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ASSESSMENT OF CLIMATE CHANGE ADAPTATION PRACTICES OF ARABLE CROP FARMERS IN KWARA STATE, NIGERIA

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Abstract: This study examined the climate change adaptation practices of farmers cultivating arable crops in Kwara State. One hundred and twenty (120) farmers were drawn for this study using multi stage sampling method. An interview schedule was designed to gather relevant data and analyzed with descriptive and inferential statistical tools. Results reveal that the average years of farming experience was 7 years with majority having no formation education. The topmost effects of climate change were crop loss (mean=4.82), food insecurity (mean=480) and the inability to plan ahead (mean=4.79). The leading mitigation practices employed by farmers were organic farming practices (mean=3.59), crop rotation methods (mean=3.53) and afforestation (mean=3.52). Foremost challenges to effective mitigation were insufficient extension contact (mean=4.85), poor support by the government (mean=4.71) and inadequate required production inputs (mean=4.69). Correlation analysis showed that educational status of the farmers indicated positive significant relationship with mitigation practices employed by farmers.

The study concluded that organic farming practices, crop rotation methods and afforestation were the leading mitigation practices employed by farmers in Kwara State. There is need for extension organizations in the study area should recruit more extension agents to enable practical field demonstration of climate change adaptation practices.

Key words*: Crop rotation, extension contact, farm loss, food insecurity, organic farming*

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INTRODUCTION

Similar to other developing countries, agriculture in Nigeria is dominated by small scale farmers who constitute 80% farming population cultivating less than 10 hectares [1]. These farmers mainly cultivate arable crops (rice, cowpea, maize, sorghum, millet etc.) and reside in the rural areas. These farmers faced several challenges ranging from inadequate access to inputs, inadequate access to farm credit, inadequate extension service providers, unstable agricultural policies and programmed, inadequate allocation of fund for agricultural research as well as the negative consequences of climate change. It is no longer news that greenhouse gas emitted into the atmosphere has caused notable shift in regular rainfall pattern, intensity of sunshine and temperature needed for food crops to survive.

Climate change can be described as the change in climate patterns. The change is solely caused by the emission of greenhouse gas that produces heat trapped by the atmosphere resulting to global warming. The leading sources of greenhouse gas being escaped to the atmosphere are human activities and natural systems. The natural occurrences are wetlands, earthquakes, forest oceans, and permafrost while activities of man causing greenhouse gas emission include industrial activities, change in land use and process of energy production [2]. The negative influence of climate change has direct impact on agricultural growth. This is because climate change cause significant shift in average rainfall pattern and intensity of sunshine and temperature needed for food crops to survive. It has further caused changes in ground-level ozone concentrations, atmospheric carbon dioxide and the nutritional quality of some foods [3].

To tackle the advert outcomes of climate change in most human endeavor, people across the world have applied mitigation and adaptation measures against greenhouse emission. Mitigation can be described as measures to minimize and curtail the emission of greenhouse gas while adaptation measures are actions to reduce vulnerability of threats that may arise from change in climatic condition. In the agricultural sector, Nigerian farmers in recent times have applied many practices to lessen the implications of climate change. In Southern and Western parts of Nigeria, several authors have listed many indigenous and climate smart adaptive strategies used by farmers cultivating arable crops. Some of the practices include practice of irrigation system (Fadama), planting of drought tolerant seeds, planting of trees (afforestation), and the application of organic practices which include the adjustment in planting date, use of manure, fallowing, mulching and timely harvest of crops [4,5]. Unfortunately, utilization of climate mitigation practices has been threatened by inadequate finance, high level of farmers' illiteracy, low knowledge of technical-know how, poor knowledge of weather forecast and low status of awareness on climate change effects among farmers [6].

Climate change has been talked about for so long and it is no doubt that it is gradually affecting agricultural development efforts in Kwara State especially in the crops production sector.

Most farmers in Nigeria are small-scale holders that operate with small finance and little capability to adopt expensive farming strategies very high weather incidents (climate change) such as heavy rainfall, heavy wind, thunder storm and flood are hazardous to crop farming, animals and humans. These usually result to loss of arable crops, prevalence of diseases and pests [7].

There are some mitigation practices that are less stressful with minimal cost. Such practices should be used by small scale arable crops farmers. Although some of these mitigation practices have already been put to use by the farmers, thus empirical study is needed to understand prominent climate mitigation practices used by farmers growing arable crops to avert the effects of change in climate in Kwara State.

The broad purpose of this study was to examine climate change adaptation practices among farmers cultivating arable crops in Kwara State. Specifically, the study (i) examined perceived effects of climate change on arable crops, (ii) investigated mitigation practices used to lessen the effects of climate change in growing arable crops, and (iii) identified the challenges faced by farmers growing arable crops on the use of climate change mitigation practices in Kwara State. Hypothesis (H0) states thus: socio-economic characteristics do not significantly affect the mitigation practices used to minimize the effects of climate change among farmers growing arable crops

MATERIAL AND METHODS

Study area

The study was carried out in Kwara State, located in North Central geopolitical zone of Nigeria. Kwara State is positioned between parallels 8Â° and 10Â° north latitudes and 3Â° and 6Â° east longitudes. Kwara State consists of sixteen Local Government Areas namely Ilorin East, Asa, Ifelodun, Ilorin South, Kaiama, Ilorin West, Irepodun, Moro, Isin, Baruten, Offa, Edu, OkeEro, Pategi, Oyun, and Ekiti.

Sampling size and sampling produce

All farmers growing arable crops in Moro Local Government were considered in the study. Three-stage selection procedure was applied to arrive at sample size. Two districts (Malete and Gaa Alaanu) in Moro local government were selected randomly in the first stage. Second stage entailed random selection of 15 farming communities in each of the districts selected. In the third stage, 4 arable crop farmers were randomly selected in each village which gives a gross sampling size of 120 respondents.

Data collection and analysis

Primary data was collected with interview schedule. Data gathered were analyzed and presented using frequency count, percentage, mean score. Stated hypothesis was analyzed using Pearson Moment Correlation (PPMC) statistical tool.

Perceived effects: Strongly agree=5, agree=4, undecided=3, disagree=2, strongly disagree=1. Usefulness of mitigation practices: highly useful=4, useful=3, undecided=2, not useful=1. Challenges to use of mitigation practices: Highly severe=5, severe=4, undecided=3, not severe=2, not a constraints=1.

RESULTS AND DISCUSSION

Socio economic characteristics of respondents

Based on results of data analysis displayed in Table 1, arable crops farming was dominated (78.3%) by male. The mean age was 42.5 years. Many of the respondents were married (75.0%) with mean score of 5 persons in each household. The percentages of respondents that have primary, secondary and tertiary education were 13.3 percent, 15.0 percent and 9.2 percent respectively. Results show that respondents had 14 years of experience in arable crop cultivation.

Table 1. Socio economic characteristics of respondents (n, 120)

Variables	Classes	Frequency	Percent	Mean
Age				42.5
Household size				5.0
Farming experience (years)				7.0
Sex:	Male	94	78.3	
	Female	26	21.7	
Marital status:	Single	2	1.7	
	Married	90	75.0	
	Widow	2	1.7	
	Widower	17	14.2	
Education:	No formal	3	2.5	
	Primary	16	13.3	
	Secondary	18	15.0	
	Tertiary	11	9.2	
	Arabic	72	60.0	

Source: Field survey, 2021.

Perceived effects of climate change on arable crop farmers

According to results of analysis presented in Table 2, the topmost effect of change in climate on arable crop farming was that it brings about crop loss to the farmers (mean=4.82). Secondly, climate change cause food insecurity (MS=4.80) is a key effect on arable crops. The third effect of climate change on arable crops is that climate change hinders the farmers to plan ahead (MS=4.79). The least effect of climate change is that it brings about livelihood diversification (MS=4.00).

Table 2. Effect of climate change on arable crop farming

Statements on effects	Mean	Standard Deviation	Rank
It brings about loss to the farmers	4.82	0.389	1st
It causes food insecurity	4.80	0.402	2nd
It hinders the farmers to plan ahead	4.79	0.517	3rd
It reduces profit	4.69	0.562	4th
It reduces efficiency	4.68	0.521	5th
It discourages the farmers from planting	4.62	0.568	6th
It reduces crop yield	4.25	1.343	7th
Increases rural-urban migration	4.17	1.056	8th
It brings about livelihood diversification	4.00	1.177	9th

Source: Field Survey, 2021.

Adaptation practices use by farmers

Results of data analysis in Table 3 showed the adaptation practices used by crop farmers to reduce vulnerability to the effects of change in climatic condition. The foremost adaptation practice used was the use of organic farming (mean=3.59). The next practice was the use of crop rotation (mean=3.53). Afforestation/reforestation and weed management were other mitigation practices employed by farmers with the mean scores of 3.52 and 3.45 respectively. The least used mitigation practices are shifting cultivation and use of improved seed varieties with mean score of 2.97 and 3.09 respectively.

Table 3. Use of climate change adaptation practices

Climate change adaptation practices	Mean	Standard Dev.	Rank
Organic farming	3.59	0.571	1st
Crop rotation	3.53	0.774	2nd
Afforestation and reforestation	3.52	0.797	3rd
Weed management	3.45	0.873	4th
Planting of cover crops	3.40	0.887	5th
Cultivation of improved crops	3.34	0.792	6th
Altering of planting date	3.31	0.893	7th
Alley cropping	3.29	0.739	8th
Water management	3.27	1.016	9th
Nutrient management	3.13	1.092	10th
Use of improved seed varieties	3.09	0.923	11th
Shifting cultivation	2.97	1.000	12th

Source: Field survey, 2021.

Challenges to use of climate change adaptation practices

As shown in Table 4, the most severe problem hindering farmers to employ mitigation practices is the insufficient extension contact (mean=4.85). The second constraint according to their severity is poor support by the government with a mean score of 4.71. Inadequate production inputs and poor access to credits were also key constraints with mean scores of 4.69 and 4.62 respectively. The least constraint affecting arable crop farmers according to their level of severity are inadequate access to information on climate change and time consuming exercise with MS of 3.71 and 3.69 respectively.

Table 4. Challenges to use of climate change adaptation practices

Challenges	Mean	Standard Dev.	Rank
Insufficient extension contacts	4.85	0.633	1st
Poor support by the government	4.71	0.640	2nd
Inadequate required production inputs (e.g., land, seeds, fertilizer etc.)	4.69	0.562	3rd
Poor access to formal credits	4.62	0.611	4th
Insufficient land	4.54	0.815	5th
Inadequate awareness of farmers on climate change adaptation practices	4.54	1.090	5th
Irregular visit of extension agents	4.25	1.063	7th
Inadequate awareness of farmers on climate change variability	3.89	1.067	8th
Poor access to information on climate change	3.71	1.402	9th
Time consuming practices	3.69	0.814	10th

Source: Field survey, 2021.

Hypothesis of the study

Null: socio-economic characteristics do not have significant effect on mitigation practices used to minimize the effects of climate change among farmers growing arable crops.

The results PPMC analysis in Table 5 showed a positive and significant correlation coefficient (r= 0.01<0.05) between education attainment and mitigation practices used to minimize the effects of climate change among farmers growing arable crops. This finding indicates that the increase in education status will bring about increase use of climate change adaptation practices among farmers in the study area.

Table 5. Results of correlation analysis between educational status and climate change adaptation practices used by farmers

		Educational status	Adaptation practices
Educational status	Correlation (Pearson)	1	0.316**
	Probability		0.001
	N	120	106
Adaptation practices	Correlation (Pearson)	0.316**	1
	Probability	0.001	
	N	106	106

Decision: reject null hypothesis (p<0.01)

The mean age implies that arable crop farmers were still young and within the active age. The finding confirms the report of Authors [8] who found that farmers growing arable crops in Kwara State are relatively young and capable to engage in stressful activities in crop farming. This study also shows that farmers growing arable crops in the study area were educated. Literacy level of the farmers could positively influence their acceptance and application of climate smart innovation practices introduced by extension agents. This observation conforms with report by Authors [9] that individual farmers with educational attainments are usually fast adopters of innovations. Finding indicates that many farmers cultivating arable crops in Kwara state are highly experienced.

The topmost effect of change in climate on arable crop farming was that it brings about crop loss to the farmers. This is because, climate change affects yield of crops in a farm and also damage and reduce the growth rate of some group. Consequently, this will lead to the loss to the farmers. Secondly, climate change cause food insecurity is a key effect on arable crops. This is because arable crop farming is paramount in keeping the availability of food all year round, therefore, a slight change in climate causes reduction in arable crop productions which ultimately causes food insecurity in Nigeria. The third effect of climate change on arable crops is that climate change hinders the farmers to plan ahead. This is so because the farmers are scared of sudden change in climatic condition which could have serious effects on their crops and thus are skeptical to plan ahead. The least effect of climate change is that it brings about diversification.

The mean score of 4.00 is also high based on the 5-point Likert scale used but this effect is the least among the ways change in climate can affect arable crops. Other effects are reduced profit and efficiency. It also discourages farmers from planting crops, reduced crop yield as well as increased rural-urban migration.

This finding agrees with previous study which found that climate change brings about loss to farmers, food insecurity and ultimately discourages them in farming [7].

The foremost mitigation practice used was the use of organic farming, implies that the non-use of synthetic agro-chemicals was the main method used by farmers to minimize the effects of climate change. The least used mitigation practices are shifting cultivation and use of improved seed varieties. This implies that extension agents need to educate the arable cop farmers more about the use of improved seed varieties because, improved seed varieties can serve as a very reliable method of reducing the effect of climate change. Other mitigation practices used are planting of cover crops, cultivation of improved crop, altering of plant date, alley cropping, water management and nutrient management. This agrees with previous study which found that organic farming and planting of cover crops are ways of mitigation practices of climate change [10].

The most severe problem hindering farmers to employ mitigation practices is the insufficient extension contact. This shows that extension agents need to work more in educating farmers cultivating arable crops on the use of adaptation practices. This is evident in table 4 where most of the farmers do not use improved seed varieties. The second constraint according to their severity is poor support by the government. This implies that the government needs to provide more support to arable crop farmers especially since the area the one mainly involved in providing food for the country. Furthermore, inadequate production inputs and poor access to credits were also key constraints. The least constraint affecting arable crop farmers according to their level of severity are inadequate access to information on climate change and time consuming exercise. Other challenges to adaptation practices against the menace of climate change conditions in crop farming were insufficient land, irregularity of extension services and inadequate awareness on climate change. This corroborates the report of study which stated that insufficient extension contacts and lack of attention by the government are the main challenges facing farmers growing arable crops on the adoption to utilize climate change mitigation practices [11].

A positive and significant correlation between education attainment and adaptation practices used to minimize the effects of climate change among farmers growing arable crops indicates that the increase in education status will bring about increase use of climate change adaptation practices among farmers in the study area.

CONCLUSIONS

The research showed that climate change affects arable crops by causing loss of crops to farmers in Kwara State, Nigeria. To manage the effects, farmers mainly get climate change information through neighbor and radio. Furthermore, the research work also indicated that insufficient extension contact was the most severe challenge hindering farmers growing arable crops to use required adaptation practices against changes in climate condition.

Therefore, extension organizations in Kwara State should recruit more extension agents to enable practical field demonstration of climate change adaptation practices.
Also, government intervention programmed is needed to enable increase access of farm inputs such as improved seed varieties to help avert the effects of variation in climatic condition. More awareness of adaptation practices against the menace of change in climate should also be delivered to the farmers in Kwara State.

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PROCENA PRAKSE PRILAGOĐAVANJA POLJOPRIVREDNIKA KLIMATSKIM PROMENAMA ZA RATARSKE USEVE U DRŽAVI KWARA, NIGERIJA

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Apstrakt: Ova studija je ispitala praksu prilagođavanja na klimatske promene poljoprivrednika koji uzgajaju ratarske useve u državi Kwara.

Studija obuhvata sto dvadeset (120) farmera, upotrebom višestepene metode uzorkovanja. Raspored intervjua je dizajniran da prikupi relevantne podatke i analizira ih pomoću deskriptivnih i inteferencijalnih statističkih alata.
Rezultati otkrivaju da je prosečno radno iskustvo u poljoprivredi bilo 7 godina, pri čemu većina nema formacijsko obrazovanje. Najveći efekti klimatskih promena bili su gubitak useva (srednja vrednost=4,82), nesigurnost hrane (srednja vrednost=480) i nemogućnost planiranja unapred (srednja vrednost=4,79). Vodeće prakse ublažavanja uticaja koje su poljoprivrednici koristili bilo je: organizovanje prakse organske poljoprivrede (srednja vrednost=3,59), metode plodoreda (srednja vrednost=3,53) i pošumljavanje (srednja vrednost=3,52).
Najveći izazovi (nedostatci) za efikasno ublažavanje uticaja klimatskih promena bili su: nedovoljan kontakt sa stručnim savetnicima (srednja vrednost=4,85), slaba podrška vlade Nigerije (srednja vrednost=4,71) i neadekvatni potrebni proizvodni inputi (srednja vrednost=4,69).
Korelaciona analiza pokazuje da obrazovni status farmera ima pozitivnu vezu značajnu zbog prakse ublažavanja uticaja koje koriste farmeri.
Studija ima zaključak da organizovanje organske poljoprivrede, metode plodoreda i pošumljavanje, predstavljaju vodeće metode kao praksa ublažavanja koje koriste farmeri u državi Kwara u Nigeriji.
Postoji potreba da savetodavne organizacije u oblasti istraživanja treba da angažuju više savetodavnih agenata (stručnih službi) kako bi omogućile praktičnu terensku demonstraciju primene u praksi prilagođavanja klimatskim promenama.

Ključne reči: *Plodored, produžni kontakt, gubitak farme, nesigurnost hrane, organska poljoprivreda*

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