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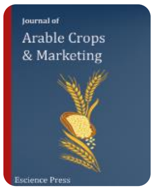

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Role of Media in Addressing the Challenges of Climate Change in the Rice-Wheat Cropping Zone in the Punjab Province, Pakistan

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ABSTRACT

The objective of this research was to analyze the role of media information in addressing the challenges of climate change in the rice-wheat cropping zone in the Punjab province, Pakistan. The study specifically analyzed the relationship between information sources and the impact of climate change. The study was conducted in the central region of the Punjab province, Pakistan. Data collection was done by multi-stage sampling from the rice-wheat crop zone of Punjab. In the 1st stage, three districts i.e., Narowal, Gujranwala, and Sialkot were selected randomly from the central Punjab region. One tehsil was randomly selected at the 2nd stage from each district. Six union councils (UCs) at the 3rd stage were picked at random; two from each tehsil. In the 4th stage, four villages from each UC were selected by systematic random sampling. At the 5th stage, 17 farmers were selected randomly from each village (480 farmers in total). Data were collected by the face-to-face administration of a structured questionnaire and were analysed by SPSS version 21. The outcome of the present investigation has revealed that the fellow farmers ($\bar{x}$=2.24 ± 0.54), private companies (dealers of fertilizer & pesticides) ($\bar{x}$ =1.70 ± 0.74), burji /wall chalking ($\bar{x}$ =1.53±0.66), TV ($\bar{x}$=1.47±0.72), field assistant/Agri. officer of the dept. of Agriculture ($\bar{x}$=1.43 ± 0.52) and mobile phone ($\bar{x}$=1.42 ± 0.64) was ranked 1st to 6th, respectively, as sources of information concerning climate change. Moreover, the results of the logistic regression model showed that the sources of information, i.e., TV, mobile, Zarai digest, fellow farmers, and private companies, had a positive and significant role ($P<0.05$) in adopting the coping strategies to cope with the climate changes while radio had a non-significant influence. The study concludes that credible and need-based information sources are the core priority of climate-affected areas. It is a dire need to address these challenges through rapid implementation of cost-effective resources to minimize the loss of climate change.

INTRODUCTION

Climate change has become a serious threat to the agriculture sector around the world. Climatic changes are impacting adversely almost the entire world and pose different challenges including food insecurity and likely reduction in the production of major crops (Ajani, *et al.*, 2021; Syed, *et al.*, 2022). The IPCC reports have recently illustrated that the impacts of climate change can already be observed on natural as well as human systems (IPCC, 2019; van der Geest and Warner 2020). The obvious reasons for this ongoing climate change include changing precipitation patterns, rising temperatures, and increased frequency of extreme weather events (Hartmann *et al.*, 2013; Zommers *et al.*, 2016). Furthermore, the increasing sea level and temperature rise caused the fast melting of the glaciers, which eventually lead to devastating flooding and sometimes the occurrence of drought. In either case, it has adverse impacts on the socioeconomic position of the people living on the planet (Field, 2014; Kulp and Strauss, 2019).

It was reported by Eckstein *et al*. (2020) that Pakistan has been ranked the 5th most-affected country around the globe due to extreme weather events between 1999 and 2018. The economy of Pakistan as reported by Rehman *et al*. (2015) heavily relies on the agriculture sector. The disruptions in water availability and any changes in temperatures (which generally affect the patterns of monsoon) can wreak havoc on the livelihood of millions of people (Abubakar 2020).

Wheat, Rice, Maize, Cotton, and Sugarcane are the most important crops of Pakistan. Rice-Wheat (R-W), Mixed-Wheat (M-W), and Cotton-Wheat (C-W) are prominent cropping systems in Punjab, a province that is regarded as the bread and basket in terms of agriculture for the country. The rice-wheat cropping system is well adopted by small, medium, and large farmers especially in Gujranwala, Sheikhupura, Nankana, and Hafizabad Districts (Ahmad *et al*., 2015).

In the rice-wheat cropping system, 72% of wheat is grown after harvesting the rice. The rice-wheat cropping scheme has implications because the rice needs puddled compacted soil to retain water during sowing whereas wheat is sown in well-drained soil that allows infiltration of the root system. Another problem in the rice-wheat cropping system is the introduction of late rice varieties that give little time for wheat sowing which ultimately lowers wheat production. The risk of late sowing of rice and wheat can be recovered if planting techniques of rice and wheat are improved (Ahmad and Imran, 2017).

Dynamic forecasting of weather and efficient systems for alarming weather severity in advance is likely to be helpful for the farmers to make appropriate decisions to save crops and related stocks from climatic hazards. Farmers need timely and accurate weather information for planning cropping patterns, selection of cultivars, land preparation, planting and sowing dates, application of irrigation, fertilizers and pesticides, and harvesting/ post-harvest decisions (Hussain, 2016).

The role of information technology especially that of ICT helpful for enhancing food security and likely for supporting the livelihoods of rural areas. The same has been recommended by the “world summit on the information society (WSIS)” from 2003 to 2005. (ITU, 2012). Building upon WSIS and the UN sustainable development goals, more recently the global ICT agenda "Connect 2020" commits to ensuring among all the vital factors; there is a key role of ICTs for assisting to enhance the socio-economic status of farmers so that sustainable development can be ensured (ITU, 2014).

The need for timely weather information/ early warning has become more important in the context of climate change and variability/ extreme events. Timely weather information could help farmers to minimize losses and to turn the climate change impacts into positive opportunities enhancing farm productivity (Chhogyel and Kumar, 2018; Malhi, *et al*., 2020). In the light above discussion, the present study focused on the role of information media in coping with the challenges regarding climate changes in the rice-wheat cropping zone of Punjab, Pakistan.

The prime objective of this current research study was to examine the role of information of media in addressing the challenges of climate change in the rice-wheat cropping zone in the Punjab province of Pakistan. The present study has fragmentized into the following sections. The first section takes into consideration the Introduction, the Materials and Methods are the points of discussion in the second section, the third section has been devoted to the discussion of the results of the present investigation, and finally, the study has concluded along with the recommendations in the fourth section.

MATERIALS AND METHODS

Description of Study Area

The Punjab province has been geographically divided into three regions i.e., upper, central, and southern, respectively. The upper part of the central region is known as the rice belt. Narowal, Gujranwala, and Sialkot are the major rice cultivating districts (famous for aromatic Basmati rice). Lahore, Faisalabad, and Sialkot districts are industrialized and attract a significant number of skilled, semi-skilled, and non-skilled labor force from the agricultural and non-industrialized districts of not only central Punjab but also from the southern and upper Punjab. The farmers of the upper part of central Punjab send their surplus labor to Europe and the Middle Eastern Countries as migrant workers.

The farmers usually cultivate rice, wheat, sugarcane, and fodder crops. When we move from the lower to the upper region of central Punjab, significant variations concerning climate, language, and food patterns can be observed. The farming community of the lower part of central Punjab usually cultivates wheat, maize, and sugarcane. Wheat is a stable food while people consume rice but in little quantities. As far as the upper part of central Punjab is concerned, the farmers cultivate rice, wheat, fodder crops, and vegetables. They usually consume rice in large quantities along with wheat. There is a joint family system particularly in the rural areas of the entire central Punjab while the nuclear family system is trending in the urban areas due to higher population density.

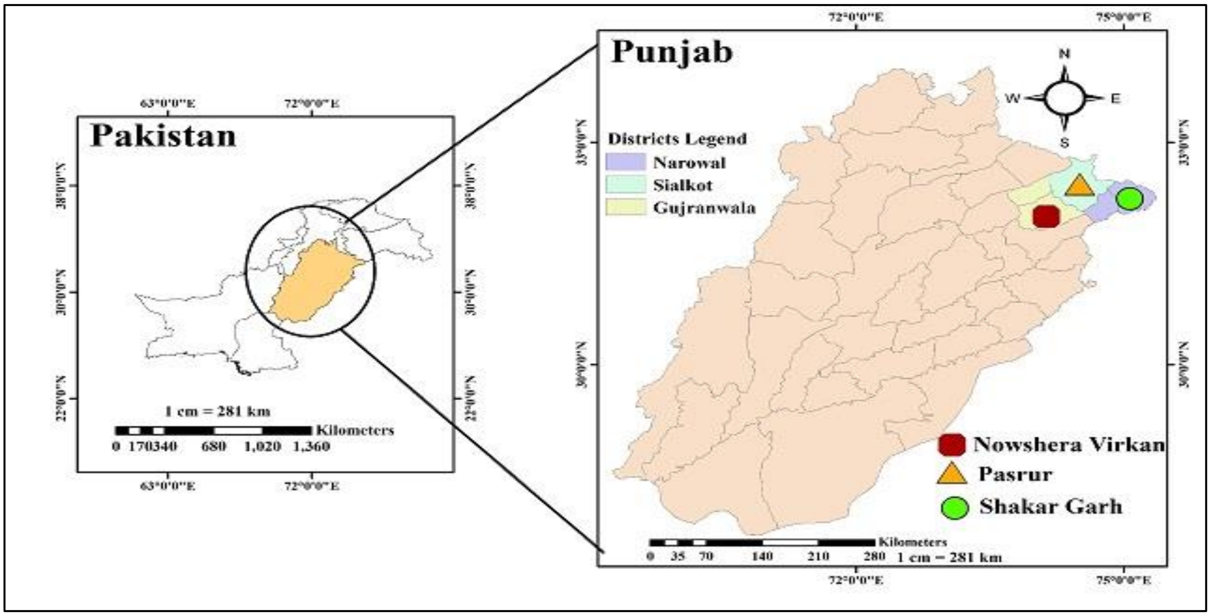

Figure 1. Geographical Location of the Study Area.

Research Design

The framework of research methods and techniques chosen by a researcher has usually termed the research design of the study. It is a general plan to answer the formulated research questions (Creswell and Creswell, 2018). It was a quantitative (cross-sectional) research study that was designed to answer the formulated research questions.

The Population of the Study

The population of the present investigation consists of all the wheat and rice growers of the districts of Narowal, Gujranwala, and Sialkot, respectively.

Sampling Technique

A multi-stage sampling technique was applied for sample selection. In the first stage, three districts, i.e., Narowal, Gujranwala, and Sialkot were selected randomly from the rice-wheat cropping zone of the Punjab province. In the second stage, three tehsils (one tehsil from each district) such as Shakargarh (Narowal district), Nowshera Virkan (Gujranwala district), and Pasroor (Sialkot district) were selected randomly. At the third stage, six Union Councils, 2 from each selected tehsil i.e., UC-90 & UC-91 from Tehsil Sakargarh, UC-78 & UC-81 from Tehsil Noshara Virkan, and UC-19 & UC-21 from Tehsil Pasroor were selected by systematic random sampling. In the fourth stage, 24 villages (four from each UC) were selected randomly and at the final stage, a sample size of 408 farmers (17 farmers from each village) was selected by using a systematic random sampling technique.

Data collection and analysis technique

A field survey for six months was conducted to collect the data from the study area. A structured questionnaire (interview schedule) containing closed-ended questions was administered by the researchers to collect primary data from the rice-wheat growers. The interview schedule contained information about the respondents concerning their socio-economic characteristics, sources of information concerning climate change, and the extent of use of the sources of information concerning climate change were mostly included.

Statistical Analysis

Descriptive statistics and the Logistic Regression Model were applied for data analysis. The collected data was managed in an excel sheet and were analyzed with the help of Statistical Package for Social Sciences (SPSS).

RESULTS AND DISCUSSION

Socioeconomic characteristics of the respondents

The socioeconomic characteristics of the respondents are useful in making the reader understand the particular societal framework of the sampled population (Gobena, 2018). The variables such as age, gender, income, education, family size, landholding, etc. help us comprehend the place and status of the respondent in the broader societal framework (Kilic *et al*. 2018). The derailed description is given as under:

Age of respondents

The mean age of the farmers under investigation was 47.64 years. It means that the majority of the study farmers belonged to the middle age group. They are likely to be in the era of information technology and are in good standing to follow better agricultural practices to cope with climate changes (Ahmad, *et al*. 2021).

Education

To bring a desirable change in the behavior of the individuals, education is the most vital and crucial tool (Khan, 2005). The mean years of schooling was 5. It means the majority of the farmers were Primary (equivalent to the 5th standard as per the education system of Pakistan) passed. It has already been reported by Akhtar (2011) and Arshad (2009) that illiterate farmers were poorly performing as compared to those who have attained some level of education.

Income

The information on aggregative income per month of respondents was requested. Table 1 explains that the minimum income of the farmers was Rs. 12,000 and the maximum income was Rs. 50,000,0. The mean income of the farmers was Rs. 37,514.71.

Family size

The contents of Table 1 have revealed that the minimum family size of the farmers was 3 members, and the maximum was 32 members. It was further noted that the majority of the respondents were living in the joint family system in rural areas to compensate for the labor shortage. The mean family size of the farmers was 8.20 ± 3.34 members.

Table 1. Socioeconomic Characteristics of the Farmers (N= 480).

Sr #	Variable	Min.	Max.	Mean	S.D.
1	Age (Years)	21	80	47.64	12.89
2	Education (Categories)	0	16	5.21	4.37
3	Income (Pkr.)	12,000	50,000,0	37,514.71	26,565.57
4	Family size (No.)	3	32	8.20	3.84
5	Farming experience (Years)	1	60	27.88	12.37
6	Size of landholding (Acres)	1.00	70.00	8.79	7.09

Source: Survey Data

Farming experience

Table 1 revealed that the minimum farming experience of the farmers was 1 year, and the maximum was 60 years. The mean experience was 27.88 years. This can be deducted from the results that farmers had enough experience of crop and livestock farming.

Size of landholdings

The variable landholding size" was conceptualized as the number of acres possessed by the farmers. The survey revealed that the minimum land holding was 1 acre and the maximum was 70 acres. The mean size of land holding was 8.79 ± 7.09 acres.

Source of Information Concerning Climate Change

To investigate the information sources concerning climate change, the respondents were asked to report regarding the media and other channels i.e., electronic media, print media, and other miscellaneous sources such as Govt. of Punjab's helpline, Seminars/ Workshops/ Symposium/ Farmer Festivals/Conferences, Fellow Farmers, Private Company Dealer (fertilizer & pesticides), Field Assistant/Agri. Officer of the Dept. of Agriculture, NGO Worker, and Burjij/Wall Chalking. The results in this regard are given in Table 2. Sources of information were categorized as electronic, print and others.

Table 2. Percentage distribution of use of sources of information concerning climate change (N = 408).

	Information sources	Never		Sometimes		Often		Mean
		f	%	f	%	f	%	
Electronic media	TV	270	66.2	83	20.3	55	13.5	1.47
	Radio	374	91.7	21	5.1	13	3.2	1.12
	Internet	359	88.0	30	7.4	19	4.7	1.17
	Mobile Phone	274	67.2	98	24.0	36	8.8	1.42
Print media	Newspapers	345	84.6	53	13.0	10	2.5	1.18
	Zari Digest/ Zirat Nama	331	81.1	61	15.0	16	3.9	1.23
	Agri. Pamphlet	364	89.2	38	9.3	6	1.5	1.12
	Agri. Leaflet	347	85.0	42	10.3	19	4.7	1.20
Other sources of information	Govt. of Punjab's helpline	305	74.8	83	20.3	20	4.9	1.30
	Seminars/ Workshops/ Symposium/ Farmer Festivals /Conferences	377	92.4	20	4.9	11	2.7	1.10
	Fellow Farmers	22	5.4	265	65.0	121	29.7	2.24
	Private Company Dealer (fertilizer & pesticides)	186	45.6	159	39.0	63	15.4	1.70
	Field Assistant/Agri. Officer of the Deptt. of Agriculture	262	64.2	116	28.4	30	7.4	1.43
	NGO Worker	375	91.9	31	7.6	2	0.5	1.09
	Burjij/Wall Chalking	232	56.9	137	33.6	39	9.6	1.53

Source: Survey Data

Table 2 illustrates the frequency of the use of the sources of information concerning climate change by the respondents.

Electronic Media: It was reported by 66.2% of the farmers that they never watched T.V. to keep themselves aware of climate change. It was reported by 91.7% of the farmers that they never used Radio to keep themselves aware of the changing climate. It was reported by 88.0% of the Rice-Wheat growers that they never used the Internet to keep themselves aware of the changing climate. A vast majority of the farmers i.e., 67.2% reported that they never used mobile phones to keep themselves aware of the changing climate. The findings of the study revealed that a significant majority were not using electronic media to keep themselves aware of the trends of climate change in the study area. Data revealed that a small portion of the sampled population was "Sometimes" and "often" using electronic media to keep themselves aware of the patterns of climate change in the Rice-Wheat cropping zone.

Print Media: The respondents i.e., 84.6% reported that they never, 13.0% told that they sometimes, and 2.5% informed that they often utilized Newspapers to keep themselves aware of the changing climate. Of the farmers i.e., 81.1% reported that they never, 15.0% told that they sometimes, and 3.9% reported that they often utilized Zarai Digest to keep themselves aware of the changing climate. The respondents i.e., 89.2% reported that they never, 9.3% informed that they sometimes, and 1.5% of the farmers informed that they often utilized Agri. Pamphlets to keep themselves aware of the changing climate. The respondents i.e., 85.0% reported that they never, 10.3% told that they sometimes, and 4.7% of the farmers reported that they often utilized Agri. Leaflets to keep themselves aware of the changing climate. The findings of the study revealed that a significant majority were not using Print media to keep themselves aware of the trends of climate change in the study area. Data revealed that a small portion of the sampled population was "Sometimes" and "often" using print media to keep themselves aware of the patterns of climate change in the Rice-Wheat cropping zone.

Other Sources of Information: The respondents i.e., 74.8% reported that they never, 20.3% informed that they sometimes, and 4.9% reported that they often utilized Govt. Punjab helpline to keep themselves aware of the changing climate. Out of the sampled population, 92.4% of the respondents reported that they never, 4.9% reported that they sometimes, and 2.7% reported that they often utilized Seminars/ Workshops/ Symposiums/ Festivals/ Conferences to keep themselves aware of the changing climate. Of the respondents i.e., 5.4% reported that they never, 65.0% told that they sometimes, and 29.7% reported that they often consulted their fellow farmers to keep themselves aware of the changing climate. The respondents i.e., 45.6% reported that they never, 39.0% told that they sometimes, and 15.4% informed that they often consulted Private Company Dealer (fertilizer & pesticides) to keep themselves aware of the changing climate. The respondents i.e., 64.2% reported that they never, 28.4% informed that they sometimes, and 7.4% reported that they often consulted the Field Assistants and sometimes the Agriculture Officer who are deputed by the Agriculture Department to keep themselves aware of the changing climate. Of the respondents i.e., 57% reported that they never, 33.6% told that they sometimes, and 9.6% reported that they often consulted Burjij/Wall Chalking to keep themselves aware of the changing climate. The above findings also indicated that the fellow farmers (X=2.24), private company dealers (X =1.70), and Burjij/Wall Chalking (X=1.53) were the major useful sources of information concerning climate change. Khan *et al*. (2012) presented similar results in their research study, and they found that TV and mobile phones were the major sources of information utilized by the farming community. Based on the overall results, it can be concluded that the farmers were mostly relying on the traditional methods for information to keep themselves aware of climate change.

Table 3. Extent of the use of the sources of information concerning climate change (N = 408).

Information sources		Mean	S.D.	Rank
Electronic media	TV	1.47	0.72	4
	Radio	1.12	0.20	12
	Internet	1.17	0.38	11
	Mobile Phone	1.42	0.64	6
Print media	Newspapers	1.18	0.44	10
	Zari Digest/Zirat Nama	1.23	0.50	8
	Agri. Pamphlet	1.12	0.37	13
	Agri. Leaflet	1.20	0.50	9
Other sources of information	Govt. of Punjab's helpline	1.30	0.55	7
	Seminars/ Workshops/ Symposium/ Farmer Festivals /Conferences	1.10	0.23	14
	Fellow Farmers	2.24	0.54	1
	Private Company Dealer (fertilizer & pesticides)	1.70	0.74	2
	Field Assistant/Agri. Officer of the Deptt. of Agriculture	1.43	0.52	5
	NGO Worker	1.09	0.29	15
	Burjij/Wall Chalking	1.53	0.66	3

Source: Survey Data

The extent of the Use of the Sources of Information Concerning Climate Change

Table 3 shows that fellow farmers (X=2.24±54), Private Company Dealer (fertilizer & pesticides) (X=1.70 ±0.74), Burjij/Wall Chalking (X=1.53± 0.66), TV (X=1.47 ± 0.72), Field Assistant/Agri. Officer of the Department of Agriculture (X=1.43±.52) and Mobile Phone (¯X=1.42±0.64) were ranked 1st to 6th, respectively as sources of information concerning climate change. Whereas Govt. of Punjab's helpline (X=1.30±0.55), Zari Digest/Zirat Nama (X=1.23±0.50), Agri. Leaflet (X=1.20 ±0.50), Newspapers (X=1.18 ± 0.44), Internet (X=1.17 ± 0.38), Agri. Pamphlet (X=1.12±0.37), Radio ¯X=1.12±0.20), Seminars/ Workshops/ Symposium/ Farmer Festivals /Conferences (X=1.10 ± 0.23) and NGO workers (X=1.09±0.29) were ranked 7th to 15th, respectively, based on the use of the sources of information concerning climate change. Rapten (2001); Shamsi (2006) and indicated that the TV, Radio a source of infotainment as well as disseminate knowledge about the latest agricultural practices. Choi (2009) has pointed out that mobile phones are being used for similar purposes just to disseminate knowledge to the farming community in case of emergency of any kind via text messages and WhatsApp videos and calls. The private pesticides and insecticides companies are approaching the farmers and the dealers to convince them about the affectivity of a certain commodity. The agricultural extension department is playing a vital role in this regard. Akhtar (2011) has also pointed out that disseminating knowledge about the latest innovations in the agricultural sector is the number one agency. The respondents were asked about the impact of climate change on crop productivity. Their responses are presented in Table 4.

Impact of information sources in meeting the challenges regarding climate change

The impact of the study variables on the coping strategies for climate change has been studied by using the logit model. The value of log-likelihood (-2LL) is 281.16 indicates that the effect of independent variables through the purposed model is significant. The value of Cox and Snell R2 i.e., 0.493, indicates that 49% of the total variation is explained by the independent variables in the chosen model and 51% by the other variables and/or by chance. The value of Nagelkerke R2 i.e., 0.661, indicates that 66% of the total variation is explained by the independent variables in the chosen model and 34% by the other variables and/or by chance. Both measures are technically called pseudo R2 and their value could hardly be tested through inferential approaches (Menard, 2000). Resultantly, it could not be considered a good measure of goodness of fit for the purposed model (Hosmer and Lemeshow, 2000).

The logistic regression model has been applied to study the impact of conducted research variables on coping strategies for weather variations. The log-likelihood value, abbreviated as -2LL, is 281.16 tells that there is a significant effect of explanatory variables; therefore, model estimation is appropriate. Further, two additional statistics Cox-and-Snell R2 and Negelkerke R^2 have values respectively 0.493 and 0.661. The first statistic indicates that 49% of total variation has been explained by explanatory variables whereas the second statistic tells that 66% of total variation has been explained by the independent variables. There has been lesser proportional by other variables, which have not been considered in the purposed model.

Table 4. Logistic regression Model for two variables.

Variables	B	Wald	Sig.	Exp(B)
TV	4.501	31.902	0.000**	0.90
Radio	-0.162	.201	0.654NS	1.17
Mobile	1.525	12.517	0.000**	0.218
Zari Digest	4.195	41.373	0.000**	0.015
Fellow farmers	2.469	11.358	0.001**	0.81
Private Company	2.870	37.677	0.000**	0.64
Constant	-8.561	35.46	0.000**	0.000

Dependent variable: Adoption of coping strategies. ** = significant at < 1%; NS = non-significant

TV

The P-value (0.00**) indicates that there is a highly significant relationship between farmers' level of TV watching with the adoption of coping strategies to cope with climate changes in the study area. Television is among the leading gadgets of technology that has been effectively used for disseminating information among people. In the present study, it was found that there has been more adoption of coping strategies toward climate change by those respondents who used to watch TV.

Radio

Radio has been used for a long time as the main source of delivering information, especially in rural areas. It would be interesting to note that radio listening tends to decrease towards adopting the coping practices towards climate changes in the study area by the farmers. The odds of listening ratio are 1.17 indicates that the odds of adopting the coping strategies by listening to the radio are likely to decrease as compared to those who are not listening to the radio for considering the adoption of coping strategies towards climate changes in the study area.

Mobile: The use of mobile phones has been increasing and mostly used by farmers towards opting the coping strategies for climate change. The odd value of 0.218 indicates that the increase of one unit of mobile usage likely to increase more chances of significantly using mobile for adopting the coping strategies by the farmers in the study area.

Zarai Digest

Print media also has a significant role in raising the awareness of farmers in the study area. A digest named "Zarai digest" has been considered by farmers. The odds of reading the Zarai digest are 0.015, which indicates that there are more chances of adopting coping strategies by reading the digits towards climate changes in the study area.

Fellow Farmers

An increase in fellow farmers contributes to the adoption of coping strategies to cope with climate changes of selected farmers. The odds ratio for the explanatory variable fellow farmers is 11.81; explained that each one-unit increase in the fellow farmers will likely increase 11.81 times chances for the adoption of coping strategies to cope with climate changes was improved. The P-value indicates that there is a highly significant relation between fellow farmers with the adoption of coping strategies to cope with climate changes in the study area.

Oral communication also plays an important role in communicating coping strategies. The odds ratio for consulting fellow farmers is 11.81 and it explains that there is a highly significant role in discussing with fellow farmers to adopt the coping strategies towards climate change.

Private Companies

Increase in private companies contributes to the adoption of coping strategies to cope with climate changes of selected farmers. The odds ratio for the explanatory variable private companies is 17.64; explained that each one-unit increase in the private companies will likely increase 17.64 times chances for the adoption of coping strategies to cope with climate changes was improved. The P-value indicates that there is a highly significant relation between private companies with the adoption of coping strategies to cope with climate changes in the study area.

There is an increase in private companies providing different types of information regarding the usage of fertilizers which tends to be a factor in communicating to farmers about the coping strategies for climate change. The odds of 17.64 for the role of private companies is highly significant for informing the farmers about the coping strategies for climate change. So, it is clear from the above results that sources of information i.e., TV, mobile, Zarai digest, fellow farmers, and private companies had a positive role in the adoption of coping strategies to cope with climate changes in the study area.

CONCLUSION AND RECOMMENDATIONS:

The study concludes that more authentic and need-based information sources are the core priority of climate-affected areas. It is a dire need to address these challenges through rapid implementation of cost-effective resources to minimize the loss of climate change. The logistic regression model showed that the sources of information, i.e., TV, mobile, Zarai digest, fellow farmers, and private companies, had a positive and significant role in adopting coping strategies to cope with climate changes in the study area. Based on findings, it is suggested that government has to take a keen interest in addressing the challenges of farmers posed by climate change. Timely and need-oriented information can play an instrumental role in the mitigation of climate change effects. Climate and weather forecasting departments must have to play their due role in the dissemination of necessary information to the farming communities. In addition, local level awareness campaigns must be launched in collaboration with different stakeholders of agricultural development.

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