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UTILIZATION OF CLIMATE CHANGE INFORMATION BY GENDER FOR CLIMATE ADAPTATION AMONG ARABLE CROP FARMERS IN OYIGBO LOCAL GOVERNMENT AREA, RIVERS STATE, NIGERIA

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ABSTRACT

The use of relevant climate information by farmers will enhance their capacity to adapt to the risk associated with climate change. The study analyzed utilization of climate information for climate adaptation among arable crop farmers in Oyigbo Local Government Area, Rivers State, Nigeria. Specifically, the study was designed to; identify the types of crops cultivated, determine how they perceive and experience climate change, identify the types of sources information available to them and determine the level utilization of climate information received by gender. Multi stage sampling procedure was used to select 160 (80 males and 80 females) respondent. Questionnaire and personal interviews were used to elicit data from the respondents. Data collected were analysed using mean, percentage, bar chart, likert scale. Results revealed that the type of crops cultivated by respondents showed that male and female arable crop producers cultivate same crops with slight difference of 72 males as against 70 females cultivated maize. It was also discovered that both the male and female respondents have perceived and are currently experiencing climate change in form of late coming of rain, increased flooding, weed, pest and disease etc. The findings also revealed that greater number of the respondents got climate information through radio (80 females and 76 males). Findings equally showed that females utilized the information received more than the males. Based on the findings it was recommended that there is the need for climate information programme planners to formulate programs that are not too complex but easy to understand and make sure such information are communicated effectively to the vulnerable set as to enable them understand.

1. INTRODUCTION

Climate change and weather variability are the major causes of stress on arable food production and availability. It demands new approaches to arable crop production. Farmers' practices will need to change in order to adapt to and mitigate changing conditions. Gender is central to this change. In the under developed societies farming is basic source of livelihood for women, where four-fifths of economically active women report agriculture as their major economic activity (Doss, 2011). More women are moving into agriculture as men move out to seasonal or paid labour elsewhere. At the same time, there is gender difference in accessing productive inputs and resources to improve returns from farming activities and to meet the challenges of climate change (FAO, 2011). Women's arable crop production is not without information gap even in the face of climate risk.Intergovernmental Panel on Climate Change (IPCC, 2014) defined climate change as a statistically significant variation that persist for decades or longer caused by human activities and natural occurrence. Deforestation, oil spills and gas flaring are some of the human causes, while volcanic eruptions and ocean current are examples of climate change caused by nature. In the world, an estimated 795 million persons are malnourished (FAO, IFAD, and WFP, 2015), and hunger and food insecurity remains a concern on the international agenda. In most of the underdeveloped countries, the problem of hunger will be worsening by the effects of climate change on arable crop production: rainfall instability, flooding, drought, extremely high or low

temperature and severity of wind storms (IPCC, 2014). According to John et al., (2013), in the developing countries the smallholder farmers are the most vulnerable to the effect of climate variation. World B (2015) opines these set of farmers are more dependent on rain water and other resources and inputs that are climate sensitive. The vulnerability of smallholder of farmers is expected to be even more severe in Nigeria, where women are more involved in agriculture, yet are highly marginalised and excluded in climate decisions that directly affect them (Osuafor & Nnorom, 2017).

Arable crop farmers are experiencing climate change although they have not considered its major implications. Recently there has been low output in arable crop production in Oyigbo Local Government Area, Rivers State leading to shortage of food, feed and fibre utilized by man, animal and agro based industries in the zone, respectively and some other regions in the country. Climate change adaptation requires new approaches to farming, which will involve change in attitude and farm practices in order to adapt to the changing conditions. Gender equality is very vital to this change. Without a gender-sensitive approach, it will be difficult to ascertain the full set of causes and potential impact of climate change. It has been discovered that there is gender difference in climate change experience in terms of adaptability, responsibility, vulnerability and aptitude for mitigation (World Bank, 2010). According to FAO (2011), women farmers have less information to productive inputs and resources to improve returns from their farming activities and to meet the challenges of climate change. Women are the major producers of the world's staple crops, accounting for 60 to 80 per cent of the food in most developing nations (UNDP, 2008). Women's agricultural activities are often characterized by gaps in information utilization, with deficiencies in several areas: land, labour, credit, information, extension, and technology (Huyer, 2016).

Climate information refers to climate scenarios, climate projections, traditional and modern seasonal outlooks and climate impacts, risks and consequences, climate advisory services, and modern and traditional climate adaptation practices (Tall et al., 2014). According to World Meteorological Organization (WMO, 2013) states that farmers having access to climate information for decision-making in their farming operation will be vital for mitigating climate-related risk. Climate information helps farmers to strategically plan their farm activities and adopt best strategy that enhance their adaptive capacity in the face of climate risks. Climate information and utilization enables farmers to better anticipate and manage extreme events, take advantage of favourable climate conditions, and adapt to change. Improvements in the quality and relevance of climate information will expand the range of options available for making arable crop farmers more resilient and prosperous in the face of climate risk. In many developing countries, ability to provide accurate climate information offers significant benefits to arable crop farmers although more frustrations are often experienced due to inaccessibility of climate forecasts or their existence in formats that cannot be perfectly decoded by largely illiterate farmers (Kiem and Austin, 2013). The overall usefulness of climate forecast is therefore determined by several factors. First, there must be sufficient ability to decode climatic forecasts and secondly, there must be sufficient motivation to effect changes in their production systems in line with the dictates of the forecasts.

Rivers State, due to its geographical location on the coastline, suffers from flooding and decline in oceanic productivity resulting in shortages in food and fish production. For this reason, it has been recommended that adaptation is necessary for Africa Nigeria in particular (Dim *et al*, 2016). FAO (2010), noted that climate change has negatively impacted progress made in African's economy as large sum of resources are been invested in adaptation issues. In Nigeria and Rivers state in particular, the impact of this change in climate are becoming more intense, this is occasioned by the increase in flooding, drought and general rainfall fluctuation experienced in the country in the past few years. Vissoh *et al*, (2012) asserted that, over the long period, temperatures are expected to increase, resulting to yield reductions and increase weed and pest's infestation. Furthermore, the rainfall variability is expected to lead to considerable postharvest losses hence food scarcity. Food insecurity, due to low yields will continue to be on the rise if equality in gender roles in crop production and climate change adaptation is not realized (World Bank, 2010). Complications arising from poor land use and land degradation further compound the problem (Adger, *et al,* 2003) especially for arable crop farmers in Oyigbo LGA. As a result of the production risk associated with climate change and variability in weather patterns, arable crop farmers in Oyigbo LGA are finding it increasingly difficult to decide when, where and how to plant, apply fertilizers and or pesticides, and harvest their produce (Kristjanson, 2015). Arable crop production risk caused by climate variability cannot be managed properly without addressing gender issues in utilization of climate information. That is why the study examined the utilization of climate change information by gender for climate adaptation among arable crop farmers in Oyigbo local government area, Rivers State, Nigeria.

1.1 Objectives of the Study

The broad objective of the study was to examine utilization of climate information for climate change adaptation among arable crop farmers in Oyigbo Local Government Area of Rivers State.The specific objectives of the study were to: identify the type of arable crops cultivated by gender;determine gender perception and experience on climate change among arable crop farmers in the study area;identify the sources and type of climate information available by gender in arable crop production;

1.2 Hypothesis

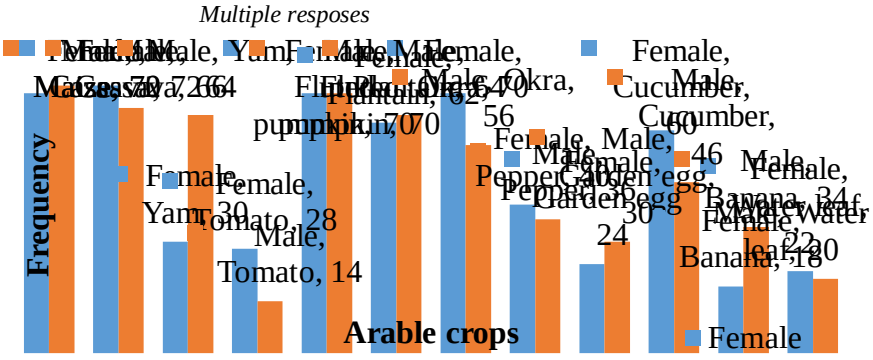
H_{01}: there is no significant difference in the level of utilization of climate information obtained by gender arable crop producers in the study area.

2. METHODOLOGY

This study was conducted in Oyigbo Local Government Area of Rivers State. The state lies on latitudes 6° and 8° South and longitudes 9° and 7° West. Oyigbo Local government area was created in 1991, it is made up of three (3) major clans namely Umuihueze, Umuokobo and Asa and seventeen (17) villages which are divided into two parts namely Asa and Ndoki, it has boundaries with Abia and Akwa-Ibom States, respectively. It also shares common boundaries with Tai, Khana, Eleme and Obio/Akpor Local Government areas of Rivers State at South, West, East and North East respectively. It is found in the South East senatorial zone of Rivers State. 2006 Census conducted in Nigeria showed that Oyigbo LGA occupies a land area of 248km2 with population of 125,331 comprising 63,434 males and 61,897 females (National Population Commission, 2009).The population of the study consists of all registered arable crop farmers in the Oyigbo Local Government Area of Rivers State. There are about Three hundred and forty-seven (347) registered arable crop farmers in Oyigbo Local Government Area of Rivers State, (Rivers State Ministry of Agriculture). Multi-stage sampling procedure was used. Firstly, purposive sampling procedure was employed to select ten communities out of the seventeen (17) communities in Oyigbo Local Government Area where arable crop farmers are predominantly experiencing climate change. Secondly, equal proportion of sixteen (16) arable crop farmers were randomly selected from each community with the composition of eight men and eight women for the study making a total of one hundred and sixty (160) arable crop farmers. Primary method of data collection was employed using questionnaire and oral interviews. The data obtained was analysed using descriptive statistical tools such as mean, frequency, percentage and bar chart. The result from the five point likert scale was further subjected to Z-test at significance level of 0.05.

3. RESULTS AND DISCUSSION

Figure 1 shows the distribution of respondents according to the type of arable crops cultivated. The result indicates that majority (142) of the respondents cultivated maize, 140 cultivated fluted pumpkin and 138 cultivated cassava while only 42 cultivated waterleaf. The result indicates that of the respondents practiced mixed cropping and cultivated maize. The 70 females and 72 males cultivated maize, this result is in agreement with a study carried out by Lumosi (2014) in South-Eastern Nigeria where most of the farmers practiced mixed farming and major crop cultivated was maize. This result implies that respondents diversified the type of crop grown which may serve as a form of insurance against crop failure due to the effect of climate change. It is also in line with the findings of Ibidapo (2018), where majority of the arable crop farmers' cultivated different types of crops. Furthermore, it can equally be deduced that there is significant agreement in the type of crop grown by the different gender although there was a sharp gender difference in yam production where fewer females (30) and (64) males produced yam among the respondents. This difference could be linked as gender role, yam production entails much labour.



Source: Field survey 2020.

Fig.1: Distribution of respondents according to Type of Arable Crops Produced

Result presented in table 1 revealed that both males and females in the study area have perceived changes in climate. The findings show a slight agreement between males and females on perception as male (97.5%) and females 95% attested to change in climate in the past decades. All the females (100%) and males (87.5%) believed climate change is the act of God while 12.5% disagreed with the assumption. Both gender; females (70%) and males 72.5% slightly agreed on the fact that human activities has contributed to climate change while 30% and 27.5% of the females and males respectively are of the opinion that humans have not contributed to the change. This agrees with Albert & Okidim (2013), who discovered that majority of the arable crop farmers in Ahoada East Local government of Rivers State perceived climate change to be the act of gods and human activities. Majority of respondents 92.5% (female) and 87.5% (males) agreed that climate change does not affect both gender the same way. It was also discovered that male and female arable crop producers performed similar roles and produced similar crops as almost all the respondents except 1.2% attested to this. The result indicates that the respondents both male and female had knowledge of climate change, human contributions to its existence and that it affects males and females differently.

Table 1: Distribution of Gender according to Perceptions on Climate Change

		Female		Male		Overall	
Variables	Category	Freq.	%	Freq.	%	Freq.	%
Observed any change in climate in the last decade.	Yes	76	95.0	78	97.5	154	96.3
	No	4	5.0	2	2.5	6	3.8
	Total	80	100	80	100	160	100.0
Climate change is an act of God.	Yes	80	100.0	70	87.5	150	93.8
	No	0	0.0	10	12.5	10	6.3
	Total	80	100	80	100	160	100.0
Human activities have contributed to this change.	Yes	56	70.0	58	72.5	114	71.3
	No	24	30.0	22	27.5	46	28.8
	Total	80	100	80	100	160	100.0
It affects males and females the same way.	Yes	6	7.5	10	12.5	16	10.0
	No	74	92.5	70	87.5	144	90.0
	Total	80	100	80	100	160	100.0
Men play different role from females in arable crop production.	Yes	0	0.0	2	2.5	2	1.2
	No	80	100.0	78	97.5	158	98.8
	Total	80	100	80	100	160	100.0
Men arable crop farmers produce different crop type from females.	Yes	0	0	0	0	0	0
	No	80	100.0	78	97.5	158	100
	Total	80	100	80	100	160	100.0

Source: Field survey 2020.

The result in table 2 shows that male and female arable crop producers fairly agree on the experiences they had on rainfall trends; majority 55% (females) and 67.5% (males) experienced late start of rains while 45% (female) and 32.5% (males) did not notice any variation. Also, higher percentage 97.5% female and 90% (male)

noticed increase in amount of rainfall in the last decades while the remaining percentage did not. Furthermore, most of the respondents 67.5% (female) and 72.5% (male) indicated that there is increase in weed infestation while remaining respondents did not observe any change in weed infestation. Majority 70% (female) and 75% (male) did not notice any change in temperature over the last decade while the remaining percentage experienced changes. Greater proportion 85% (female) and 67.5% (male) of the respondents experienced more frequent flooding while other did not have this experience. Majority 55% (female) and 85% (male) did not experience increase in crop loss as a result of climate change although there is a sharp difference in this regard as more females (45%) experience more losses than the males (12.5%). Results on pest and disease infestation showed that majority 57.5% (female) and 60% (male) arable crop producers experienced an increase while the rest of them did not notice increase in pest and disease infestation. This result indicates that both male and female arable crop producers in the study area fully aware of climate change, and are currently experiencing some of its impacts in their crop production.

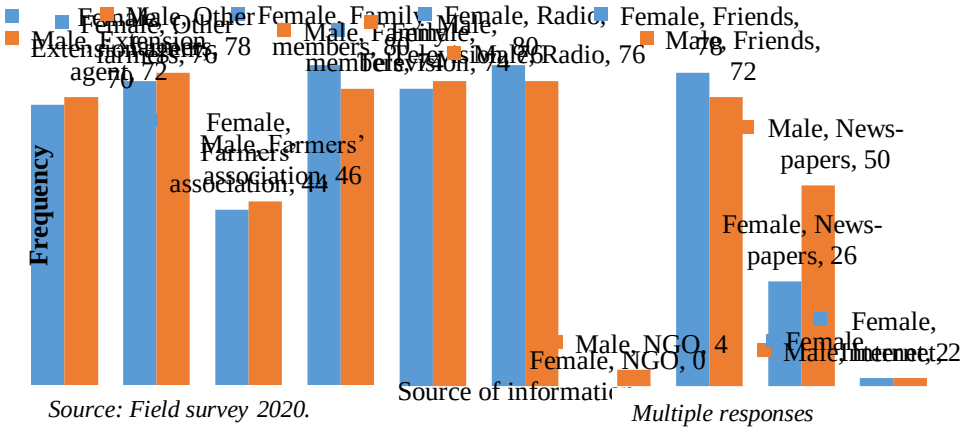
Table 2: Distribution of Respondents according to Experience on Climate Change

		Female		Male		Overall	
Variables	Category	Freq.	%	Freq.	%	Freq.	%
Earlier start of rain	Yes	36	45	26	32.5	64	40.0
	No	44	55.0	56	67.5	96	60.0
	Total	80	100.0	80	100.0	160	100.0
Later start of rain	Yes	42	52.5	54	67.5	96	60.0
	No	38	47.5	26	32.5	64	40.0
	Total	80	100.0	80	100.0	160	100.0
Increased amount of rainfall	Yes	78	97.5	72	90.0	150	93.8
	No	2	2.5	8	10.0	10	6.3
	Total	80	100.0	80	100.0	160	100.0
Increase weeds	Yes	54	67.5	58	72.5	112	70.0
	No	27	32.5	22	27.5	48	30.0
	Total	80	100.0	80	100.0	160	100.0
Change in temperature	Yes	24	30.0	20	25.0	44	27.6
	No	56	70.0	60	75.0	116	72.5
	Total	80	100.0	80	100.0	160	100.0
More frequent floods	Yes	68	85.0	26	67.5	122	76.3
	No	12	15.0	54	32.5	38	23.7
	Total	80	100.0	80	100.0	160	100.0
Increase crops loss	Yes	36	45.0	30	12.5	66	41.3
	No	44	55.0	48	85.0	92	57.5
	No response	-	-	2	2.5	2	1.3
	Total	80	100.0	80	100.0	160	100.0
Increased pest and disease infestation	Yes	46	57.5	48	60.0	94	58.8
	No	34	42.5	28	35.0	62	38.8
	No response	-	-	4	5.0	4	2.5
	Total	80	100.0	80	100.0	160	100.0

Source: Field survey 2020.

The result represented in fig 2 on sources of climate information available to gender arable crop producers indicates the respondents got information through various channels in this order; radio (80 females and 76 males), family members (80 females and 74 males), others farmers (76 females and 78 males), friends (78 females and 72 males), television (74 females and 76 males) and extension agents (70 females and 72 males) while (no female and 4 males) and (2 females and 2 males) got information on climate change from NGO and internet respectively. This result agrees with the finding of Bobadoye, et al (2019) where most of the respondents 45% of male and 62% of female respondent receive climate information through either radio or television. Onyeneke and Madukwe (2010) asserts that accessing climate information via radio has been linked to low cost, wide range of coverage, use of local language and low maintenance cost. Also, family members' other farmers and friends were also found to be good source of climate information to respondent, as good numbers of the respondents; (80 females and 74 males); (76 females and 78 males) and (78 females and 72 males) respectively accessed climate information from these source. This finding is in line with the result of Nlerum, Albert and Prince (2012), discovered that good percentage rural women get agricultural information from family members, friends and other farmers. Significant gender disparity was discovered in the access of Non-Governmental Organisation as source of climate information as none of the female accessed information via this channel while 4 males did. It was observed that the potentials of internet in disseminating climate information is

yet to be harnessed as very few respondents 2 male and female accessed information on climate change this medium.



Source: Field survey 2020.

Fig. 2: Types of Source of climate change information available to gender arable crop farmers for adaptation

Results represented in table 4.3 on the type of climate information received by respondents shows that majority of them accessed information on fertilizer application (females 97%, males 95%) while (92.5% of females and 95% of males); (90% of females and 95% males) and (95% females as against 87.5% males) received information on improved varieties, use of herbicides/pesticides and rainfall prediction respectively. Also, good percentage of the respondents got information on; Rainfall establishment (females 90% as against male 95%); Short and long term variety (90% females as against 95% male); change in temperature 97.5% females as against 75% males) etc. The finding from this study indicates that the respondents both male and female received different types of climate information ranging from weather forecast, rainfall prediction, improved varieties, pest and disease infestation, use of fertilizer and that is required to enable them make informed decision on what, when, where to produce which lower their vulnerability, increase adaptation and avert the risk posed by climate change in the study area (Nlerum, et al, 2012).

Table 3: Type of Climate Information Received by Respondents

	Female		Male		Overall	
Variable	Freq.	%	Freq.	%	Freq.	%
Fertilizer application	78	97.5	76	95.0	154	96.3
Improved varieties	74	92.5	76	95.0	150	93.8
Use of herbicides, pesticides	72	90.0	76	95.0	148	92.5
Rainfall prediction	76	95.0	70	87.5	146	91.3
Daily weather forecast	76	95.0	66	82.5	142	88.8
Flood prediction	74	92.5	68	85.0	142	88.8
Pest and disease outbreak	72	90.0	70	87.5	142	88.8
Temperature	78	97.5	60	75.0	138	86.3
Warning rains	65	81.3	76	95.0	141	88.1
Rainfall establishment	72	90.0	76	95.0	148	92.5
Post-harvest handling	65	81.3	76	95.0	141	88.1
Short and long term variety	72	90.0	76	95.0	148	92.5
Drought prediction	12	15.0	18	22.5	30	18.8
Wind direction	6	7.5	8	10.0	14	8.8

Source: Field survey 2020.

3.1 Level of Gender difference in Utilizing Climate Information Received for Climate

The Z- test represented in table 4 shows utilizing climate information received for climate change adaptation using a scale of ($\bar{x}$ ≥ 3.00) and z-test with decision rule of (P significant at α ≤ 0.05)it was discovered that both male and female arable crop producers in the study area used the information received alike although the females utilized it more; Daily weather forecast ($\bar{x}$ = 4.05 females as against $\bar{x}$ = 4.13 male); Rainfall prediction ($\bar{x}$ =4.00 females as against $\bar{x}$ = 3.78 male); Rainfall establishment ($\bar{x}$ = 4.13 females as against $\bar{x}$ = 4.05 male); Flood prediction ($\bar{x}$ = 3.30 females as against $\bar{x}$ = 3.30 male); Improved variety ($\bar{x}$ = 3.00 females as

against $\bar{x}$ = 3.15 male); Pest and disease outbreak prediction ($\bar{x}$ = 3.30 females as against $\bar{x}$ = 3.18); Use of herbicides/Pesticides ($\bar{x}$ = 3.30 females as against $\bar{x}$ =3.18 male); Fertilizer application ($\bar{x}$ = 3.30 females as against $\bar{x}$ =3.18 male) and Temperature ($\bar{x}$ = 2.80 females as against $\bar{x}$ = 2.50 male). The findings revealed there was no significant difference in male and female level of utilization of the information received at P significant at α ≤ 0.05. Nevertheless, there was significant difference in the level use of information received on rainfall prediction and temperature with significant p-value of 0.012 and 0.016 respectively. From the result it could be deduced that female respondents utilized the climate information receive more than the male as to make informed decision for adaptation and reduce the impact of climate variability their arable crop production. The result is in line with empirical studies carried out by Jost et al., (2016), which indicated that women who accessed relevant climate information used them to change their agricultural management practices, diversify crop production, and change storage and processing techniques to adapt and mitigate the effect of climate change.

Table 4: Mean Distribution of Gender according to Level of Utilization of Climate Information Received

Gender	Most often	More often	Often	Less often	Not at all	Mean±SD	z-test		
							z-score	p-value	Remark
Daily weather forecast									
Female	28	34	18	-	-	4.13±0.75	-0.562	0.287	NS
Male	28	34	14	2	2	4.05±0.93			
Total	56	68	32	2	2	4.09±0.84			
Rainfall prediction									
Female	14	52	14	-	-	4.00±0.60	2.273	0.012	S
Male	10	42	28	-	-	3.78±0.66			
Total	24	94	42	0	0	3.89±0.63			
Warning rainfall									
Female	2	4	4	12	58	1.50±0.98	-0.914	0.180	NS
Male	4	2	8	14	52	1.65±1.09			
Total	6	6	12	26	110	1.58±1.04			
Rainfall establishment									
Female	28	34	18	2	2	4.13±0.75	-0.562	0.287	NS
Male	28	34	14	-	-	4.05±0.93			
Total	56	68	32	2	2	4.09±0.84			
Drought prediction									
Female	2	4	10	44	20	2.05±0.90	0.331	0.370	NS
Male	2	4	16	28	30	2.00±1.01			
Total	4	8	26	72	50	2.03±0.95			
Flood prediction									
Female	4	22	50	2	2	3.30±0.72	1.109	0.134	NS
Male	2	20	50	6	2	3.18±0.71			
Total	6	42	100	8	4	3.24±0.71			
Temperature									
Female	6	2	44	26	2	2.80±0.85	2.135	0.016	S
Male	4	-	40	24	12	2.50±0.93			
Total	10	2	84	50	14	2.65±0.90			
Wind direction									
Female	4	4	-	4	68	1.40±1.07	0.172	0.432	NS
Male	-	2	6	12	60	1.38±0.74			
Total	4	6	6	16	128	1.39±0.92			
Short and long time crop variety									
Female	-	14	52	12	2	2.98±0.66	-0.245	0.403	NS
Male	2	8	60	8	2	3.00±0.64			
Total	2	22	112	20	4	2.99±0.64			
Improved varieties									
Female	4	10	62	2	2	3.15±0.66	-1.423	0.077	NS
Male	-	14	56	6	4	3.00±0.68			
Total	4	24	118	8	6	3.08±0.67			
Pest and disease outbreak prediction									
Female	4	22	50	2	2	3.30±0.72	1.109	0.134	NS
Male	2	20	50	6	2	3.18±0.71			
Total	6	42	100	8	4	3.24±0.71			

Use of herbicides, pesticides									
Female	4	22	50	2	2	3.30±0.72	1.109	0.134	NS
Male	2	20	50	6	2	3.18±0.71			
Total	6	42	100	8	4	3.24±0.71			
Fertilizer application									
Female	18	38	22	-	2	3.88±0.85	-0.595	0.276	NS
Male	20	36	24	-	-	3.95±0.74			
Total	38	74	46	-	2	3.91±0.80			
Post-harvest handing									
Female	2	4	-	26	48	1.58±0.92	-1.363	0.087	NS
Male	2	8	10	12	48	1.80±1.15			
Total	4	12	10	38	96	1.69±1.05			

Source: Field survey 2020 *≥ 3.00 = frequently used, < 3.00 = Not frequently used* *P significant at α ≤ 0.05*

4. CONCLUSION AND RECOMMENDATION

The study has shown the there was gender imbalance among arable crop producers in the utilization of climate information for climate change adaptation in the study area. The study revealed that both gender perceived and had experienced some of the impact of climate change in the course of crop production. Both gender utilized climate information from various sources although the male used more formal sources of information such as television, radio, newspaper, NGO and extension agents than the females. It was also discovered that the females utilized the information received such as daily weather forecast, rainfall establishment prediction, flood prediction, improved varieties, fertilizer application etc to avert climate change related risk. The females were more constraints than the males in utilizing the climate information that will enable them make informed decision for climate change adaptation. Based on the findings it was recommended that the issue of productive resource requires empowering the bargaining and decision-making power of both genders to utilize resources such as land, inputs and soft loans to enable them access and utilize climate information.

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