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USE OF COPING STRATEGIES FOR FLOODING AMONG ARABLE CROP FARMERS IN EDU LOCAL GOVERNMENT AREA OF KWARA STATE, NIGERIA

Ajoke Oluwatoyin Kayode* and Sharafadeen Abiodun Abdulqadir
Department of Agricultural Extension and Rural Department, University of Ilorin, Nigeria
*Corresponding Author Email: kayode.ao@unilorin.edu.ng

Abstract
Flooding is becoming increasingly common in developing countries, and the destructive impact on arable crop farming is clearly one of the greatest setbacks in agricultural production. The study assessed the sources of information on coping strategies, the level of usage of coping strategies, the perceived effects of flooding on arable crops, and the challenges to using coping strategies. Data were collected using a structured interview schedule, and descriptive statistics, Pearson's product moment correlation, and Chi square analysis were used to analyze the data. Results showed that the average age of the respondents was 53.4 years, and the mean farming experience was 15.5 years. Filling bags with sands (=2.86) and early planting of crops (=2.76) were the most popular coping measures. Chi-square analysis indicated positive and significant relationship between level of use of coping strategies and radio ($\chi 2$= 48.908; $p<0.05$) and fellow farmers ($\chi 2$= 141.976; $p<0.05$). Results further showed that the use of coping strategies had a significant relationship on flooding ($p<0.05$). The study concluded that the effect of flooding on crop farming is high and also that the use of coping strategies has a significant relationship with the effect on flooding on arable crop farming in the study area. Findings underscore the need to devise strategies to cope with this devastating effect on arable crop farming. It also recommends increased extension contacts to provide reliable and adequate source of information on coping strategies for flooding.

Key words: Flooding, coping strategies, level of use, climate change

Introduction

Flooding has remained a key source of concern in Nigeria because of its devastating impact on food security and national prosperity. It's a natural occurrence that happens along riverbanks, streams, lakes, shorelines, coastal areas, and low plains, among other places.
Flooding in Nigeria is fluvial (coming from rivers overflowing their natural and constructed defenses), coastal (affecting mostly coastal communities), and pluvial (unexpectedly arriving after a severe storm) in nature, and has been a major source of concern for rural and urban populations alike Douglas *et al.,* (2008), Houston *et al.*, (2011), Bashir *et al.,* (2012,).

It's also worth noting that climate change, which has now become a worldwide phenomenon, contributes to flooding by increasing annual rainfall. Flooding is the most common disaster in Nigeria as reported by Adaku (2020). It was also confirmed that majority of Nigeria's states are increasingly suffering from annual flooding during the rainy seasons caused by increased precipitation linked to climate change Aja & Olaore (2014).

The National Emergency Management Agency (NEMA) estimated that ₦2.29 trillion, or 2.83 percent of the GDP, would be necessary. The floods cost the country ₦81 million in 2013 Okoruwa, (2014). The 2012 floods in Nigeria, which occurred between July and October of that year, were one of the most disastrous in the country's history. Kogi, Kwara, Edo, Cross Rivers, Rivers, Benue, Delta, and Bayelsa were among the States affected. Flooding has catastrophic effect on agriculture most especially to the arable crop farmers by damaging farmers' crops, decreasing yield of crops, reducing productivity and reducing the annual income of the farmers. Kwara state, namely the Edu LGA, is one of the worst-affected states by flooding. In the Edu L.G.A. of Kwara State, approximately 458 farms under the Central Bank of Nigeria (CBN) anchor borrowers scheme were flooded in 2017 Nigerian Tribune (2017) Due to the effect of flood on arable crop

farming, farmers have been obliged to explore ways to cope with flooding. As a result, certain coping mechanisms and adaptation strategies have been employed. Anugwara & Emakpe (2013) attested that flood disaster damaged over 1.9 million hectares of lands and reduced food production along flood plains. Also, the extent of farmlands annually affected by flood in Nigeria was estimated by Atu *et al.* (2018) to be 63.07%. The effect of flooding is devastating on the livelihood security of people as confirmed by Aluko *et al.* (2019) that flood risk disrupts rural developments resulting to losses of human, material, economic as well as livelihood of the people.

The cost of flooding on arable crop farming, which includes crop yield reduction, annual income realized from farm produce reduction, farm destruction, and soil depletion, justifies an investigation of the farmers' coping strategies for dealing with and coping with floods. More importantly considering the relationship between the Sustainable development goals (SDGs) and flooding such as in; Sustainable Development Goal (SDG) -1 (No Poverty) – This sustainable goal seeks to eliminate poverty by 2030. However, environmental hazards such as flooding exacerbate the already low standard of living in Nigeria making poverty rampant among people. When floods occur, poverty becomes even more entrenched. Also Goal 2 of the Sustainable Development Goals (SDGs) is to eliminate hunger (Zero Hunger). Flooding has a significant impact on farming in Nigeria Osabohien, *et al.* (2018). To reduce hunger in Nigeria, the close relationship between flooding and food security must be addressed by controlling and preventing the human drivers of flooding in Nigeria. In addition, goal 15 of the Sustainable Development Goals (SDGs) which is life on the land. Flood waters devastate land by stripping soils and eroding shorelines, destroying natural vegetative cover in their path Smith *et al.*, (2017). Its harmful effects endanger all forms of life, including plants and animals which reduces farm output.

Objectives of the Study

This study assessed the use of coping strategies against flood by the arable crop farmers in Edu L.G. Area, Specifically, the study

- describe the socio-economic characteristics of the arable crop farmers in Edu LGA, Kwara State,
- identify sources of information on coping strategies used for flooding;
- determine the level of use of coping strategies among respondents;
- examine the perceived effect of flooding on arable crop production; and
- identify the constraints to coping strategies used for flooding in the study area

Hypotheses of the study

$H0_1$: There is no significant relationship between socio-economic characteristics and the level of use of coping strategies.

$H0_2$: There is no significant relationship between sources of information and level of use of coping strategies.

$H0_3$: There is no significant relationship between the perceived effect of flooding and level of use of coping strategies.

Materials and methods

The Study Area

Edu Local Government Area of Kwara State the study area, is located between longitude 4°54'15" East and 50 31' 00" East of the Greenwich meridian and latitude 80 35' 38" North and 90 15' 00" North of the Equator, it covers an area of 2,542 km^2 Oriola & Chibuike (2016). Edu is one of the sixteen Local Government Areas in Kwara State with Lafiagi as headquarter. The Local Government Area has a population of 402,469 N.P.C. (2010). The study area has a mean annual rainfall and temperature of 300 mm and 29°C respectively. The Average Relative Humidity is about 78.6 % and this varies seasonally with the lowest reaching 69.99 %. The study area is characterized by the alternate dry and wet season Bello *et al.*, (2007).

Edu. L.G.A is dominated by Nupe speaking people, who lives close to river banks and engage in agriculture as the major economic activity. Fish farming and rice cultivation are the two major activities of the people in the study area Oriola & Chibuike (2016),

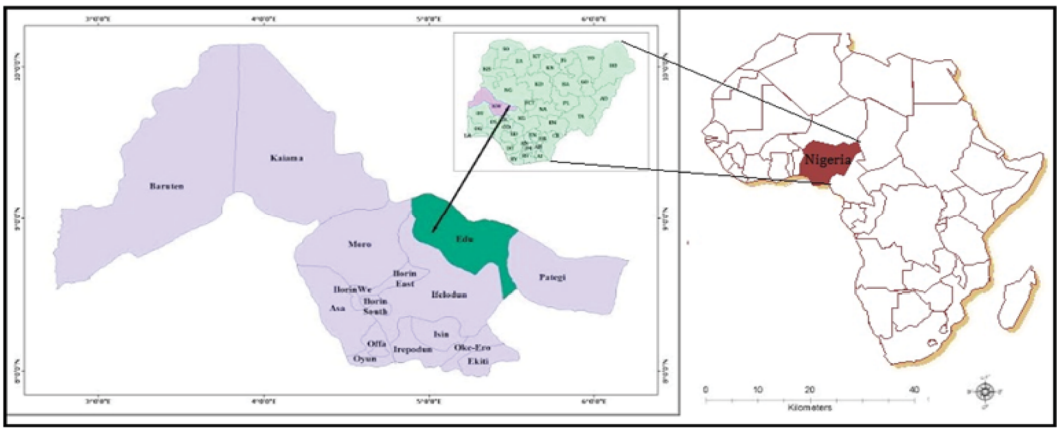


Fig. 1. Map of Kwara State Showing the Study Area, Edu Local Government

Sampling Procedure and Sample Size

The population for the study, comprised all arable crop farmers in Edu. LG.A. of Kwara State. The list of registered arable crop farmers in Edu, LGA with Kwara State Agricultural Development Program (KWADP) was used as sample frame. The list comprised 276 registered arable crop farmers, out of which 50% were randomly selected given a total sample size of 138.

Data Collection and Analytical Technique

An interview schedule was used to collect data from the respondents. Data collected were subjected to both descriptive and inferential statistical analysis. Descriptive statistics involving the use of frequency counts, percentages, mean and standard deviation. Inferential statistics used were Pearson's product Moment Correlation (PPMC) and Chi square analysis were used to test the hypotheses of the study.

The Pearson correlation coefficient (r) for the study was obtained as follows:

$$r = \frac{\sum XY - (\sum X)\left(\frac{\sum y}{N}\right)}{\sqrt{\left(\sum X^2 - \frac{(\sum X)^2}{N}\right) - \left(\sum Y^2 - \frac{(\sum Y)^2}{N}\right)}}$$

Where: X = Independent variables such as, Age, Household size, Years of schooling

X^2 = Square of score on independent variables

Y = Level of use of coping strategies

Y^2 = Square of score on dependent variables

XY = Product of X and Y

$\sum$ = summation of sores

N = Number of Raw sores

$\sqrt{}$ = Square root

Chi-square model is specified as follows:

$$x^2 = \sum \frac{(O-E)^2}{E}$$

This translates into:

O= (observed value – expected value)2

$\chi 2$ = sum of (i.e., across categories) (divided by) expected frequency

Measurement of Variables

Descriptive statistics such as frequency, percentage, mean and standard deviation were used to present the socio-economic characteristics of the respondents and sources of information of coping strategies. Level of use of coping strategies was measured on a three (3) point Likert type scale of Not used =1, Used often =2 and Used Very often =3. Scores were sum-up and converted to means for each of the respondents. The mean scores were adopted as a

measure of the respondents' level of use of coping strategies. The level of use of coping strategies was categorized using a benchmark of <2 for low, 2-3 for average, and >3 for high level of use. To measure perceived effect of flooding Various perceived effect statement were listed, and respondents were required to indicate their options of perceived effect of flooding on arable crop and the scale was graduated as on a 4-point Likert type scale of No effect =1, Low effect =2, Moderate Effect =3 and high Effect =4. Scores were aggregated and converted to means for each of the listed possible perceived effect. The mean scores were adopted for ranking of the perceived effect in order of effectiveness. Constraints faced by farmers in using the coping strategies were measured using a 3-point Likert-type scale. A list of possible constraints was drawn and respondents were required to rate their level of severity on a scale of one to three graduated as follows; Not severe =1, severe=2, Very severe=3. Scores were aggregated and converted to means for each of the listed possible constraints. The mean scores were adopted for ranking of the constraints in order of severity

Results and Discussion

Table1: Distribution of Respondents according to their Socio-economic Characteristics N=138

Variables	Frequency	Percentages	Mean	SD
Age (in years)				
≤ 30	18	13.0		
31-40	38	27.5	53.4	13.57
41-50	41	29.7		
>50	41	29.7		
Sex				
Female	20	14.5		
Male	118	85.5		
Marital status				
Married	124	89.9		
Otherwise	14	10.1		
Years of Formal Education				
0	16	11.5		
1-6	63	45.7	8.5	4.21
7-12	48	34.8		
Above 12	11	8.0		
Farm size(Hectares)				
≤ 1	50	36.2		
2-4	61	44.2	2.9	1.56
5-6	20	14.5		
> 6	7	5.1		
Farming Experience (Years)				
< 3	8	5.8		
4-6	24	17.4	15.5	5.11
> 6	106	76.8		
Extension Contact (Past 6 months)				
0	129	93.5	0.3	0.14
1	8	5.8		
2	1	0.7		

Source: Author`s field Survey, 2020.

The result in Table 1 shows that the mean age of the respondents was 53.4 years. The implication of this is that the farmers are advanced and mature enough to undertake the activities involved in coping strategies of flood. Also, 85.5% males and 14.5% of them were females. Similar result reported by Adepoju & Awodunmuyila (2008) who stated a high level of male involvement in farming because of the energy requirements in the cultivation. About 89.9% of the respondents were married, with 8.5 as mean years of formal education. This is in line with the a priori expectation that a well-educated farmer has the capacity to adopt more strategies to deal with variations in climatic factors. The mean years of farming experience is 15.5 this implies that the respondents had vast years of experience about farming which means farming was predominant in the study area and this could assist the farmers to practice coping strategies on flood because of their experience. This result is in line with Ofuoku, (2011) who argue that a well experienced farmer will have a good knowledge of climatic factors as they relate to their farming operations.

Result in Table 1 further shows that 0.33 was the mean of extension contact in the past 6 months this shows that extension agents rarely visited the farmers to educate them on flood disaster. This result is in consonance with Agbamu (2005), that there is a disproportional extension agent to farm family ratio in Nigeria.

Distribution of Respondents According to Sources of Information on Coping Strategies

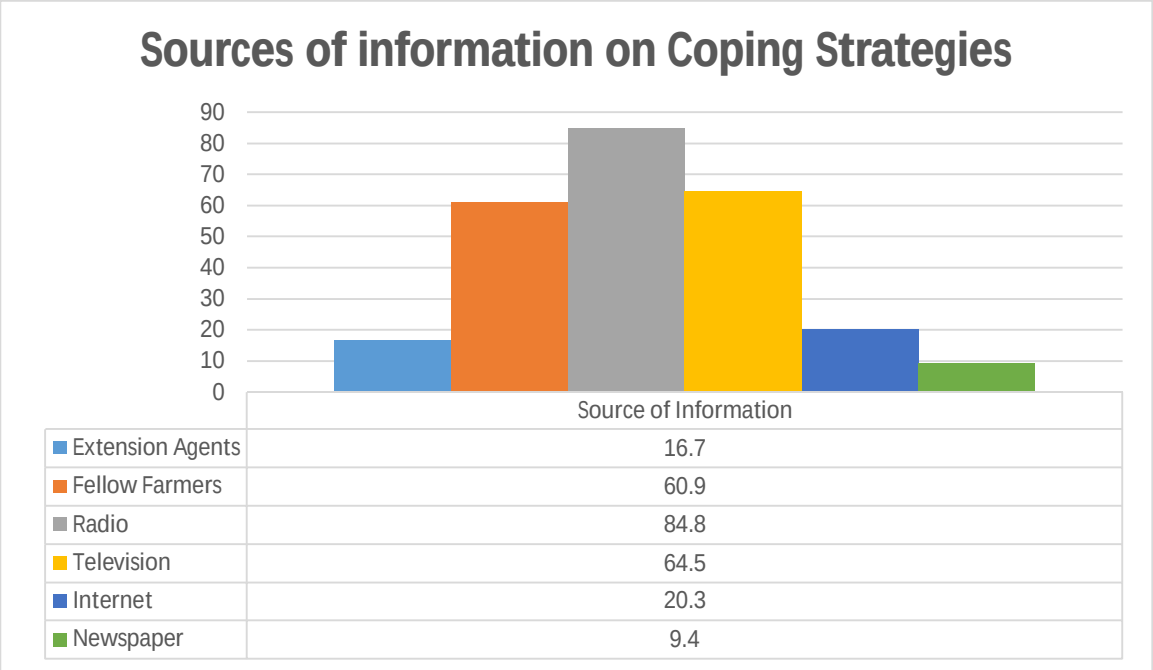


Figure 1: Sources of information on Coping Strategies
Source: Author`s Field Survey, 2020.

Figure 1 shows different sources by which the farmers get information on coping strategies. The result shows majority (84.8%) of the respondents got their information from radio which may be due to the versatile nature of radio and ability to reach and work in remote rural areas easily and at a low cost. This result contradicts the findings of Yohanna *et al.*, (2014) that farmers do not use radio as source of information on climate change related information but for other purpose. Other sources of information include Television with 64.5%, followed by information from fellow farmers with 60.9%, next to it is 29.3% with information from extension agents to be 16.7% and the least newspapers with 9.4%. This result implies that

respondents get information on coping strategies on flooding through different channels**.** This result agrees with Kayode *et al* (2021) that there is low level of information contact between farmers and extension workers in Kwara state.

Table 2: Distribution of Respondents According to use of Coping Strategies

Coping strategies	Not used F (%)	Used often F (%)	Used very often F (%)	MS	Rank
Filling bags with sand	6(4.3)	8(5.8)	124(89.9)	2.86	1st
Early planting of crops	0(0)	33(23.9)	105(76.1)	2.76	2nd
Land management Practicing e.g. Shifting cultivation/Terracing	6(4.3)	27(19.6)	105(76.1)	2.72	3rd
Upland farming	3(2.2)	43(31.2)	92(66.6)	2.64	4th
Planting of different types of crops	5(3.6)	39(28.3)	94(68.1)	2.64	4th
Change of crop varieties	13(9.4)	71(51.4)	54(39.1)	2.30	6th
Construction of wooden bridges	30(21.7)	80(58.0)	28(20.3)	1.99	7th
Agricultural insurance of farms	124(89.9)	11(8.0)	3(2.2)	1.12	8th

Source: Author's field Survey, 2020. *multiple responses. expected mean score =2

The result on Table 2 shows that filling of bags with sand was the most used coping strategy with a mean score of 2.86. Filling of bags with sand is an indigenous and ancient means and it is mostly used because of the availability of getting sand and has proved to be effective over time. This corroborate the findings of Obinna *et al.,* (2018) that sand filling is one of the coping mechanism of farming household on flood. Next to it was early planting of crops with a mean score of 2.76, early planting is practiced by most experienced farmers to avoid flooding which mostly occur due to excessive rainfall during the peak rainfall months which can lead to large runoff or overflow of water bodies. This is in line with findings of Ajibade *et al.,* (2019) that rice farmers adopted a change of rice seedling to a variety which matured earlier than the local rice and it may be said that this was to ensure early harvest of rice crops before the peak of rainfall when floods are usually experienced. Followed by the use of land management practices with a mean score of 2.72. The least used coping strategy was agricultural insurance of farms (with a low mean score of 1.1) which may be due to lack of information or misinformation about agricultural insurance of farms. This concurs with the result of Ouikotan (2017) who reported that in West Africa cities, insurance companies have not played an important role in flood risk management.

Results in Table 3 shows that flooding leads to loss of arable crops ranked first with a mean score of 3.8. next to it is reduces the income of the farmers with mean score of 3.7, This indicates that when a flood destroys arable crops, it reduces the farmer's income when produce is sold which has a significant impact on the availability and profitability of arable crops. Followed by reduction in harvest with a mean score of 3.2. This is supported by Rock *et al.* (2016) that the effects of flooding are linked to poverty, lack of knowledge, low livelihood sources, lack of insurance, weak institutions and problems with emergency response and early warning preparation.

Distribution of Respondents by Perceived Effect of Flooding on Arable Crops

Table 3: Perceived Effect of Flooding on Arable Crops by farmers in Edu L.G. Area of Kwara State, Nigeria

Effect Statement	No Effect	Low effect	Moderate Effect	High Effect	MS	Rank
Leads to loss of Arable crops	2(1.4)	1(0.7)	14(10.1)	121(87.7)	3.84	1st
Reduces income of Arable crop farmers	2(1.4)	2(1.4)	30(21.7)	104(75.4)	3.71	2nd
Reduces crop yield	3(2.2)	18(13.0)	63(45.7)	54(39.1)	3.22	3rd
Reduces the standard of living of affected farmers	4(2.9)	10(7.2)	79(57.2)	45(32.6)	3.20	4th
Increases famine and hunger in the community	11(8.0)	20(14.5)	74(53.6)	33(23.9)	2.93	5th
Exposes the crops to pest and diseases	14(10.1)	25(18.1)	70(50.7)	29(21.0)	2.83	6th
Increases risk of loss of farm totally	14(10.1)	26(18.8)	67(48.6)	31(22.5)	2.83	7th
Loss of livelihood	20(14.5)	39(28.3)	51(37.0)	28(20.3)	2.63	8th
Makes the land uncultivable for a period of time(water logged)	27(19.6)	32(23.2)	46(33.3)	33(23.9)	2.62	9th

Source: Author`s field Survey, 2020.

Table 4: Distribution of respondents based on the constraints to the use of coping strategies by farmers in Edu LG Area

Constraints	Not Severe F (%)	Severe F (%)	Very severe F (%)	MS	Rank
Untimely government intervention on flooding	3(2.2)	8(5.8)	127(92.0)	2.90	1st
Lack of access to loans from banks to boost production	4(2.9)	18(13.0)	116(84.1)	2.81	2nd
Technical know how of coping strategies	2(1.4)	27(19.6)	109(79.0)	2.78	3rd
Insufficient capital	7(5.1)	27(19.6)	104(75.3)	2.70	4th
Inadequate information from extension agents about flood	6(4.3)	32(23.2)	100(72.5)	2.68	5th
Inadequate knowledge on improved methods of coping with flooding	4(2.9)	36(26.1)	98(71.0)	2.68	5th
Poor communication network	2(1.4)	43(31.2)	93(67.4)	2.66	7th
Inadequate supply of labour	37(26.8)	63(45.7)	38(27.5)	2.01	8th

Source: Author`s field Survey, 2020.

Result in Table 4 shows the severity of the constraints faced by farmers in using the coping strategies. The most severe constraint faced by the farmers was untimely government intervention with mean score of 2.9 and ranked 1st. This may be due to neglect of agricultural sector and lack of timely intervention by the government and bad governance. Lack of access to loans was the 2nd most severe constraint with a mean of 2.8. Most financial institutions are not always willing to finance agriculture. Also, technical know- how is another challenge the

farmers are facing with a, mean score of 2.78. Lastly inadequate supply of labour was considered to be the least severe constraint which has influence on the use of coping strategies, this may be due to the fact that labour is readily available in the rural areas but there is no sufficient fund to acquire enough labour and work force to work on the farm. This result implies that in spite of the high level of use of coping strategies, the farmers were constrained by the above factors. This agrees with the findings of Owolabi (2013) that the most intense constraint of flood coping strategy was lack of assistance from government.

Hypotheses Testing

Table 5: Result of Chi-square showing Relationship between Sources of information and Level of Use of Coping Strategies

Variable	X^2 (chi-square)	p-value	Decision
Radio	48.908	0.000	Significant
Television	7.634	0.664	Not Significant
Extension Agent	15.061	0.989	Not Significant
Fellow Farmers	141.976	0.000	Significant
Internet	12.266	0.268	Not Significant
Newspaper	13.394	0.202	Not Significant

Source: Author`s field Survey, 2020

Result in Table 5 shows Chi square (x^2) indicating the relationship between the use of coping strategies and source of information. Radio (x^2=48.908, p-value=0.000) and Fellow farmers (x^2=141.976; p-value=0.000) had a significant relationship with the source of information, this shows how significant radio and fellow farmers were in disseminating information about coping strategies to other farmers in the study area.

Table 6: Result of PPMC showing Relationship between Effect of Flooding and Level of Use of Coping Strategies

	Effect of Flooding	Use of Coping Strategies
Effect of Flooding	1	0.203***
Use of Coping Strategies	0.203***	1

Source: Field survey, 2020.
correlation is significant at .05 level (2-tailed)

Table 6 shows the result of correlation analysis between the use of flooding coping strategies and the effect on flooding. The result reveals that the use of coping strategies has a significant relationship with the effect on flooding on arable crop farming in the study area. When farmers use coping strategies it gives them an edge on flood disasters and flood destroying their farms totally. This is congruent with apriori expectation. Ofuoku, (2011) argue that a well experienced farmer will have a good knowledge of climatic factors as they relate to their farming operations.

Table 7: Relationship between selected Socio-economic Characteristics and use of Flood Coping Strategies

Variables		Storing of Filling of bags with sands	Practicing Shifting cultivation	Change of crop varieties	Early planting of crops	Upland farming	Planting of different types crops	Agricultural insurance of farms	Terracing of farms
Age	Correlation Coefficient	**-0.467***	-0.087	-0.047	-0.015	**0.177***	-0.010	-0.087	**0.196***
	Sig. (2-tailed)	**0.033**	0.310	0.583	0.863	**0.038**	0.909	0.313	**0.021**
Years of Formal Education	Correlation Coefficient	0.158	0.104	**0.345***	**0.555***	0.129	-0.030	-0.008	-0.033
	Sig. (2-tailed)	0.064	0.224	**0.035**	**0.019**	0.132	0.726	0.925	0.704
Farm Size	Correlation Coefficient	0.147	**0.388***	0.010	0.065	0.130	**0.502***	-0.092	0.022
	Sig. (2-tailed)	0.085	**0.031**	0.905	0.451	0.129	**0.008**	0.283	0.795
Farm Experience	Correlation Coefficient	-0.013	-0.072	-0.035	0.032	**0.191***	0.038	-0.115	0.099
	Sig. (2-tailed)	0.882	0.404	0.686	0.705	**0.025**	0.659	0.181	0.249
Household size	Correlation Coefficient	0.083	**0.479***	0.153	-0.091	0.108	-0.127	-0.076	0.028
	Sig. (2-tailed)	0.336	**0.016**	0.073	0.287	0.207	0.137	0.378	0.743
Extension Contact	Correlation Coefficient	0.089	0.017	0.056	**0.345***	0.005	0.000	-0.089	0.053
	Sig. (2-tailed)	0.301	0.840	0.516	**0.035**	0.950	1.000	0.301	0.535

Source: Author`s field survey, 2020.

Correlation is significant at the .05 level (2-tailed)

Table 7 shows correlation results on relationship between some selected socio-economic characteristics and flood coping strategies. The result shows that age had significant relationship with the filling of bags with sands, this is because the use of sand bag to control flood is simple but effective the more the farmers advance in age, the more they use strategies that reduce drudgery and sand is easily available. Years of formal education was significant to change in crop varieties and early planting of crops. Educated farmers tend to have good knowledge about new and improved varieties of crops which are good for planting and they know the advantage of early planting of crops to avoid the effect of flooding which can occur when rain is fully established. This finding is similar to that reported by Nwaiwu *et al.*, 2012. Farm size had a significant relationship with practice of shifting cultivation and planting of different types of crops. The size of the farm determines whether a farmer can plant different types of crops and practice shifting cultivation w This means that when a flood destroys arable crops, it reduces the farmer's income, which has a significant impact on the availability and profitability of arable crops when flooding

occurs. Farming experience was significant to upland farming. Household size was also significant to practicing of shifting cultivation. This is in line with apriori expectation as a larger household size is expected to translate into more labour which may be very important when the farmer is taking decision to go for shifting cultivation rather than stay within the flood plains. Extension contact had significant relationship with early planting of crops. When farmers are visited by the extension agents even when flooding wants to occur and the farmers are informed early, they can strategize and practice planting of crops and harvest early before the flooding affect their farms. This result is in corroboration with that of Olayemi, (2012) which stated that for every 1-unit increase in age, years of formal education, farming experience and farm size of farmers there is probability of increase in coping strategies employed.

Conclusion and Recommendations

Based on the findings of the study, it was concluded that though the level of use of coping strategies for flooding was high among respondents in the study area, the perceived effect of flooding is also high. The study however shows that respondents were constrained with factors such as untimely government intervention on disaster such as flooding, and lack of access to fund/ loan from banks.

It is therefore recommended

- Policy makers, Ministry of Agriculture, ministry of environment and other relevant agencies should focus on designing and implementation of strategies which farmers can use to cope with flooding
- Also improved technologies should be made available to replace the indigenous coping strategies in order to reduce the effect of flood on arable crop farming.
- The agricultural extension agency should increase the frequency of extension visits and educate farmers on the use of adequate coping strategies on flooding.

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