especially to farmers. However, assessment of the effectiveness of communication channels in information dissemination in the agriculture sector has been a challenge in Kenya and in other African countries (Mburu, 2013). The rapid use of various communication channels to disseminate agricultural information to farmers on various agricultural activities by government and other agriculture sector stakeholders has played a tremendous role in making information accessible to farmers to enhance production (Achebe and Lucky, 2013). Radio is a major communication channel and dissemination tool used by many farmers especially in rural areas. Other information communication channels include; television, mobile phones, mobile applications, short message service (SMS), and internet (Adam, 2002).

Agriculture has been a major contributing sector for economic development. According to Shepande (2010), "a well performing agricultural sector translates into significant improvements in the country's Gross Domestic Product (GDP), contributes to employment generation, and broadens the country's tax base". Hans (2015) also contended that the African economy is primarily based on the agriculture sector, which employs most of a country's population, especially in rural areas. Given that the livelihood of the majority of people in Kenya depend on agricultural-related activities, the sector when well developed, would contribute significantly to the welfare and economic development of the country (Shepande, 2010). Majority of people involved in agricultural activities are the rural poor of the country and consequently operate on a small scale basis mostly due to lack of capital.

Maize in Kenya is a staple food hence it is important to majority of the population. Most small-scale farmers engage in maize production and therefore need information for proper crop management due to the myriads of challenges involved. These challenges include Maize Lethal Necrosis Disease (MLND), unreliable rainfall, drought stress, flooding, increasing soil acidifications and adoption of varying land use patterns, climate change that has interfered with planting cycles as well as the fall armyworm (FAW), (Food Agricultural Organisation (FAO), 2017; National Potato Council of Kenya (NPCK), 2017). Agricultural extension is defined by Adams (1982) as assistance given to farmers to help them to identify and analyse their production problems and to become aware of the opportunities for improvement. . The Kenya extension officer to farmer ratio is among the highest in East Africa. There is need for other information interventions to support extension led information sources amongst farmers due to the high farmer ratio (Gundu, 2016).

As the need for information on agricultural practices and challenges increase, more and more communication channels come in as information sources. The government, non-governmental organization, extension officers and other technocrats in the agricultural sector have turned their attention to the effectiveness of communication channels in information dissemination. Assessing the effectiveness of communication channels in dissemination of information on FAW amongst maize farmers is therefore imperative in determining the best communication channel to be used. According to Abubakar *et al.* (2009), agricultural information has been distributed differently and using different communication channels with the most notable being media channels such as television and radio. Crandall (2012) asserts that dissemination of information on the fall armyworm is of importance to smallholder farmers growing maize to reduce the risk of suffering losses that would eventually lead to food insecurity in case of maize invasion by the pest. According to Howland *et al.* (2015) essessment of the effectiveness of communication channels used in disseminating information on FAW to maize farmers is critical in determining the communication channel to be used in reaching farmers.

Theory and factors influencing choice of communication channels amongst maize farmers

The research study was centered on the diffusion theory by Rogers (1995). The theory offers robust information and knowledge on information diffusion process where innovation is communicated via different channels over a given period across people from a particular social system.There are five established adopter categories according to Rogers Theory of Diffusion of Innovation; innovators, early adopters, early majority, late majority, and laggards. The diffusion of innovations theory refers to the process of passing a new idea among members of a community over a given period by focusing on awareness, knowledge, attitude change and decision-making process that leads to the adoption or non-adoption of an innovation (Tucker and Napier, 2002). While the majority of the general population tends to fall in the middle categories, it is still necessary to understand the influence that information and information communication channels have on the different characteristics of the target population.

When identifying the adopted communication channel of the most effective communication channels of fall armyworm information, the study identified the most preferred channel as used by the different adopter categories. Adoption of a technology may be measured by "both the timing and extent of new technology utilization by individuals" (Feder and Savastano, 2006). Rogers (1995) identifies the cost, relative advantage, complexity and compatibility as characteristics, which influence adoption of an innovation. A Better understanding of the processes by which new knowledge diffuses within and across societies and communities can suggest actions and investments that can be undertaken by governments and sector players with the aim to promote emerging innovations (Feder and Savastano, 2006).

Materials and Methods

The study area, Lugari in Kakamega County was specifically sampled as there were fall army worms attacks among maize farmers and the area has had relatively good maize production. The randomly sampled population included key informants from three seed companies (Western Seed Co, Pannar Seed Co and Kenya Seed Co), and two key informants from ministry of agriculture, extension staff and KALRO staff. The study targeted a population of 250 maize farmers, with a sample size of 155 maize farmers obtained according to Kothari (2010) sample size calculation formula as tabulated below;

$$n = \frac{\dfrac{Z^2 \times P(1-p)}{e^2}}{1 + \dfrac{Z^2 \times P(1-p)}{e^2 N}}$$

Where: n= the desired sample size, Z= the Zed-Score corresponding to the confidence level, P=Population proportion, e=the margin of error, N=total population in the target area (Total number of farmers in Lugari County)

$$n = \frac{\dfrac{1.960^2 \times 0.5(1 - 0.5)}{0.05^2}}{1 + \dfrac{1.960^2 \times 0.5(1 - 0.5)}{0.05^2 \times 250}}$$

$$n = \frac{\dfrac{3.8416 \times 0.25}{0.0025}}{1 + \dfrac{3.8416 \times 0.25}{0.625}}$$

$$n = \frac{384}{2.5}$$

$$n = 155 \text{ Farmers}$$

Under probability sampling, the study used systematic sampling method to find the nth number, so that every nth household from the first household which was picked randomly was selected as part of the sample till the 155 number of the sample size was attained. A semi-structured questionnaire was used to collect data from knowledgeable respondents who know the household agriculture activities representing their households. The study used descriptive statistics in which quantitative data was entered and coded in Microsoft Excel 2016 version and later exported to Statistical Package for Social Sciences (SPSS) version 22 for data processing and analysis. Data was then presented in graphs, tables, percentages, standard deviation and frequencies.

Results and discussion

Respondent's gender. Under the household questionnaires administered among the 155 farmers interviewed 55 % were female whereas 45 % were male as shown in Figure 1.
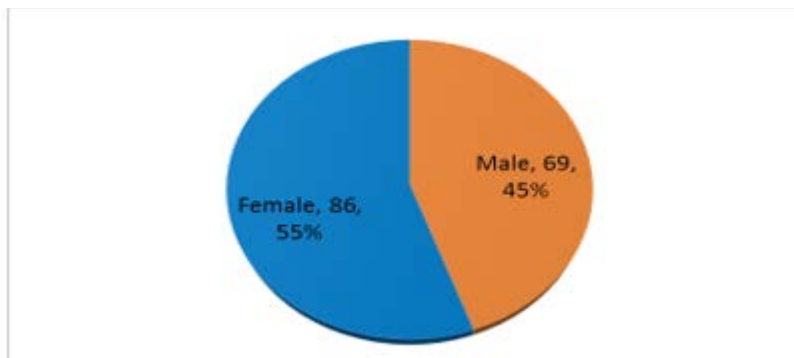

Figure 1. Distribution of respondents by gender

The above findings agree with Diiro (2018) who stated that agriculture in Kenya has a female face as it has women as the majority. Therefore information dissemination and information communication channels should factor in the characteristics of women as the majority to receive targeted communication.

The finding shows that about 65 % of the respondents had family sizes of 1-5 members, 33 % had family sizes of 6-10 members while 3 % had families with more than 11 members (Figure 2). The larger the families size the more ICTs tools that the family is bound to own which increases access to various information communication channels.
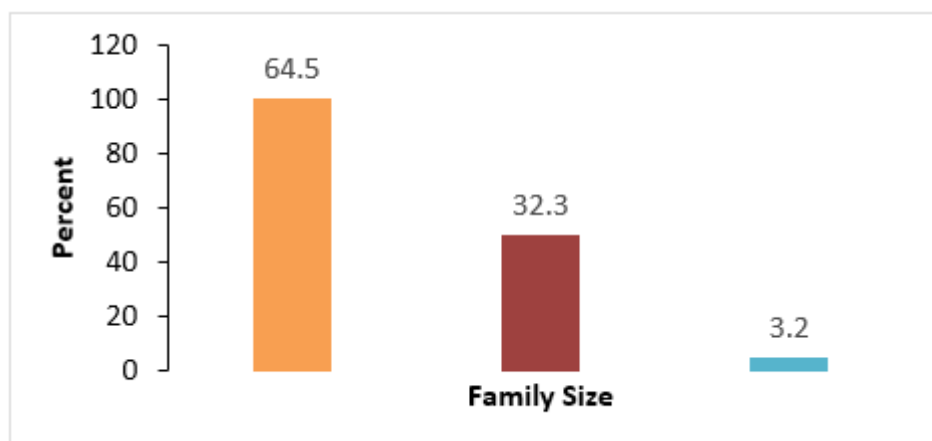
Figure 2. Percent distribution of respondents by family size

Highest education Level of Respondents. Table 1 shows the distribution of respondents by their highest education level. The study indicated that 48% had secondary school qualification, while 27% had primary school qualification. The findings further indicate that 20% of the respondents reached tertiary level education while only 5% had no education at all. These findings are similar to those of Oduro- Ofori *et al*. (2015) who also indicated that farmers highest education level was secondary school level. The educational level of farmers influence the farmer's productivity levels as the higher the educational levels of the farmer, the higher the agriculture production levels.

Table 1. Distribution of respondents according to their highest education level

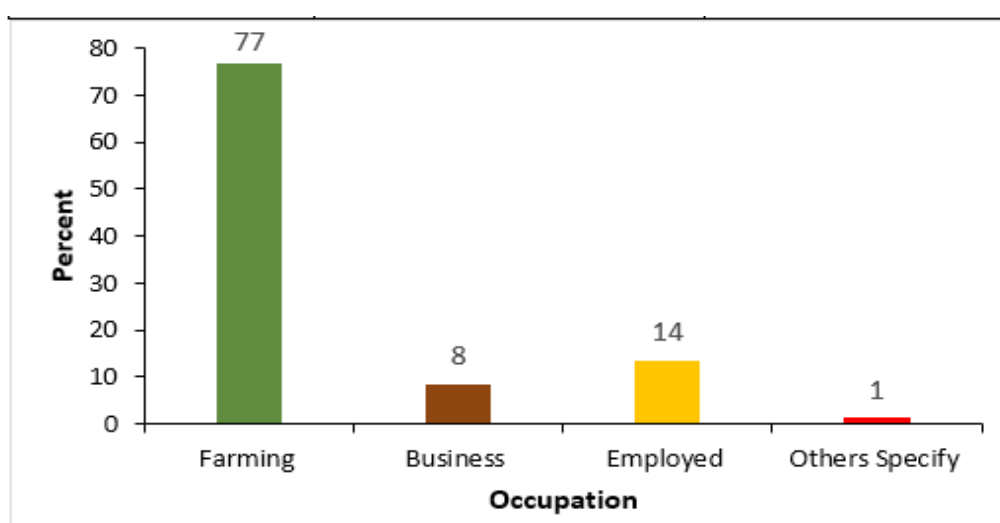| Highest education Level	Frequency	Percent
No education	4.5	7%
Primary education	26.5	41%
Secondary education	48.4	75%
Tertiary education	20	31%
Others (Specify)	0.6	1%
Total	100	155

Figure 3. Percent distribution of respondents by occupation

Table 2. Relationship between gender, educational level, area of residence and occupation of the respondents with ownership of a phone and television (P-Value=0.05).

Socio-Demographic Factors	Ownership of Mass Media Communication Channels (Devices)				
	Phone		Television (TV)		Number Of Respondents
Gender	Yes	No	Yes	No	
Male	51(73.9%)	18(26.1%)	28(40.6%)	41(59.4%)	69
Female	67(77.9%)	19(22.1%)	32(37.2%)	54(62.8%)	86
Pearson Chi-Square value(2-sided)	0.562	0.669			
Highest Education Level					
No Education	0(0%)	8(100%)	1(10.0%)	7(90%)	8
Primary Education	2(4.9%)	39(95.1%)	6(14.6%)	35(85.4%)	41
Secondary Education	14(18.7%)	61(81.3%)	29(38.7%)	46(61.3%)	75
Tertiary Education	21(67.7%)	10(32.3%)	24(77.4%)	7(22.6%)	31
Pearson Chi-Square value(2-sided)	0.000		0.000		
Area Of Residence					
Marakusi	30(25.4%)	88(74.6%)	45(38.1%)	73(61.9%)	118
Mautuma	2(50.0%)	2(50.0%)	2(50.0%)	2(50.0%)	4
Mbagara	3(12.0%)	22(88.0%)	7(28.0%)	18(72.0%)	25
Munyuki	0(0%)	1(100%)	0(0%)	1(100%)	1
Sipande	2(28.0%)	5(71.4%)	2(28.0%)	5(71.4%)	7
Pearson Chi-Square value(2-sided)	0.215		0.302		
Occupation					
Business	8(38.1%)	13(61.9%)	16(76.2%)	5(23.8%)	21
Employees	8(61.5%)	5(38.5%)	8(61.5%)	5(38.5%)	13
Farming	101(84.9%)	18(15.1%)	85(70.6%)	36(29.4%)	121
Pearson Chi-Square value(2-sided)	0.000		0.000		155

The percent distribution of respondents by occupation is depicted in Figure 3. Most of the respondents (77%) were farmers, 14% were doing business as their main occupation, and 8% were employed while 1% were engaged in other occupations. According to Baum (2007) agriculture is one of the dominant activities for the rural population, with 62% of farmers relying on agricultural activities as their source of income. This emphasises the need for rural farmers to be given agriculture support through adequate, and timely agricultural information using effective information communication channels which would facilitate higher agriculture production levels.

In Table 2, out of the 69 men interviewed 73.9 % had phones while 26 % did not have. In contrast 40.6 % had televisions and 60 % did not have. In addition, out of the 86 females interviewed, 78 % had phones whereas, 22 % did not have. On the other hand, 37 % had televisions while 63 % did not have. The study found that there is no statistically significant relationship between gender of the respondent and ownership of phone and television. Table 2 also shows that majority of the respondents with tertiary education level had phones at 68%, followed by respondents with secondary education level at 19%. Most respondents with primary education level had no phones. On the other hand, the majority of the respondents who had televisions had secondary education at 39%, followed by respondents with tertiary education at 24 %. Only 10 % with no education had a television. The findings established that there is a relationship between the education level of the respondent and owning a phone or television.

Lastly, Table 2 shows that there was a very strong statistically significant relationship between employment status of the respondents and ownership of a phone or television.

Table 3. The relationship between gender, highest education level, area of residence with occupation of the respondent and ownership of a radio and computer/laptop

Socio-Demographic Factors	Ownership of Mass Media Communication Channels (Devices)				
	Radio		Computer/Laptop		Number Of Respondents
Gender	Yes	No	Yes	No	
Male	60(87.0%)	9(13.0%)	7(10.1%)	62(89.9%)	69
Female	75(87.2%)	11(12.8%)	3(3.5%)	83(96.5%)	86
Pearson Chi-Square value(2-sided)	0.963	0.940			
Highest Education Level					
No Education	8(85.7%)	1(14.3%)	0(0%)	8(100%)	8
Primary Education	33(80.5%)	8(19.5%)	0(0%)	41(100%)	41
Secondary Education	66(88.0%)	9(12.0%)	2(2.7%)	73(97.3%)	75
Tertiary Education	29(93.5%)	2(6.5%)	8(25.8)	23(74.2%)	31
Pearson Chi-Square value(2-sided)	0.565	0.000			
Area Of Residence					
Marakusi	104(88.1%)	14(11.9%)	9(7.6%)	109(92.4%)	118
Mautuma	3(75.0%)	1(25.0%)	0(0%)	4(100%)	4
Mbagara	14(56.0%)	11(44.0%)	0(0%)	25(100%)	25
Munyuki	0(0%)	1(100%)	0(0%)	1(100%)	1
Sipande	6(85.7%)	1(14.3%)	1(14.3%)	6(85.7%)	7
Pearson Chi-Square value(2-sided)	0.638		0.360		
Occupation					
Business	12(92.3%)	1(7.7%)	2(15.4%)	11(84.6%)	21
Employees	19(90.5%)	2(9.5%)	4(19.0%)	17(81.0%)	13
Farming	103(85.7%)	18(14.3%)	5(3.4%)	116(96.6%)	121
Pearson Chi-Square value(2-sided)	0.795		0.026		155

Table 3 shows the relationship between gender, highest education level, area of residence and occupation of the respondent and ownership of a radio and computer/laptop. A total of 69 men were interviewed and 87 % had phones while 13% did not have. On the other hand 90 % did not have computers/laptops. In addition, out of the 86 females interviewed, 87 % had radios whereas 13% did not have, while 97% of females had no computers. Findings show that slightly more women (87.2%) had radios compared to men (87 %). In contrast, men had more televisions than females.

Table 3 also shows that majority of the respondents who had radios had secondary education level (88%), followed by respondents with primary education level (80%). Those with no education were the fewest. On the other hand, the majority of the respondents who had computers/laptops had tertiary education levels (26%) followed by 3% with secondary education levels. All the respondents with primary and no education had no computers/laptops. The study found a strong relationship between ownership of a computer/laptop and the respondent's highest education level.

The Table further shows that all respondents from Munyiki had no radios (100 %). The majority of the respondents who had phones were from Marakusi (88%), followed by respondents from Mbagara (54%). On the other hand, the majority of respondents who had computers/laptops were also from Marakusi (7 %).

Table 4. The relationship between gender, highest education level, area of residence and occupation of the respondent and ownership of a radio and computer/laptop.

Socio-Demographic Factors	Ownership of Mass Media Communication Channels (Devices)				
	Radio		Computer/Laptop		Number Of Respondents
Gender	Yes	No	Yes	No	
Male	60(87.0%)	9(13.0%)	7(10.1%)	62(89.9%)	69
Female	75(87.2%)	11(12.8%)	3(3.5%)	83(96.5%)	86
Pearson Chi-Square value(2-sided)	0.963		0.940		
Highest Education Level					
No Education	8(85.7%)	1(14.3%)	0(0%)	8(100%)	8
Primary Education	33(80.5%)	8(19.5%)	0(0%)	41(100%)	41
Secondary Education	66(88.0%)	9(12.0%)	2(2.7%)	73(97.3%)	75
Tertiary Education	29(93.5%)	2(6.5%)	8(25.8)	23(74.2%)	31
Pearson Chi-Square value(2-sided)	0.565		0.000		
Area Of Residence					
Marakusi	104(88.1%)	14(11.9%)	9(7.6%)	109(92.4%)	118
Mautuma	3(75.0%)	1(25.0%)	0(0%)	4(100%)	4
Mbagara	14(56.0%)	11(44.0%)	0(0%)	25(100%)	25
Munyuki	0(0%)	1(100%)	0(0%)	1(100%)	1
Sipande	6(85.7%)	1(14.3%)	1(14.3%)	6(85.7%)	7
Pearson Chi-Square value(2-sided)	0.638		0.360		
Occupation					
Business	12(92.3%)	1(7.7%)	2(15.4%)	11(84.6%)	21
Employees	19(90.5%)	2(9.5%)	4(19.0%)	17(81.0%)	13
Farming	103(85.7%)	18(14.3%)	5(3.4%)	116(96.6%)	121
Pearson Chi-Square value(2-sided)	0.795		0.026		155

As depicted in Table 4, most of the respondents aged 36-55 years had radios (88 %), followed by respondents aged above 55 years (86%) and lastly those aged 18-35 years (85%). On the other hand, the majority of the respondents (19 %) who had computers/laptops were in the age-group 18-35 years followed by respondents aged above 55 years (7%). The study found a statistically significant relationship between age of the respondent and ownership of a computer/laptop.

Table 4 further shows that the majority of the respondents who had radios were married (89%), while most of the respondents who did not have radios were single (80%). On the other hand, the majority of the respondents who had computers/laptops were also married (6%) while all the respondents who were divorced had no computers/laptops (100%). However, the study found no significant relationship between marital status of the respondent and ownership of a radio, but found a strong relationship between age and ownership of a computer/laptop.

Furthermore, most of the respondents who had radios were from family sizes of 1-5 members (10%). On the other hand, all the respondents from family sizes of more than 11 members had no computers/laptops (0 %). The majority of the respondents who had computers/laptops were from family sizes of 1-5 members (6 %). The study found that there is a statistically significant relationship between family size of the respondent and ownership of a radio and computer/laptop. Lastly, Table 4 shows that most of the respondents who had radios and computers/laptops were farmers with (85 %). There was a statistically significant relationship between occupation and

ownership of a computer/laptop.

Table 5 shows the relationship between age, marital status and the family size of the respondent and ownership of a radio and computer/laptop. As depicted, most of the respondents aged 36-55 years had radios (88%) followed by respondents aged above 55 years (86 %) and lastly those aged 18-35 years (85%). On the other hand, the majority of the respondents who had computers/laptops were in the age-group of 18-35 years (19%) followed by respondents aged above 55 years (7%). The study found no statistically significant relationship between the age of the respondent and ownership of radio and computer/laptop, whereas the relationship between age of the respondent and ownership of a computer/laptop was statistically significant. The results in Table 5 further show that the majority of the respondents who had radios were married (89 %), while most of the respondents who did not have radios were single (80 %). On the other hand, the majority of the respondents who had computers/laptops were also married (6%). All the respondents who were divorced had no computers/laptops (100%). The study found a strong relationship between age and ownership of a computer/laptop.

Most of the respondents who had radios were from family sizes of 1-5 members (10 %). On the other hand, all the respondents from family sizes of more than 11 members had no computers/laptops (0%). The majority of the respondents who had computers/laptops were from family sizes of 1-5 members (6%). The study found that there is a statistically significant relationship between family size of the respondent and ownership of a radio and computer/laptop.

Table 5. The relationship between age, marital status and family size of the respondent with ownership of a radio and computer/laptop

Socio-Demographic Factors	Ownership of Mass Media Communication Channels (Devices)				
	Radio		Computer/Laptop		Number Of Respondents
Age	Yes	No	Yes	No	
18-35years	18(85.7%)	3(14.3%)	4(19.0%)	17(81.0%)	21
36-55years	80(87.9%)	11(12.1%)	3(3.3%)	88(96.7%)	91
Over 55years	37(86.0%)	6(14.0%)	3(7.0%)	40(93.0%)	43
Pearson Chi-Square value(2-sided)	0.936		0.032		
Marital Status					
Divorced	2(100.0%)	0(0%)	0(0.0%)	2(100.0%)	2
Married	120(89.6%)	14(10.4%)	8(6.0%)	12(94.0%)	134
Single	4(80.0%)	1(20.0%)	2(40.0%)	3(60.0%)	5
Widowed	9(64.3%)	5(35.7%)	0(0%)	14(100.0%)	14
Pearson Chi-Square value(2-sided)	0.052		0.015		
Family Size					
1-5 Members	10(10.0%)	90(90.0%)	6(6.0%)	94(94.0%)	100
6-10 Members	7(14.0%)	43(86.0%)	4(8.0%)	46(92.0%)	50
11+ Members	3(60.0%)	2(40.0%)	0(0.0%)	5(100.0%)	5
Pearson Chi-Square value(2-sided)	0.003		0.049		155

Figure 4 shows the distribution of respondents according to their knowledge of FAW. Results show that (97 %) knew about FAW while (3%) did not know.
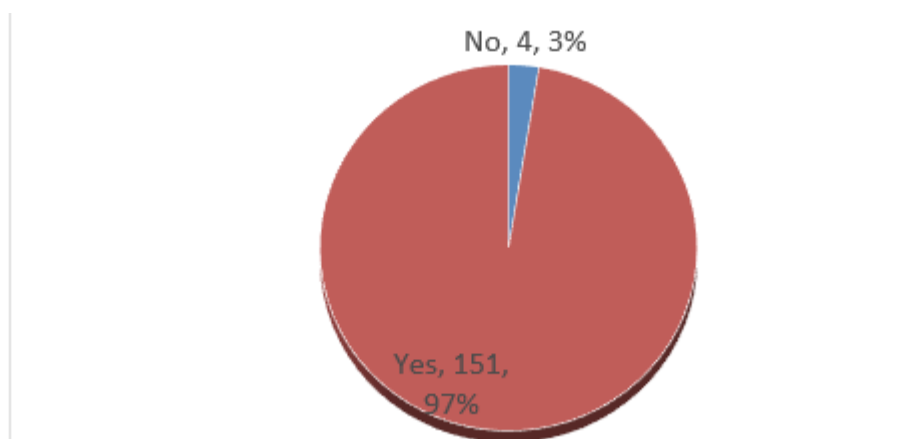
Figure 4. Distribution of respondents based on Knowledge about FAW

Table 6. The effectiveness of mass media channels used in disseminating Information on fall army worms among maize farmers

Mass Media Channels	Rate of effectiveness in FAW information dissemination			
	Most effective	Effective	Less effective	Percentage
Television	0.600%	48.40%	51%	100
Radio	87.100%	12.90%	0%	100
Newspaper	1.900%	92.90%	5.20%	100
CD/DVD	0.000%	33.60%	66.50%	100
Telephone Calls	72.900%	25.90%	1.30%	100
Farmers Magazine	0.000%	6.50%	93.50%	100
Internet	2.600%	45.10%	52.30%	100
Web Portal	0.000%	3.20%	96.80%	100
Mobil App	0.000%	1.90%	98.10%	100
Mobile Text messages	64.600%	33.50%	1.90%	100
Email	0.000%	3.20%	96.80%	100

The results in Table 6 show the rate of effectiveness of mass media channels in dissemination of information on FAW according to the respondents. The findings show that in general the majority (58%) rated radio as most effective in FAW information dissemination followed by mobile text messages (45 % very great extent) and telephone calls (37% very great extent). Additionally, (29%) considered newspapers moderate extent, mobile App (98 % very low extent), farmer's magazine (93% very low extent), CD/DVD (67% very low extent), emails and web portal were rated as least effective (96 % very low extent).

Table 7 shows the relationship between age, marital status and the family size of the respondent and ownership of a radio and computer/laptop. The study found no statistically significant relationship between the age of the respondent and ownership of a radio. On the other hand, the study found a statistically significant relationship between age of the respondent and ownership of a computer/ laptop. The study found no significant relationship between marital status of the respondent and ownership of a radio. Regarding the relationship between family size of the respondent and ownership of a radio and computer/laptop, the study found that there was a statistically significant relationship.

Table 7. The relationship between age, marital status and family size of the respondent with ownership of a radio and computer/laptop

Socio-Demographic Factors	Ownership of Mass Media Communication Channels (Devices)				
	Radio		Computer/Laptop		Number Of Respondents
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Pearson Chi-Square value(2-sided)	0.936		0.032		
Marital Status					
Divorced	2(100.0%)	0(0%)	0(0.0%)	2(100.0%)	2
Married	120(89.6%)	14(10.4%)	8(6.0%)	12(94.0%)	134
Single	4(80.0%)	1(20.0%)	2(40.0%)	3(60.0%)	5
Widowed	9(64.3%)	5(35.7%)	0(0%)	14(100.0%)	14
Pearson Chi-Square value(2-sided)	0.052		0.015		
Family Size					
1-5 Members	10(10.0%)	90(90.0%)	6(6.0%)	94(94.0%)	100
6-10 Members	7(14.0%)	43(86.0%)	4(8.0%)	46(92.0%)	50
11+ Members	3(60.0%)	2(40.0%)	0(0.0%)	5(100.0%)	5
Pearson Chi-Square value(2-sided)	0.003		0.049		155

Table 8 shows the accessibility, acceptability, authenticity, credibility, familiarity, usability likability and interactivity of mass media communication channels by the respondents. More so, the results show that telephone calls were most liked (43 %) and interactive (43 %) as a means of mass media communication channel

Table 8. Accessibility, acceptability, authenticity, credibility, familiarity, usability likability interactivity of mass media communication channels

	Television	Radio	Newspaper	Telephone Calls	Farmers Magazine	Internet	Mobile App	Mobile Text Messages	Percent
Accessibility	18(11.6%)	60(38.7%)	2(1.3%)	30(19.4%)	1(0.6%)	2(1.3)	0(0%)	42(27.1%)	100
Acceptability	10(6.5%)	60(38.7%)	3(1.9%)	43(27.7%)	0(0%)	4(2.6%)	7(4.5%)	28(18.1%)	100
Authenticity	42(27.1%)	52(33.5%)	2(1.3%)	11(7.1%)	1(0.6%)	2(1.3%)	20(12.9%)	25(16.1%)	100
Familiarity	45(29%)	57(36.8%)	2(1.3%)	24(15.5%)	3(1.9%)	2(1.3%)	9(5.8%)	13(8.4%)	100
Usability	9(5.8%)	32(20.6%)	2(1.3%)	42(27.1%)	1(0.6%)	2(1.3%)	0(0%)	67(43.2%)	100
Likeability	10(6.5%)	45(29.0%)	3(1.9%)	66(42.6%)	1(0.6%)	2(1.3%)	0(0%)	28(18.1%)	100
Interactivity	0(0%)	40(25.8%)	0(0%)	67(43.2%)	0(0%)	0(0%)	1(0.6%)	47(30.3%)	100
Reliability	18(11.6%)	52(33.5%)	2(1.3%)	30(19.4%)	1(0.6%)	2(1.3)	8(5.2%)	42(27.1%)	100

Table 9 depicts the effectiveness rating of inter-personal communication channels. Results showed that (90 %) of the respondents rated fellow farmers as the most effective inter-personal communication channel, followed by agro dealers (63 %) and peers (58%). Furthermore, extension officers/agents (45 %) were rated as very low in effectiveness in terms of FAW information dissemination.

Table 9. The effectiveness rate of inter-personal communication channels used in information dissemination on fall army worm among maize farmers

Inter-personal communication channels	Rate of effectiveness in FAW information dissemination				
	Very great extent	Great extent	Moderate extent	Low extent	Very low extent
Extension Officer/Agent	0(0%)	8(5.2%)	49(31.6%)	70(45.2%)	28(18.1%)
Peer	90(58.1%)	45(29%)	20(12.9%)	0(0%)	0(0%)
Fellow farmers	140(90.3%)	15(9.7%)	0(0%)	0(0%)	0(0%)
Agro Dealers	98(63.2%)	45(29%)	12(7.7%)	0(0%)	0(0%)

Table 10 shows the accessibility, acceptability, authenticity, credibility, familiarity, usability, likability and interactivity of inter-personal communication channels by the respondents. The majority further shows that 45% of the respondents reported that extension officers/agents were accessible, 53 % acceptable, 63% authentic and usable in each case and 66% reported that the extension officer/agent were reliable in terms of inter-personal communication channel.

The results further show majority (61 %) reported that fellow farmers were familiar, interactive (57%) and that they were more likable (78%). More so, the results show that agro dealers were the least accessible (3 %) and acceptable (5 %).

Table 10. Distribution of accessibility, acceptability, authenticity, credibility, familiarity, usability likability interactivity of inter-personal communication channels used in information dissemination on fall army worm among maize farmers.

Measurement	Inter-personal communication channels			
	Extension Officer/Agent	Peer	Fellow Farmers	Agro Dealers
Accessibility	70(45.2%)	50(32.3%)	30(19.4%)	5(3.2%)
Acceptability	82(52.9%)	45(29%)	21(13.5%)	7(4.5%)
Authenticity	99(62.7%)	15(9.5%)	38(24.1%)	6(3.8%)
Familiarity	32(20.6%)	10(6.5%)	95(61.3%)	18(11.6%)
Usability	99(63.9%)	5(3.2%)	13(8.4%)	38(24.5%)
Likeability	39(25.2%)	24(15.5%)	78(50.3%)	14(9.0%)
Interactivity	15(9.7%)	12(7.7%)	89(57.4%)	39(25.2%)
Reliability	102(65.8%)	5(3.2%)	12(7.7%)	36(23.2%)

Conclusions and Recommendations

The study found out that level of effectiveness of the communication channels used in information dissemination on FAW to maize farmers differs from one channel to other. It further revealed that there is a strong relationship between ownership of a computer/laptop and the respondent's education level, occupation and age. In addition, the study also found a statistically significant relationship between family size of the respondent and ownership of a radio and computer/laptop. However, the study found no statistically significant relationship between gender and ownership of a television.

While efficient efforts have been put by the Kenya Government to disseminate information on FAW, care should be taken to establish the effectiveness of different communication channels used

in information dissemination. The study however, established that radio was the most effective communication channel in information dissemination on FAW to maize farmers in Lugari, Kakamega County. A greater percentage of farmers therefore rely on information from the radio followed by text messages for communication. Lastly, the study found out that communication between farmers was the most effective inter-personal communication channel for disseminating information on FAW.

In a bid to combat and effectively solve challenges of effectiveness of communication channels used in disseminating information on FAW, extension officers should be trained on efficient communication skills as well as on FAW to create awareness. This study consequently recommends that the Ministry of Agriculture and Technology in conjunction with the Ministry of Information and Technology should work on modalities of ensuring that radio is made accessible to maize farmers as it is the most effective communication channel. This can be achieved through rural electrification to ensure constant supply of power for the radios. The study further recommends use of phones by the Government and extension officers in disseminating information on FAW.

Acknowledgements

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