African Research Journal of Education and Social Sciences, Vol.9 (2), 2022 | E: editor@arjess.org | W: www.arjess.org
ISSN (Online): 2312-0134

INDIGENOUS FOOD MANAGEMENT PRACTICES AND CLIMATE CHANGE ADAPTATION IN SERERE DISTRICT UGANDA

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ABSTRACT

Climate change continues to be the single greatest threat to humanity with its blunt effects, affecting mostly the indigenous and local communities whose livelihoods are hinged on climate friendliness and dependent activities, thus the need for their involvement in shaping climate change adaptation and consequently its mitigation. For a very long time, indigenous communities have interacted with their environment and as a result, acquired immense information about it. Thus, the need for their involvement in climate change adaptation and mitigation discourse. This study, therefore, sought to examine the influence of Indigenous Food Management Practices on climate change adaptation among the Iteso community in the Serere district in Uganda. The study adopted a cross-sectional survey research design, and its sample was selected randomly. The sample size of 704 was arrived at using the Yamane formula. This included subsistence farmers, pastoralists, fishing communities, and small-scale traders. Data was collected using questionnaires and focus group discussions with the community stakeholders. For data analysis, SPSS and thematic analysis were used for quantitative and qualitative data analysis respectively, the study found that a significant portion of the population was vulnerable to food insecurity. This is mainly a preserve of both social, political, and economic factors and climate change, poor harvests from previous seasons had exacerbated their vulnerability to food insecurity. Also, over-dependence on produce to offset most households' expenses was a driver of food insecurity among the local communities, and poor agricultural and farming practices greatly affected the environment and led to climate change and food insecurity. Generally, the brunt effect of climate change among the community was manifested through food insecurity and poor agricultural production with 49.1% of the respondents indicating to be vulnerable to food insecurity and 15.1 specifying to be very vulnerable. Additionally, 84.1% of the respondents indicated that climate change was the major driver of food insecurity in the Serere district. The study also concluded that there should be a social-economic service to help offset some household expenses to prevent over-dependence on the sale of household food production. Also, there should be deliberate efforts to enhance the preservation and protection of indigenous foods and species to enhance sustainability and adoption by local communities. There should be efforts to provide food storage facilities for local communities, which will prevent wastage and post-harvest losses. Also, high-quality seeds

should be provided, those which mature in short periods and have a lengthy shelf life. This will protect communities from food insecurity and famine in the face of climate change. The study further made recommendations for policies, action, and future studies.

Keywords: *Indigenous Food management practices, Climate change adaptation, Food insecurity, Food processing*

1. INTRODUCTION

Defined as a change or variability in weather conditions and surface temperatures over a long period, especially decades or longer (IPCC, 2011), climate change is the single greatest complex challenge that affects societies in many ways and has an impact on societal development (O'Brien 2008). The 1906-2005 century saw global average surface temperatures increase by 0.74 ± 0.18 °C (IPCC, 2007). Following an observation of global air, ocean temperatures, and changes in (among others) snow/ice extent and sea level, the Intergovernmental Panel on Climate Change (IPCC) concluded that the climate system has warmed, and thus climate change is a reality that humanity ought to grapple with. As a result, the parley on climate change has been at the epicenter of contemporary discussions in all spheres of development mainly arising from the sole fear that, unlike the medieval times, the rate, and extremes at which the climate is changing, poses not only an existential threat to humanity but also threatens the future of the coming generations.

Many factors have been hailed for the phenomenon. For example, in Africa and South Asia, the rise in population size has stressed the available resources, especially land and water leading to an alteration in land use with, for example, forests and permanent wetlands turned into farmland, to feed the growing population. This has destroyed the ecosystem further exacerbating climate change. Also, the increase in greenhouse gas emissions stemming from industrialization and increased human activity on the earth's surface has led to increased global warming and consequently climate change (Sustainability, 2021). Absolute temperatures have been observed globally case in point, in 2016, every month was hotter than the previous and saw the biggest jump in atmospheric CO2 concentrations. As a result, millions of people have been suffering across the globe from the impacts of climate change. For example, the El Niño-driven drought, made worse by climate change, is exacerbating food insecurity, which strongly indicates the severe climate adaptation and disaster preparedness gap, especially in developing countries. Globally, the number of people who are displaced from their homes due to extreme weather events is unprecedented.

This situation is regarded as the biggest humanitarian crisis since the Second World War (UN, 2017).

However, the irony is that climate change is affecting the people who are the least responsible for its occurrence. The 2022 IPCC report titled impacts adaptation and vulnerability pointed out that climate change despite being a global phenomenon affected people in varying ways. People living in poverty and rural areas, who are barely responsible for greenhouse gas emissions, bear the wrath of climate change impacts. Despite governments and intergovernmental efforts to mitigate its occurrence, the trend seems to only progress. With a surge in food insecurity, increased internally displaced Persons, loss of lives due to climate-related occurrences, and environmental degradation due to human activities, measures to curtail and mitigate climate change should be intensified and the fight against climate change should take a multidimensional approach (UN 2019). In essence, the complexity of climate change requires developing and implementing a sufficiently complex response at all scales, from the international to the national, to the community, and down to the household and individual levels. One which explores the social, political, cultural, and economic spheres of climate change. While also allowing for the integration of indigenous knowledge and practices into mainstream scientific undertakings to adapt to and consequently mitigate climate change.

Climate change cannot be eliminated thus the need for adaptation. The IPCC 2022, in all its six sessions, emphasized the need for adaptation to accompany mitigation efforts. However, proposed adaptation strategies have remained prohibitive to many vulnerable communities for example the farming communities in Africa, which derive their livelihood from rain-fed agriculture because of their inability to afford smart farming practices. This leaves production to a few farmers with access to funds, education, and generally buffers to combat climate change impacts. As a result of short rain seasons and long drought periods, farmers are often faced with low productivity and reduced yield, creating food hunger, and malnutrition leaving local communities' food insecure. Several social dimensions have been proposed to promote equity in climate change adaptations. Among these is gender, which takes into consideration the roles of men and women, targeting them differently to tailor climate change interventions. Additionally, migration and government policy have also been cited as coping mechanisms for the effects of climate change. Policy actions targeted at sustainable agriculture and rural development can help tackle the challenges posed by climate change. However, such interventions have fallen short of their goal due to the alienation of indigenous knowledge and practices (Awuah-Nyamekye S, 2014). Thus, the need for incorporation of indigenous knowledge practices in the climate of climate change mitigation and adaptation.

Multiple studies have found that indigenous knowledge has not been taken into consideration when dealing with climate change in recent decades, the knowledge has been disregarded and perceived as primitive and not viable (Hobbs, N. T. 2013) & (IPCC 2022). To a larger extent, the exclusion of indigenous knowledge and practices regarding climate change mitigation and adaptation strategies among local communities could not only explain why the challenge of climate change continues to increase despite all government and international efforts but also, denies stakeholders the achievement of sustainable climate change mitigation, and adaptation strategies while also alienating local communities from the process of shaping their future regarding climate change. Given the above, to effectively curtail the progression of climate change, policymakers and stakeholders should explore how local communities without modern science have adapted and mitigated climate change. To allow for the integration of indigenous knowledge into mainstream practices and efforts to mitigate and adapt to climate change. Therefore, this study sought to examine the influence of Indigenous Food Management Practices on climate change adaptation among the Iteso community in the Serere District in Uganda.

2. METHODOLOGY

2.1 Research Design

To achieve the research objectives and to address the research problem, this study adopted a descriptive survey research design. A research design is the plan for obtaining answers to the questions being studied and for handling some of the difficulties encountered during the research process (Polit &Beck 2004). Research designs are developed to meet the unique requirements of a study. According to De Vos (1998) a research design is a blueprint or a detailed plan for how a research study is conducted. The term survey can be used to designate any research activity in which the investigator gathers data from a portion of a population for the purpose of examining the characteristics, opinions, or intentions of that population (Couchman & Dawson 1995).

A descriptive design was adopted because of its high degree of representativeness and the ease with which a researcher could obtain the participant's opinion (polit & beck 2004). This involved the use of both qualitative and quantitative data. The design provided answers to questions of who, what, when, where, and how, associated with the research problem. It also provided information about natural occurrences, health status behavior, attitudes, and characteristics of the group. Therefore, the descriptive study enhanced an in-depth understanding of climate change mitigation among agro-pastoralists, drought areas, fishing communities, and metropolitan areas respectively.

In this doing the study's findings were context-specific and provided a robust understanding of indigenous practices and climate change adaptation among the Iteso people of Serere district.

2.2 Target Population

A population refers to an entire group of individuals, events, or objects having a common observable characteristic. In most cases, a researcher first defines the population to which she or he wants to generalize the result. Also, researchers would like to generalize results to the absolute population or target population (Mugenda &Mugenda 2007). Polit and Beck (2004) defined a population as the entire aggregation of cases that meet a set of criteria. The target population is the aggregate of cases about which the researcher would like to generalize the findings. This study targeted 704 respondents using the Yamane formula. This was composed of the fishing communities, subsistence farmers, pastoralists, and the business community in the urban centers. This allowed for the attainment of a robust understanding of climate change mitigation and adaptation among the diverse groups in the Iteso community.

2.3 Sample Size and Selection

From a population of 1,188,665 according to the 2014 national population and housing census, the sample size was derived using the Yamane formula and will be selected randomly from the areas of Kasilo (Apapai and Ongoto), Bugondo, Pingire and Serere Township. The sample areas were purposely sampled due to their unique economic activities. This was meant to capture climate change adaptation and mitigation strategies among wetland, pastoralists and relatively drought-ridden areas respectively in Uganda and, among densely and sparsely populated areas. In this way, the study arrived at robust findings explaining climate change adaptation practices among the Iteso community. However, the participants were selected through stratified random sampling. This was meant to ensure that everyone had the same chance of being selected or not selected.

Table 1

Sampling Frame

Category	Population	Sample Size	Sampling Technique
Business	109,238	104	Purposive Sampling
Fishing Communities	210,115	200	Purposive Sampling
Subsistence Farmers	457,303	200	Random Sampling
Pastoralist	412,009	200	Purposive Sampling
Total	1,188,665	704	

The sample size (n) will be:

$$n = N \div 1 + N(e^2)$$

n = 4,188,665/ 1+ 4,188,665 (0.0025)

n = 704

n = 704

2.4 Instruments of Data Collection

The researcher employed questionnaires and Focus group discussions for data collection. Polit and Beck (2004) defined a questionnaire as an instrument for gathering information from respondents through the self-administration of questions on paper and pencil. The utilization of structured questionnaires enhanced objectivity and supports statistical analysis. The questionnaires were distributed to households. There were two types of questions in the questionnaire, and this included closed-ended questions and open-ended questions. This allowed the researcher to collect both qualitative and quantitative data.

Focus group discussions were conducted in groups of 5-8 people with relevant stakeholders and community members respectively to collect data relevant to the objectives. These groups were mobilized with the help of area chiefs and clan elders. Also, the conversations were held in both English and Ateso languages to allow for a robust engagement regarding climate change mitigation and adaptation. Finally, all questionnaires were collected by the researchers from different locations and kept safe while the recordings from the interviews were transcribed and prepared for analysis.

2.5 Data Analysis

The data analysis process involved several activities i.e., data editing for correctness and completeness, data coding, entry, and modification. The study employed both qualitative and quantitative methods both of which require different processes. In this case for quantitative data, cleaning of generated information through coding was undertaken to identify errors, omissions, and inconsistencies which was then be followed by a data entry and analysis process using the Statistical Package for Social Scientists (SPSS) and Microsoft Excel Package through Regression and Correlation analysis to establish the relationship between the variables of the study. The researcher then presented the findings in the form of graphs, charts, and written accounts.

For the qualitative data, the researcher undertook a descriptive statistical analysis of the information gathered from the open-ended questionnaires and the focus group discussion with

respondents. Descriptive analysis allowed the researcher to be able to detect patterns and themes from data collected for inference which was achieved through thematic analysis. In this case, the researcher identified the most predominant themes in the responses. The results were presented in charts, graphs, and reports. The findings from the analysis were reported in chapter four and presented verbally before a panel.

2.6 Ethical Considerations

Despite the high value of knowledge gained through research, knowledge cannot be pursued at the expense of human dignity thus the need for ethical precepts in research Osoo and Onen, (2005).

In social research, confidentiality and anonymity of information provided by respondents are of utmost importance. If a researcher satisfies the respondents regarding the anonymity and confidentiality of the information they provide, the validity of responses is guaranteed as they provide actual information. Therefore, the researcher ensured anonymity and confidentiality by not asking respondents to write their names and personal details.

The researcher ensured informed consent by the participants. Informed consent was established by providing information to the respondents as to the nature and purpose of the study and the objectives of the study were communicated to the respondents. This information helped the respondents make informed decisions on whether to participate in the study or not.

Also, participation was voluntary. The researcher did not in any way both directly and indirectly through incentives coerces the respondents into participation in the study against their will. The decision of whether to participate or not was left for the respondents to make and on that basis, the researcher proceeded.

Finally, the researcher also obtained a letter of approval and introduction from the University and will obtain a pass from Serere seeking permission to collect data. To ensure that all the laws of the land are observed, and that the researcher's presence and activities are not illegal.

3. RESULTS

This section presents key findings regarding food management practices as a coping mechanism in the context of climate change.

3.1 Food Processing

From the responses, 96.3% of the respondents indicated that Sun drying was their preferred food processing mechanism while 2.5% specified using local preservatives for processing their food

and 1.1% used factories to process their food. Having observed the trend, it was very clear that most respondents processed their food through sun drying. In this regard, people have harvested their produce and spread it under the sun, reducing the risk of food getting moldy or spoilt. Also, most households did not have specific areas to dry their food but instead used their compounds, public rocks, and house verandas as drying grounds for their produce which approach presented a health threat. The essence of sun drying was to remove water contents and increase aeration in food products to increase their shelf-life. Effective as sun drying may be, it has in most cases left communities vulnerable in times of natural calamities like floods and droughts because the foods could either decompose or be infested by pests. Also, those who used local preservatives gave examples like the use of red paper and Santana for sweet potato preservation, ash, and sawdust to preserve food items like beans and ground nuts among others.

3.2 Number of Meals

From the above responses, 56.8% of the respondents had two meals a day, while 36.7% of the respondents had three meals a day, 3.8% of the respondents had one meal a day and 2.7% of the respondents had more than three meals a day. Sit-down interviews and focus group discussions revealed the number of meals had daily, where a mechanism of coping with food scarcity and mainly a preserve of one's ability to access or acquire food. Follow-up interviews with participants indicated that when there is plenty of food respondents had more than three meals a day which effectively met their dietary needs. However, as the climate becomes drier and food becomes scarce, the number of meals is strategically reduced to prevent absolute starvation in cases where there is no food.

Also, the household population had an impact on the number of meals per day.

Table 2

Food efficiency and Number of Meals Per Day

Food efficiency	**Three or more**	**Two or less**	**Total**
No	70 (25.3%)	273 (63.9%)	343 (48.7%)
Yes	207 (74.7%)	154 (36.1%)	361 (51.3%)
Total	277 (100.0%)	427(100.0%)	704 (100.0%)

A Chi-square test of independence was conducted to test the relationship between food efficiency and the number of meals had per day with a chi-statistic of X-squared = 98.986, df = 1, p-value < 2.00, it was observed that the variables of food efficiency and the number of meals had per day had a statistically significant relationship and were therefore deemed dependant on each other. It was also observed that a significant percentage of participants who specified having two or more meals a day pointed out that they had sufficient food as a significant percentage of those who specified having two or fewer meals a day also did not have sufficient food. It was generally observed that the number of meals one had was a coping mechanism in that when there is food scarcity, the number of meals reduced and increased when food production was good.

3.3 Possible Causes of Food Insecurity

When asked about the possible causes of food insecurity, four responses were availed namely: Climate Change, Less Production, Increased Population, and Poor storage/ Consumption. From the responses, 84% of the respondents acknowledged that climate change is a significant driver of household food insecurity, while 59.0% pointed out that less production was a key driver of food insecurity, 49.4% pointed out that increased population was a factor in food security and 34.7% specified that poor storage/ consumption. Most of the participants acknowledged that climate change was a major driver of food insecurity in the district. This is because they could not plant crops which also led to less production in the gardens. Some respondents further indicated that the unpredictable weather had barred them from planting during the March- April rains and could have now been harvesting thus the lack of food.

Also, through focus group discussions, participants pointed out that the lack of enough land to produce sufficient food to feed their households was a driver of food insecurity. This was mainly a result of land tenure policies and traditions among the Iteso community which made land not easily accessible. It was further observed that the tenure systems and cultures disadvantaged women more than men. For instance, women did not inherit the land and did not have access to crucial economic resources as these were a preserve of the men.

3.4 Vulnerability to Food Insecurity

When asked about their vulnerability to food insecurity, the respondents were given four responses namely: Vulnerable, Not Vulnerable, Very Vulnerable, and Not sure.

According to the responses, 49.6% of Participants were Vulnerable to food insecurity, 25.4% were Not Vulnerable to food insecurity while 15.1% of the participants were very vulnerable and 9.9%

were not sure about their vulnerability to food insecurity. The varying degrees of vulnerability to food insecurity were a result of various factors both social and economic.

When the aspect of vulnerability to food insecurity in face of climate change was discussed in the focus group discussions, participants who specified to be vulnerable pointed out that the unfavourable weather conditions had made agriculture impossible and there was not much in terms of agricultural produce thus the vulnerability to food insecurity if climatic conditions continued. Also, some respondents specified that the increasing vulnerability to food insecurity among households is the lack of organization and planning among household heads, for instance, households frequently sold foodstuffs which left them with no food for household consumption. During a sit down with a retired agricultural officer, he pointed out that food insecurity was not a common situation traditionally because people planned household agriculture well, clearly indicating which farm produce was for sale and which one was for household consumption, additionally with the supervision of area chiefs and clan leaders, every household had a granary full of staples to prevent the brunt effects of famine.

3.5 How to Address Food Insecurity

When asked about how food security should be ensured, respondents were given five responses namely: climate change mitigation, efficient storage, efficient Production, Economical Consumption, and Others.

According to the responses, 67.2% of the participants indicated that climate change mitigation was an effective way of ensuring food security, while 54.8 of the respondents specified that efficient storage was an effective way of ensuring food security, 52.8% of participants pointed out that efficient production was an effective path towards ensuring food security, 50.7% opined that economical consumption of produce and 12.4% believed that other approaches besides the provided ones where effective in ensuring food security. The high preference for climate change mitigation as a pathway to ensuring food security was because of its ability to enhance agriculture and its negative impacts on agriculture. Most respondents opined that despite the high population, effective and efficient agricultural production was the most viable option for climate change mitigation and the most viable option for ensuring food security.

The study also found that there were no reliable sources of food relief in times of crisis arising from climate change.

Table 3

Food Storage Vs Food Efficiency

Food storage	No	Yes	Total
Granaries	26 (7.6%)	40 (11.1%)	66 (9.4%)
Others	214 (62.4%)	185 (51.2%)	399 (56.7%)
Regular stores	103 (30.0%)	136 (37.7%)	239 (33.9%)
Total	343 (100.0%)	361 (100.0%)	704 (100.0%)

A Chi-square test of independence was conducted to test the relationship between food storage facilities and food efficiency. With a chi-square statistic of X-squared = 9.1797, df = 2, and p-value = 0.01015, it was observed that there was a statistically significant relationship between food storage practices and food efficiency because a significant percentage of participants who indicated having granaries also specified to have enough food. Various explanations can explain the phenomenon, but the traditional aspect of food storage was a great contributor to food efficiency and those used regular food stores had a relative degree of food security, however, it was observed that a significant percentage of participants who specified use other mechanisms (sleeping houses) also specified not have enough food.

4. DISCUSSION

The study found that food management is a key adaptation mechanism because the greatest impact of climate was its brunt effect on food security. The study two a four-dimension approach to the analysis of food management i.e., food production, processing, storage, and consumption. The study found that a significant percentage of participants did not have adequate food due to the unreliable weather conditions which affected agricultural production. The study also found that agricultural production and storage were the key drivers of food insecurity, this was because less production and inefficient storage practices made produce vulnerable to waste and consequently food insecurity in the face of climate change. The study also observed that for effective food security despite climate change, efforts should be put into improving traditional food storage practices like the use of granaries, sleeping houses, and substandard stores among other practices which did not allow for a prolonged shelf life of the food product.

Regarding the efficacy of the existing climate change coping and adaptation practices, the high number of respondents who say they have done nothing about the climate change problems implies that there hasn't been sufficient sensitization concerning possible adaptation practices, or that the framers do not have enough resources to venture into adaptation measures such as planting improved seed, tree planting and practising sustainable agriculture. Early garden preparation as an adaptation to late rainfall onset enables the farmer to plant immediately when the rain starts so that the crop benefits sufficiently from the short rain period that may follow. Planting as early as the rains start is effective since it ensures that the growing crop benefits sufficiently from the available rainfall. However, many farmers often fail to achieve this due to labour shortages in their homes. This is especially true for small-sized families with very young children who cannot participate in gardening. Thus, some portions of the land are tilled late, leading to poor harvest. This practice also requires sufficient information on the expected rainfall pattern. Otherwise, one is at risk of losing their planted crops in case the rain stops suddenly.

Also, Drought resistant crops, early maturing crops/varieties and improved seed are crucial adaptation mechanisms as such crops may have the capacity to produce considerable yield even when the rains are not sufficient or come late. However, very few farmers have access to the early maturing varieties and improved seeds as these usually come at a cost that the resource-poor farmers may not afford. Most farmers keep growing their traditional varieties, making this practice applicable to only a small fraction of society. Therefore, improving food security during climate change should incorporate increased social and economic accessibility of necessary agricultural inputs.

It was also observed that avoiding the sale of food, due to the reduced harvest per season, would increase the family's food reserves. However, this has a negative impact on access to other needs of the family such as medication, clothing, and education since crop production is the number one income source of most rural households. Therefore, families that stop selling their produce are at risk of having their children drop out of school (resulting into early marriages and a generation that may not help their parents during old age), being unable to buy clothing and mosquito nets for their members (resulting in malaria and pneumonia infections) and being unable to seek medical attention in case of sickness (resulting in miserable deaths). All these will eventually result in setbacks in the development of the communities. Another practice related to this was consuming food sparingly; this would allow the household to "survive" with little harvested produce but also puts the family members, especially children, at a risk of malnutrition that may escalate into death. Therefore, social-economic empowerment should be incorporated into mainstream climate change adaptation initiatives

Altering crop types depending on the rainfall situation in a given season is an effective adaptation measure as some crops can tolerate drought/excessive rainfall more than others. For example, if there's too much rainfall, the farmers grow sorghum instead of cassava since cassava is very susceptible to rotting. Some farmers mentioned that they sometimes decide to re-plant crops when the original ones are scorched and killed by lack of rainfall. This could be a good option though it has great implications on labour demand which is now diminishing as many people are seeking off-farm activities.

A small fraction of the participants mentioned soil and water conservation as a means of adapting to droughts and floods. It was evident from many gardens that farmers maintain grass bans between gardens with the purpose of conserving water and soil, and also ensuring that flood water can sink under these bans. The farmers, however, complained of a few community members that are failing to adhere to this practice. This is such a commendable practice that should be encouraged. Other environmental conservation practices such as agroforestry and application of manure are potential climate change adaptation practices although they are not widespread. Water harvesting was also mentioned as an adaptation measure; however, this water seems to be used in the household and not for crop production since no farmer was found to be practising small-scale irrigation.

Seeking off farm jobs can be a saving option for the lucky peasants who may be able to find a job or employ themselves in other ways. In southwestern Nigeria, this was found to be the most common adaptation practice among the arable food crop farmers (Apat et al., 2009). However, it is worthwhile to note that all these "mouths" that abandon crop production will have to be fed by the remaining few farmers. Consequently, the amount of food produced will reduce and the food market prices will go high since more food from other areas will have to be supplied. This will eventually cripple the progress of those that have abandoned agriculture as they will be spending most of their income on food supplies. During the FGDs, the participants lamented that many young people have abandoned crop production; there are more mouths to feed than those engaged in food production.

Also, Cultivation in high areas is an effective adaptation measure to flood occurrence for those who have plots in such areas. This practice on the other hand is a dream for the people whose areas become entirely affected by floods like those who do not have access to high areas, warranting re-location.

The community members also mentioned that they report to the sub-county officials for help when calamities such as floods and drought destroy their crops. The sub-county officials later forward the reports to the government and NGOs who usually provide food aid (maize flour and beans) and some seed. Nonetheless, the food aid usually provided is usually insufficient i.e., it cannot

feed the households for the several months they take without any harvest. The households have to seek help elsewhere, such as from relatives who have employment in towns. Some farmers lamented that a lot of maize floors may be sent by NGOs, but each household may receive only two cups full. A Sub- County chairperson also lamented that his reports are usually not responded to immediately by the government department of disaster preparedness and awareness.

The study also found that culture was a key component for climate change adaptation in Serere district because it framed the context through which climate change occurred and was perceived among a particular group. From the field observation, a significant percentage of them specified that climate change was a result of both man-made and supernatural factors. The belief that supernatural beings had anything to do with the changing climatic conditions had a bearing on people's responses and therefore in a way culture influenced people's perception of climate change and also influenced how they responded to government initiatives in climate change adaptation and mitigation. Additionally, it was observed that traditional practices to some extent negatively impacted the environment leading to climate change for example rice cultivation and house construction in wetlands and bush burning as a means of clearing the land among others had an impact on the environment and consequently led to climate change. Similarly, it was also observed that climate change had a negative impact on climate, for instance, climate change-induced migration led to cultural diffusion among the victims, and the loss of traditional plants and forests. Generally, it was observed that central-local climate change adaptation initiatives.

Regarding gender roles, it was observed that despite the seemingly equal impact of climate change on both genders, the indirect impacts of climate change had varyingly far-reaching social, political, and economic effects on men and women. For instance, it was observed that traditionally, that the role of earning household income was left to the male folk while ensuring household sustainability in terms of food production, ensuring there is enough food, its production, management, and consumption was left to women. And therefore, this disadvantaged women economically since most of their labour was unpaid unlike the men and also despite the droughts and floods, households still looked to the women folk to ensure there was household food. However, the scarcity that came with climate change had a bearing towards participants' psychological being since some became victims of violence, abuse and death in which case women were more vulnerable.

Lastly it was observed that people generally understood climate change and its impacts. However, the men had a high likelihood to participate in climate change while women were more caught up in instant gains for continued survival of their households. Also, despite the understanding climate change a significant portion of respondents believed that to some extent something could be done to address climate change, but they also believed that, to les extent their responsibility to mitigate

climate change, they believed that the government had to lead in climate change adaptation and mitigation initiatives since the local communities did not the capacity. Therefore, there was a need for deliberate sensitisation to increase awareness on climate change, adaptation and mitigation and the significance of local community participation in this regard.

Regarding the farmers' perceptions of climate change and its effect on crop production. The results of the respondents" climate change perceptions imply that although the rural people do not know the science behind climate change, they have observed changes in their local weather and seasons. The citizens relate climate change to only environmental degradation in and around their areas; for example, cutting of trees and cultivation in wetlands to be responsible for increased drought; and, poor ploughing methods, bush burning and lack of grass bands being responsible for increased floods. Thus, the citizens are not aware of the global warming caused by the greenhouse gases emitted by industries and vehicles elsewhere, including places outside Uganda. These results are like those of the research conducted by the BBC World Service Trust, 2009, that found that most Ugandans often make little distinction between environmental degradation and climate change. In the same study, the media of which the radio is part was found to be the major source of climate change awareness (similar to findings from this study). The radio assumes the number one position in creating climate change awareness because many participants could afford it.

5. CONCLUSION

The study concluded that despite the increasing threat that climate change poses to local communities in Serere and the eastern region of Uganda, very little had been done to deliberately bring such communities to the discussion table where climate change adaptation and mitigation strategies are being identified and implemented. Therefore, this top-down approach which alienated local communities could effectively explain why the phenomenon persisted among local communities. Also, the study concluded that climate change mitigation initiatives should entail social empowerment initiatives to allow for sustainability. This is because the lack of alternative sources of income besides farming made communities more vulnerable. Therefore, there should be training in hand skills like tailoring, kneading, and backing among other stops to provide an alternative source of capital. In this way, vulnerability to the brunt effects of climate change will be reduced since there is a continuity in income flow despite climate change.

The study was premised on the diffusion of innovations theory and social systems theory. The study findings affirmed the thesis of the social systems theory by acknowledging the role of various institutions in climate change adaptation among the Iteso community. The study observed that the various social institutions like the family, education, religious and cultural institutions among

others were a fundamental factor in enhancing sustainable community climate change adaptation. The study also affirmed the aspect of social acceptance in innovation acceptance because society had its traditional coping mechanisms that were always in conflict with mainstream innovation. Therefore, social acceptance was proven to be the last stage in the adoption of the innovation.

Studies should be conducted to establish the impacts of climate change on men and women so as to arrive at the necessary gender-sensitive climate change mitigation strategies. Studies should also be conducted to understand how minorities indigenously cope with climate change. Further studies should be conducted to find out sustainable climate change adaptation and mitigation approaches among local communities.

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