CLIMATE CHANGE MITIGATION AND GENDER INEQUALITY NEXUS: EVIDENCE FROM SUB-SAHARA AFRICA

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ABSTRACT
While efforts and policy have been pursued towards adapting to and mitigating against climate change towards achieving sustainable development, the role of gender has not been given the required attention. This study is aimed at determining the impact of closing the gender gap on the mitigation of climate change. The panel least square estimated method was employed spanning from 2008 to 2020 and on some countries in Sub-Saharan African. Agriculture nitrous oxide emission as a % of total emission (AN2O) and CO2 emissions from gaseous fuel consumption as a % of total (CO2FE) were used to capture climate change. Various measures of gender gap showed a substantial impact on climate change. While female tertiary enrolment, female to male labour participation ratio, and government national expenditure % of GDP were negatively related with agriculture nitrous oxide emission as a % of total emission and agricultural sex employment ratio had a positive relationship with climate change. The study thus, advocates among others the increase of females in the engagement of non-agricultural activities as well as an increase in female tertiary education to mitigate climate change

Keywords: Climate change, gender gap, mitigation, panel data, Sub-Saharan
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1. INTRODUCTION

Climate change remains a threat to the effective achievement of the global Sustainable Development Goals (particularly SDGs 1 and 2). UN reported a climate disaster cost of $250billion to $300 billion per annual between 2003 and 2013 (United Nations Development Programme (UNDP), 2016). Climate change can hamper all developmental efforts starting from impediments to agricultural production as a result of flooding and drought which has resulted in food insecurity. For instance, in 2017, disasters and floods as a result of climate change displaced 18.8 million people, About 132 million people of the global poor are estimated to be living in areas with high flood risk in 2018, while climate change is estimated to drive 68 million to 132 million into poverty by 2030 (Global Report on Internal Displacement. 2018; World Bank, 2021). Climate disasters have also been seen to increase gender-based violence (GBV) (sexual harassment and violence), domestic violence, sexual exploitation of children, and human trafficking (UN Women, 2016). The agricultural sector, the poor and slighted group of individuals are affected most by climate change because of their weak resilience and high venerability has given their high dependence on natural resources and a high poverty level of which is more among females.
With the realities of climate change which started in 1979, the global economy has not been silent about it. Several conferences (world climate conference by the World Meteorological

Organization of 1979, Intergovernmental Panel on Climate Change (IPCC) in 1988, and the most critical steps of the adoption of the United Nations Framework Convention on Climate

Change (UNFCCC) in 1992, and the Kyoto protocol of 2005) have been held seeking for the way out. Although these yielded remarkable success over the years, but not in all regions and this has been as a result of some factors which may have not been accounted for before now.

Gender inequality among other forms of inequalities has tenaciously shackled global developmental efforts including climate change mitigation. Data showed in 2018 that the global labour force participation rate for men was as high as 75% as compared to the low rate of participation of 48.5% for women (International Labour Organization (ILO), 2018). Also, while the global unemployment rate for men was 5.5 %, that of women was 6.2% and the share of women to men in informal employment (including agricultural workers) was 7.8% higher than that of men with 1/3 of women's global employment being in the agricultural sector and accounting for only 12.8% of agricultural landholders. Access to finance is also very low, about 58% in comparison to 65% for men representing (Food and Agriculture, (FAO), 2015; ILO, 2018) yet females are bearing the brunt of coping with climate change associated shocks, stress and pollution, and are14 times more likely than men to die during a disaster (Center for International Environmental Law & CARE International, 2015).

However, the effect of climate change differs across regions and countries. Africa has been noted to be likely the continent most vulnerable to climate change (Parry et al, 2007). This was confirmed by Sarkodie and Strezov (2019) in their studies on 192 United Nations that the region most vulnerable to climate change in Africa. Gender inequality has also been found to be prevalent in Sub-Saharan Africa irrespective of various efforts at achieving gender equity. The region has the highest Gender Inequality Index of 0.527 in 2015 (UNDP, 2016). UNDP (2010), noted that in 2008, as measured by Gender Inequality Index, the deficits as a result of gender inequality were 73.5% for Sub-Saharan Africa as compared to the World deficit of 56%. There is limited or no access to all productive resources such as credit, agricultural inputs, formal employment, and education. There are little or no legal rights to access or own land. Females are engaged more in non-formal employment than formal. The International Labour Organization (ILO) (2011) showed that in 2009, employment of men to women is 62.9% and 81.2% in Sub-Saharan Africa while ECA in Gender sustainable development report (2015) showed that in 2011, women's share in nonagricultural paid employment in Sub-Saharan African was 39.6%.

Analysis of gender and climate is a recent issue of policy debates in the analysis of climate and environmental change. But, only a few studies have examined the adaptation impact of gender (Tacoli et al., 2014, Fawzy, et al, 2020). This may be associated with the recent widespread accepted fact that the poorest and the women are the worst hit by climate change. However, the potentials of women to substantially contribute to the mitigation of climate change has received less attention in the different climate change mitigation strategies designed and implemented. To the best of our knowledge, there has not been an empirical study on the impact of gender inequality in the mitigation of climate change. Vital links are assumed to be found between climate change and gender inequality. While climate change can reduce the progress towards gender equality and pose a hitch to the achievement of development, gender inequality can aggravate the effects of climate change.

Hence, it becomes imperative to investigate the connectivity between climate change mitigation and gender inequality towards achieving sustainable development in Sub-Saharan Africa. Thus we may ask: How is gender inequality related to climate change mitigation? Hence, the objective of this study is to determining the impact of closing the gender gap on the mitigation of climate change in Sub-Saharan African. The research will prove valuable for addressing gender gaps in climate change mitigation. It can be argued that if gender equality

initiatives are incorporated into climate change mitigation actions, poverty and inequality will be reduced and sustainable development in Sub-Saharan African can become achievable. Hence, this study is crucial as it is set to fill the gap in the literature on Sub-Saharan Africa by answering the above questions. The study intends to employ a panel data framework where the data was analyzed using the Panel Least Square regression approach.

2. LITERATURE REVIEW

2.1 Conceptual Literature

Conceptualization of Climate, Climate change, and climate change mitigation

Climate is defined as the average weather or the mean and variability of temperature, precipitation, or wind over a period ranging from months to thousands of years (IPCC, 2018). Climate change is stated as the increasing temperatures and weather patterns, which is resulting in environmental degradation having social and economic impacts. This is usually a result of greenhouse gas emissions which result in the trapping of heat by the earth's atmosphere resulting in global warming (Yue & Gao, 2018). These greenhouse gasses include nitrous oxide (N2O), carbon dioxide (CO2), methane (CH4), and fluorinated gases among which are perfluorocarbons (PFCs) and sulfur hexafluoride (SF6) (UNFCCC, 2008). There are two major channels through which greenhouse gases are generated: the human activated and natural systems. However, human activities have a greater impact on the climate.

The natural systems include forest fires, permafrost, volcanoes, earthquakes, etc while the human factors are majorly energy usage and production activities of man among which are industrial activities, poor agricultural activities, and domestic energy use. Data showed that of the 55.3 GtCO2e amount of global greenhouse gas emitted in 2018, CO2 fossil as a result of energy production and activities of the industries accounted for about 68% while land use and agricultural activities accounted for 6.4% (United Nations Environmental Programme, 2020). Thus, human activities accounted for about 74% of total greenhouse gas. In the analysis and response to climate change two concepts/approaches are obvious; mitigation and adaptation.

'Mitigation' is concerned with withstanding or opposing or trying to put an end to factors that cause climate change. Thus, climate change Mitigations are all efforts to reduce or prevent the emission of greenhouse gases (Lambrou & Piana, 2006). Mitigation measures are actions that are taken to reduce and curb greenhouse gas emission**s.** These include the use of new technologies and renewable energies, as well as changing human practices and consumption. The aim is to significantly reduce/avoid human interference with the climate system thereby stabilizing the greenhouse gas levels towards ensuring good living climate conditions for food production and sustainable economic development (National Aeronautics and Space Administration (NASA), 2021). Adaptation on the other hand is concerned with building the capacity to react to or withstand the crush of climate change. Its measures are actions that concentrated on reducing the vulnerability of the effects of climate change. Its objective is to reduce human vulnerability to the harmful aftermath of climate change such as sea-level encroachment, extreme weather situations, or food insecurity. It is also concerned with making the most use of what is now available/advantageous opportunities of climate change (for instance, longer growing seasons or increased yields for some regions). Thus, while mitigation is concerned with the causes of climate change, adaptation addresses its impacts**.**

Concept of gender inequality

Gender is defined as a socially constructed role, opportunities, and responsibilities that have to do with men and women. It can also be defined as the unseen power structures that govern the relationships between the sexes. According to UNDP (2010), the inequality between the sexes is not a result of biological points but resolved by the learned and inequitable social treatment (UNDP, 2010). Gender equality is stated in various ways but inclines to five main components: unequal distribution in rights, privileges, values, circumstances, outcome, and agency. Gender

equality occurs when there is equity in some key dimensions: accumulation of *endowments*, the use of those endowments to *access economic opportunities* and generate *returns (education, health, land, etc),* and their application to take actions, or *agency*, affecting individual and household wellbeing.

Gender and climate change

Before now there has been little focus on gender-climate change mitigation. Nevertheless, since human behaviour and activities are the driving causes of climate change, studies around mitigation must also be gender-sensitive. Climate change/ climate change mitigation actions and gender is concerned with human activities which are predominant in the agricultural sector and the industrial sector. Data showed that the

agricultural sector is dominated by women, particularly in rural areas. Women learn to play a greater role in the management of natural resources and nutrition. Women's involvement in agricultural capacity is most common in regions most adversely affected by the impacts of climate change, especially Sub-Saharan Africa and Asia. Hence, the responsibility of mitigating climate highly falls on their shoulders (Canadian International Development Association, 2002). However, required and/or customary laws usually restrict women's property and land rights. This often makes access to credit and agricultural extension services difficult for them. In addition to this, reducing their spur to engage in environmentally sustainable farming practices as well as making long-term land rehabilitation investments. Rodenberg (2009) noted that women have deficiencies in the rights over land for the means of production. They also suffer from technology, information, finances, and training, e.g., in climate mitigation and prevention of disaster. From studies, women and children are 14 times more likely to lose their lives in a natural disaster (Araujo, et al, 2007). Hence, they are highly needed in the reduction of the causes of climate change.

2.2 Theoretical Literature

Functionalist theory: Put forward by Talcott Parsons in the 1940s and 1950s, it posits that gender inequality is an act of creating division of labour between genders with the aim of maximization resource. It believes that the women are should take care of the home and the men basic needs of the family (Ewubare & Ogbuagu, 2017). This role of women in taking care of the house, often open them to the use of more of energy than men.

Feminist theory: This is an opposite of the functionalist theory and argues against gender inequality. To the feminist theory, gender inequality is a simultaneous actions towards the benefit of the family and the economy irrespective of the genders. This was based on the Intra-household bargaining of husbands and wives model that gender's preferences differ (Prettner & Strulik, 2017).

2.3 Empirical Literature

There exist a dearth of literature on gender inequality and climate change mitigation. Although some studies were carried out on the adaptability or vulnerability of climate change as it relates to gender. Among the very few studies are the studies carried out by Dankelman (2002) where it was strongly argued that climate change does not only need technology as a solution but also equity in welfare and distribution. Hence in exploring the linkage between environment and gender, a positive and negative relationship was found between gender and climate change .Umar and Ibrahim (2011) assessed the perception level of farmers to climate change. They made use of 63 random farmers in Nasarawa State, Nigeria, and found that the knowledge of climate change is high among the farmers. As a result of this, the farmers tend to moderately practice organic farming although not deliberately mitigate climate change.

In another study, Alexander (2011) examined the understanding of researchers to the vulnerabilities to climate change in Africa particularly women that depends more on the natural environment. The result of the study showed 46 of Africa's nations, women account for at least 40% of agricultural workers. It was also found that there is a strong relationship between climate change and environment-based livelihoods, thereby being related to gender. The determinant of the demand of renewable energy and the intensity of carbon emission in sub-Saharan Africa as a means of mitigation of Co2 emission was investigated on by Asogwa, Ugwuanyi and Anumudu (2018). They employed the principal component analysis and it was revealed that population density was a major condition for the regeneration of renewable energy.

In a more recent studies, Adzawla, Azumah, Anani, and Donkoh (2019) investigated the gender aspect of climate change adaptation using descriptive statistics on 300 farmers in two districts in Ghana. The outcome showed that climate change has affected the lives of many, particularly females. Remarkable differences were found in the adaptation of males and females. Also, using a survey of 99 participants, seven focus group discussions, and 13 in-depth interviews in a coastal community in Vietnam, Phan, Jou and Lin (2019) investigated the main cause of gender inequality in their ability to adapt to climate change emphasizing on the role of social capital. Climate change was noted to have exacerbated gender inequality. The outcome showed that gender norms are the main reason for division and interactions of men and women

in formal and informal networks. They thus recommended that attention be paid to gender issues (reducing gender imbalance) in the formulation of policies on climate change.

Agu, Obodoechi and Ugwu (2021) analyzed the impact of Co2 emission, and temperature change as measures of climate change on the productivity and labour supply of farmers in Nigeria. Using OLS method of estimation, temperature change and rainfall positively impacts on the productivity of the agricultural sector in Nigeria. CO2 emissions was found to have a significant and positive impact on Nigeria's agricultural output. Following Agu et, al, (2021) is the analysis of the effect of the consumption of renewable energy in the decarbonization of Nigeria's energy carried out by Onyechi and Ejiofor (2021). The Fully Modified Ordinary Least Squares estimation method was employed and the outcome of the study revealed that trade openness and Co2 emission from non-renewable energy are positively and significantly related with the consumption of renewable energy consumption. On the other hand, urban population, GDP per capital and oi rent do not have significant impact the consumption of renewable energy.

2.4 Research Gap and Value Addition

The outcome from previous researches has shown that it is important to eliminate gender inequalities in climate issues. For example, some studies (Haigh & Vallely, 2010) noted that the workload for women increases when the climate becomes bad (unfavourable) and they are more in poverty. This is also attributed to inequality in all areas of life. Hence reducing the gender gap can help increase their empowerment and reduce their venerability to climate change. However, the best way to reduce the venerability is to reduce/ put an end to its occurrences. Thus, an effort to eliminate gender inequalities requires a specific gender-based policy. Agriculture and greenhouse gasses have been identified to be a major cause of climate change. It has also been established that women are more in these activities.

Therefore, it is crucial to recognize that gender inequality is one of the overriding causes of climate change. It has also been proved that the gainful empowerment of women will reduce their poverty level (Ogbeide-Osaretin, & Uwaifo, 2020), reduce their pressure on the environment, improve social and environmental quality, and thus, mitigating climate change. Lambrou and Pianna, (2006) and Mignaquy, (2020) observed that the inclusion of gender in all demission of climate change policy including taking responsibility to mitigate climate

change need to be made. Despite, these and the relevance of the relationship between gender equality and climate change mitigation a review of the previous literature showed that there is a paucity of empirical research to prove this relationship. Rather, studies on climate change and gender had been on venerability. The particular relevance of the need for a study of this in Sub-Saharan African is the high level of poverty and gender gap in the region as well as a high level of pressure on the environment from this region. These gaps in the literature have propelled the necessity of undertaking this research.

3. METHODOLOGY

3.1 Econometric Model Specification

This study is based on the functionalist theory. It is model on a panel data framework to enable us to account and isolate the effects of countries specific time-unchanging characteristics specifically the level of development. Wooldridge (2002) also showed the relevance of using panel data to solve the problem of omitted variable. The conventional form of panel data framework is given as:

$$yit = \alpha it + \beta i\, Xit + \mu it \quad . (1)$$

$$\mu it = \mu i + vt + \varepsilon i,t \quad (2)$$

with *yit as* response variable, while αit, βi and *Xit* are k-vectors of regressors that are not constant and parameters for i =1, 2, …, n cross-sectional constituents (countries); t =1, 2 … T is time series part; μit is the accustomed disturbance, with μi, the country's, unobservable weight, *vt,* is a time specific factor and εit an idiosyncratic disturbance.

This study builds on the inequality--- development model imitated by Ahluwalia (1976) and modified by Anand and Kanbur (1992) by dropping the log-quadratic equation of Ahluwalia (1976).

However, since the concern of this study is on gender inequality and climate change, we modified the framework by using some measures of Gender inequality. The model of the impact of gender inequality (assuming a linearity of inequality) on climate change for this study is given below as:

$CH_{it} = \beta_0 + \beta_1 GI_{i,t} + \varepsilon_{i,t}$ ……(3)

Where CH is a measure of climate change and for this study, agriculture nitrous oxide emission as a % of total emission (AN2O) and CO2 emissions from gaseous fuel consumption as a % of total (CO2FE) were used. This tis to determine which of these sources of climate if influenced more by gender inequality. GI is measures of gender inequality and increase in the inequalities are expected to increase climate change. As has been identified by literature, some determinants of inequality are government expenditure and human capital development (Ngepah, 2016). Hence, for the sake of gender inequality, female tertiary enrollment was introduced the. Increase in female educational level is anticipated to ease gender inequality as it will increase their opportunity for employment in skilled and high paid jobs and tertiary education provides opportunity for technological advancement. Government expenditure is envisaged to reduce inequality especially if aimed at redistributing income to enhance the welfare of the group, here, female. This is expected to be negatively related with climate change which is in line with literature (Li & Zou, 2002).
Putting in all these variables into the models, our comprehensive model for the study from equation is given as:

$AN2O_{it} = \beta_0 + \beta_1 ASEMR_{i,t} + \beta_2 FTGEN_{i,t} + \beta_3 SLPR_{i,t} + \beta_4 GNE_{i,t} + \beta_5 FAH_{i,t} + \beta_6 INF_{i,t} + \varepsilon_{i,t}$ ……(4).

$CO2FE_{it} = \beta_0 + \beta_1 ASEMR_{i,t} + \beta_2 FTGEN_{i,t} + \beta_3 SLPR_{i,t} + \beta_4 GNE_{i,t} + \beta_5 FAH_{i,t} + \beta_6 INF_{i,t} + \varepsilon_{i,t}$ ……(5).

Where
AN2O is agriculture nitrous oxide emission as a % of total emission
CO2FE is CO2 emissions from gaseous fuel consumption as a % of total
ASEMR is Agricultural female to male employment ratio
FTGEN is female tertiary enrolment rate
SLPR is female to male labour participation ratio
GNE is government national expenditure % of GDP
The model is estimated using the panel least square method of estimation.

3.2 Data

The data for the study was obtained from the World Bank (World Development Indicators), (2020) for 13 countries in Sub-Saharan Africa (Ethiopia, Kenya, Rwanda, Tanzania, (East Africa), Angola, Botswana, Congo DR, Lesotho, South Africa (Southern Africa), Cote d'Ivoire, Ghana, Liberia, and Nigeria (West Africa). These countries were selected only based on data availability as well as ensuring complete coverage of Sub-Saharan Africa for this study. The study is for the period 2008 -2020 which is a long enough time period.

4. EMPIRICAL EXAMINATION

4.1 Correlation Analysis

Table 1: Correlation matrix

	AN2O	CO2FE	ASEMR	FTGEN	SLPR	GNE
AN2O	1.000000					
CO2FE	0.548705	1.000000				
ASEMR	-0.209256	0.431489	1.000000			
FTGEN	-0.505357	-0.202950	0.134166	1.000000		
SLPR	-0.323233	0.300273	0.920931	0.187031	1.000000	
GNE	-0.592921	-0.359050	0.463160	0.378274	0.515404	1.000000

The determination of the degree of the multi-collinearity among the variables of the model presiding the regression analysis is carried out using the Pearson correlation coefficients and the result is presented in Table 4.1. No multicollinearity was found among the variables from the outcome of the result. Agricultural sex employment ratio (ASEMR), female tertiary enrolment (FTGEN), female to male labour participation ratio (SLPR), and government national expenditure % of GDP (GNE) had a negative correlation with agriculture nitrous oxide emission as a % of total emission (AN2O). However, examining the correlation between the dependent variables and CO2 emissions from gaseous fuel consumption as a % of the total (CO2FE), the result showed that ASEMR and SLPR were found to be positively correlated with CO2FE while FTGEN and GNE were found to be negatively correlated with CO2FE. This suggested that gender negatively correlates with agents of climate change.

Although there is a high correlation coefficient between Agricultural sex employment ratio (ASEMR) and female to male labour participation ratio (SLPR), this however calls for concern. But given the importance of the two variables in the model (measures of gender inequality) we could not remove them from the model. However, it is also important to note that one of the remedies to multicollinearity according to Gujarati (2003) is to do nothing, particularly when there is no redundant variable in the model. Hence, the model was estimated. These were contrary to our a priori expectations. Nevertheless, a simple bivariate correlation has failed to capture the impact of some other variables in the relations of the variables of interest. Hence, there is the need for a multivariate analysis from where the policy recommendation for this study was drawn.

Table 2 Estimation of gender inequality variables and agents of climate change

	Estimation using AN2O as Dependent Variable	**Estimation using CO2FE as Dependent Variable**
Explanatory variables	**Coefficient/Probability**	**Coefficient/Probability**
ASEMR	28.46290* (0.0000)	9.450845* (0.0000)
FTGEN	-5.548773* (0.0000)	-0.100335 (0.2589)
SLPR	-44.09134* (0.0000)	-3.581673* (0.0021)
GNE	-0.394402* (0.0000)	-0.094704* (0.0000)
C	83.61972* (0.0000)	4.375561* (0.0000)
	R^2=0.6776 Adj R^2=0.4735 F(sat)= 117.68 F(pro)=0.000 DW=1.964	R^2=0.7929 Adj R^2=0.5897 F(sat)= 187.55 F(pro)=0.000 DW=1.9784

***Indicates significant at 5% level of significance**
Source: Author's computation

4.2 Estimation and interpretation of Result

Interpretation of result

As shown in Table 2 (appendix), the fitness of the model was scrutinized and was found well fitted. R^2 of 0.6776 indicated that 67% of the variation in the dependent variable was explained by the explanatory

variables. The DW statistics was 1.964. This confirms the absence of autocorrelation. Looking into the relationship and impact of the independent variables, Table 2 revealed that for the model with agriculture nitrous oxide emission as a % of total emission (AN2O) as a measure of climate change, Agricultural female to male employment ratio (ASEMR), is positively and substantially related with climate change which is in line with expectation. On the other hand, female tertiary enrolment (FTGEN), female to male labour participation ratio (SLPR), and government national expenditure % of GDP (GNE) had a negative significant impact on climate change which are all in line with theoretical and our expectation. The substantial impact of FTGEE signifies the need of improving the tertiary education of the female gender because that will give them more opportunity to be gainfully employed in higher paid jobs, earn more, reduce poverty level and dependence on natural resources thereby reducing climate change.

Specifically, the result showed that a 1% increase in the Agricultural female to male employment ratio will lead to a 28% increase in the emission of agriculture nitrous oxide emission as a % of total emission and climate change. On the other hand, 1% increase in female tertiary enrolment, 1% increase in female to male labour participation rate in internet banking, and 1% rise in government national expenditure % of GDP will bring about a 5.5%, 44%, and 0.4% surge in climate change of which they all have a substantial impact on climate change.

Examining the connectivity between gender inequality and climate change through the emission of CO2FE as a Dependent Variable, Table 2 showed that the result is similar to that of AN2O although the magnitude of the variables differs. The result also showed that

Agricultural female to male employment ratio (ASEMR), was found to be positively related to CO2FE with significant impact. On the other hand, female to male labour participation ratio (SLPR) and government national expenditure % of GDP (GNE) had negatively and substantially impact on CO2 emissions from gaseous fuel consumption as a % of total emission

(CO2FE) measure of climate change while FTGEN was found to be positively related to CO2FE without a significant impact.

On the magnitudes, the result showed that a 1% increase in ASEMR and FTGEN leads to a 9% and 0.1% increase respectively in the emission of CO2FE and climate change. While 1% increase in SLPR and GNE leads to a 3% and 0.1% fall respectively in CO2FE.

5. POLICY DEDUCTION OF EMPIRICAL DISCOVERY AND CONCLUSION

5.1 Implication of the discoveries and policy supposition.

i) The study exhibited a positive and substantial impact of the ratio of female to male employment in the agricultural sector on the climate change measures particularly on the agriculture nitrous oxide emission as a % of total emission measure of climate change. Given that emissions from the agricultural sector are a major contributor to climate change (United Nations Environmental Programme (2020), the implication of this is that the gender inequality that has made females be more in the agricultural sector with no resources for green practices has been a contributing factor to the ever-increasing climate change. Hence, this study recommends that for effective climate change mitigation, the reduction of gap in Agricultural female to male employment ratio (ASEMR) is highly recommended by increasing the proportion of females in nonagricultural employment. Also, increasing the income level of females so that even if they are in the agricultural sector, proper practices can be carried out as they have access to resources (land, credit, etc) needed for clean agricultural practices. More so, the proportion of women in the agricultural sector will also be reduced with the reduction in the gender gap of formal employment thereby reducing the pressure on the natural resources as their income level has increased.

ii) The result of the impact of ASEMR on the mitigation of climate change was strengthened by the outcome of female to male labour participation ratio which had a negative and significant impact on the climate change mitigation. This result implies that as the ratio increases (more females in the labour force) the rate of emission of both agricultural and carbon oxide into the climate causing climate change reduces.

Therefore, climate change can be effectively mitigated by increasing the share of females in employment. This study, therefore, recommends the increase in the share of females in labour force for effective mitigation of climate change. The outcome of this study is in line with Ogbeide-Osaretin and Uwaifo (2020) who found that gender inequality reduction is a vital tool for the achievement of sustainable development.

iii) Education has always been recommended as a key for development. This is also expressed here. The result of the study showed that climate change mitigation can be achieved with an increase in female education in tertiary levels of education. This is shown by the negative and significant impact of FTGEN on AN2O and CO2FE which were the measures of climate change. Thus, increasing the level of education of females will help them acquire the knowledge of clean practices which will reduce the amount of emission of gaseous waste into the climate. At this time, it will increase their income level and as such reducing their pressure on natural resources. The study consequently advocates for the encouragement of female higher degrees in education to narrow the gap in education and advance technological literacy. With higher education, they can be engaged in higher paid jobs, which will mean a higher level of income and as such reducing dependency on natural resources thereby mitigating climate change.

iv) The results further showed that government expenditure significantly reduces climate change given its negative relationship with AN2O and CO2FE. As such, a continued increase in government expenditure is particularly recommended especially in the development of human capital (education).

5.2 Conclusion

Climate change still poses a threat to the effective achievement of the global Sustainable Development Goals. While various policies have been put in place to combat this challenge, the role of closing the gender gap as a measure of mitigating climate change has not been given the required attention. Hence, this study dived into assessing the effectiveness of the reduction of gender inequality in the mitigation of climate change.

The upshot of this study showed that closing the gender gap is an important tool that can help in the mitigation of climate change. Various channels by which this can be achieved as found from the result of this study are in the reduction of the proportion of females in the agricultural sector or increase their income level as well as the availability of resources (land, credit, machines) needed for clean agricultural practices. Also, an increase in the share of females in labour force, as well as an increase in higher levels of education for females (tertiary education), are important channels by which the gender inequality gap can be closed and climate change mitigated.

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