

Research Article**IMPACT OF CLIMATE CHANGE ON THE ESTABLISHMENT OF SCHOOL FARMS IN SECONDARY SCHOOLS IN BAYELSA STATE, NIGERIA*****Salome Emeya and Indakimi, Markson E.**Department of Agricultural Education, Faculty of Vocational and Technical Education,
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Abstract

The study was carried out to investigate the impact of climate change on the establishment of school farms in secondary schools in Bayelsa State. Two specific objectives, two research questions and two null hypotheses were tested in the study. The study employed a descriptive survey research design. The population of the study was 105 public secondary school agricultural science teachers in Bayelsa state which comprised 66 male teachers and 39 female teachers. There was no sampling technique adopted for the study since the population was manageable. The researcher used the total population of 105 agricultural science teachers for the study purposely out of 217 public schools. Data collected were analyzed using mean and standard deviation for the research questions while t-test was used for the hypotheses at 0.05 level of significance. A 19-impact item questionnaire tagged: "Impact of Climate Change on the Establishment of School Farms in Secondary School Questionnaire was developed by the researcher from literature reviewed. A five-point Likert scale of strongly agree (SA), agree (A), undecided (U), Disagree (DA) and strongly disagree (SD) with a numerical value of 5,4,3,2, and 1 respectively were used for data collection. Three experts from the Department of Agricultural Education, at Niger Delta University validated the instrument. Pearson Product Moment Correlation Coefficient was used to determine the reliability of the instrument and a reliability coefficient of 0.85 was obtained. Findings revealed from the study indicated two areas, namely the impact and the causes, on the establishment of school farms in secondary schools in Bayelsa State. It also revealed that nineteen (19) impact items were identified in the study as impact of climate change on the establishment of School farms in secondary schools in Bayelsa State. It was concluded that climate change poses significant threats to the establishment and sustainability of school farms in secondary schools in Bayelsa State. Based on the findings, it was recommended among others that Bayelsa State Ministry of Education should integrate climate change education into agricultural science curriculum. The Ministry of Agriculture should also promote agro forestry and conservation of agriculture practices.

Keywords: Impact, Climate change, Establishment, School farms, Secondary schools.

INTRODUCTION

In both developed and developing nations of the world, much emphasis has been placed on climate change as a monstrous and devastating hazardous disaster capable of impeding the establishment of farm, growths of crops and rearing of animals as well as affecting the health of man (farmer). Climate change is one of the most pressing issues of our time, with far-reaching impacts on agriculture, food security, and sustainable development. Climate change is a significant threat to environmental sustainability, agricultural productivity, and ecosystems characterized by rising temperatures, changing weather patterns, increased frequency of extreme weather events, (Suwari & Osemene, 2024). Climate change has been identified as a major threat to agricultural production and food security in Nigeria (Ike, 2015). Rising temperatures, changing rainfall patterns and increased frequency of extreme weather events are expected to impact agricultural productivity, leading to reduced crop yields and decreased livestock productivity (Intergovernmental Panel on Climate Change, (IPCC, 2013). Climate change is synonymous to an increase in average global temperature caused by natural and human activities which increase greenhouse gases such as carbon dioxide (CO₂) and methane in the atmosphere leading to a phenomenon called the greenhouse effect (Olaniyi *et al.*, 2014). In a similar view Eneji *et al.* (2020) see climate change as the effect of long-term

changing climatic conditions which is caused among other human activities, by carbon dioxide and carbon monoxides released from and methane emission from animal dungs, rice fields, land fill sites, agricultural chemicals and pesticides. Climate change refers to the long-term warming of the planet, which is primarily caused by the increasing levels of greenhouse gases in the earth's atmosphere (IPCC, 2020). These gases such as carbon dioxide and methane trap heat from the sun and prevent it from being released back into space, leading to a rise in global temperatures (Hansen *et al.* 2016). School farms in Secondary schools can play a crucial role in promoting agricultural education, food security and sustainable development. A school farm is an agricultural project established and managed by a school community, typically involving students, teachers and parents to promote agricultural education, food security and sustainable development (Adeola *et al.*, 2020). School farms can range from small plots of land to large-scale resources and goals of the school community. School farms serve as outdoor classrooms where students can learn about agriculture, nutrition and environment conservation, (Kumaret *al.* 2019). Bayelsa State, located in the Niger Delta Region of Nigeria is particularly vulnerable to climate change impacts such as flooding, sea-level rise, and temperature increases. However, climate change poses significant challenges to the establishment of school farms. Establishment of school farms in secondary school refers to the creation and management of agricultural projects within the school premises, aimed at providing student with hands-on experience and practical skills in agriculture.

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The school farm is a significant and effective learning model of using outdoor spaces in the school as a real-life learning environment, (Smeds *et al.*, 2015). It is a place where students can practice traditional farming activities, explore farm life, and interact with nature. The school farm contains two main sections: the planting section and livestock section (Iwerawumi, 2020). Kumar *et al.* (2019) defined school farms as “a platform for experiential learning and sustainable agriculture” that provides students with opportunities to develop skills in agriculture, entrepreneurship and environmental management. Adeola *et al.* (2020) emphasize the importance of school farms in promoting food security, sustainable agriculture and environmental conservation among secondary school students. Oladele *et al.* (2017) highlights the role of school farms in teaching student about agricultural entrepreneurship, income generation, and sustainable livelihoods. A School farm in this context is a piece of land located within or around the school and used for the cultivation of crops and/or rearing of animals. Kumar *et al.* (2019), Adeola *et al.* (2020) and Ravindranath *et al.* (2019), enunciated that the following are benefits of school farms; improve agricultural education, food security, sustainable development, entrepreneurship and employment and community engagement. School farms can play a crucial role in promoting agricultural education and food security, particularly in rural areas (Adebayo, 2017). However, climate change poses significant challenges to the establishment of school farms, due to increased temperatures, changing rainfall patterns, and increased frequency of extreme weather events (Akinbami, 2016). An agricultural science teacher is an educator who specializes in teaching agricultural science, agriculture and related subjects to student in primary, Secondary or post-secondary educational institutions (Kumar *et al.*, 2019). In the context of this study, an agricultural science teacher is an educator who specializes in teaching agricultural science, agriculture and related subjects to students in secondary schools in Bayelsa State.

The following are the impacts of climate change on the establishment of school farms in secondary schools.

- Changes in temperature and precipitation patterns: Affecting crop growth and yield (Intergovernmental Panel on Climate change (IPCC, 2013), Drought and water scarcity: Limiting irrigation and affecting crop productivity (Oladele *et al.* 2017), Shifts in Growing Seasons: Disrupting traditional farming practices and schedules (Kumar *et al.*, 2019), Loss of Biodiversity: Reducing crop and animal varieties in school farms (Food and Agriculture Organization (FAO, 2018), Soil erosion and degradation: Reducing fertility and affecting crop yields (United Nations Environment Programme (UNEP, 2016). Economic losses: Reducing revenue from school farm sales (Iwerawumi, 2020). Limited Access to water: Affecting irrigation and agricultural activities (United Nations Emergency Scientific Cultural Organization (UNESCO, 2017), Changes in soil temperature: Affecting seed germination and plant growth (IPCC, 2013), Reduced student participation: due to climate related hazard and disruptions (Oladele *et al.*, 2017). Increased risk of crop failure: due to climate variability and extremes (Iwerawumi, 2020).

In the context of this study, the following are the causes of climate change:

Greenhouse gas emissions: from industrial activities, transportation and agriculture causes climate change (IPCC, 2013), deforestation and land degradation: leading to loss of biodiversity and ecosystem disruption (UNEP, 2016), population growth and consumption pattern: increasing demand for resources and energy (UNEP, 2019), Fossil fuel burning: releasing carbon dioxide and other greenhouse gases (Environmental Protection Agency (EPA, 2020), agricultural practices: such as monoculture and intensive farming (FAO, 2018), industrial agriculture: contributing to greenhouse gas emissions and resource depletion (Kumar *et al.*, 2019), waste management practices: contributing to methane emissions and pollution (UNEP, 2016), over exploitation of natural resources: depleting water, soil and biodiversity (Adeola *et al.*, 2020).

Statement of the problem

Climate change has become a disturbing hazardous global issue due to its attendant negative impacts on humanity. World bodies and various countries in various setting, have deliberated and made some predictions of increase in extreme climate events such as unusual storms, flood, changing pattern of rainfall, strong wind, drought and tidal waves in Africa. This adverse effect of climate change is already evident with the developing countries being more vulnerable. Some years ago, particularly in 2012, 2018, 2020 and 2022 respectively, various parts of Nigeria including Bayelsa State experienced massive flooding. Some local government areas like Yenagoa, Ogbia, Kolokuma/Opokuma, Southern-Ijaw and others had some of their secondary schools flooded by the devastating flood and their buildings had problems such that school records, instructional materials and school farms were damaged. This resulted into the closure of all the schools for a period of time and had also led to the change of the school academic calendar in the study area. The establishment and sustainability of school farms in Bayelsa State face significant challenges due to climate change impact which include among others erratic rainfall and flooding, increased temperatures, limited awareness and adoption etc. (Suwari, & Osemene, 2024). In the light of this situation and several predictions of extreme climate effects from world bodies such as World Health Organization (WHO), United Nation Emergency Scientific Cultural Organization (UNESCO) and United Nations (UN) in the coming years, the researcher therefore seeks possible ways to apply when establishing school farms in the face of climate change. This paper therefore aimed to identify the impact of climate change on the establishment of school farms in secondary schools in Bayelsa State.

Aims/Objective of the study

The aim of the study was to investigate the impact of climate change on the establishment of school farms in secondary schools in Bayelsa State. Specifically, the study sought to:

- i) Examine the causes of climate change on the establishment of school farms in secondary schools.
- ii) Identify the effect of climate change on the establishment of school farms in secondary schools.

Research Questions

The study is guided by the following research questions.

- i. What are the causes of climate change on the establishment of farms in secondary schools
- ii. What are the impacts of climate change on the establishment of school farms in secondary schools?

Hypotheses

+
The following null hypotheses were tested in this study.

Ho₁: There is no significant difference between the mean responses of male and female agricultural science teachers on the causes of climate change on the establishment of school farms in secondary schools.

Ho₂: There is no significant difference between the mean responses of male and female agricultural science teachers on the effect of climate change on the establishment of school farms in secondary schools in Bayelsa State.

METHODOLOGY

The study adopted the survey research design. The purpose of adopting this design was to collect data from a large or manageable sample of the population. The study was carried out in Bayelsa State, south-south zone of Nigeria with its capital as Yenagoa. The population of the study was 105 agricultural science teachers of public secondary schools in Bayelsa State.

Table 2. Mean response and standard deviation of the causes of climate change on the establishment of school farms in secondary schools

S/N	Item Statement	Males (n=66)			Females (n=39)		
		X	SD	RMK	X	SD	RMK
1	Green House gas emission	3.7	1.37	Agree	3.8	1.48	Agree
2	Deforestation and land degradation	4.1	1.10	Agree	4.1	1.27	Agree
3	Fossil fuel burning	4.1	1.17	Agree	3.8	1.44	Agree
4	Population growth and consumption	3.8	1.39	Agree	4.0	1.25	Agree
5	Agricultural practices	4.1	1.04	Agree	3.8	1.43	Agree
6	Waste management practices	3.9	1.16	Agree	4.0	1.27	Agree
7	Industrial agriculture	3.9	1.18	Agree	4.2	1.25	Agree
8	Soil pollution	4.4	1.04	Agree	4.1	1.27	Agree
9	Over exploitation of natural resources	4.0	1.17	Agree	4.1	1.34	Agree
	Grand Mean and Standard Dev.	4.0	1.18		3.9	1.33	

Key: Field survey, 2024

There was no sampling technique adopted since the population was manageable. The agricultural science teachers were 66 males and 39 females. Forty teachers were selected from Yenagoa L.G.A respectively. A-19 impact item questionnaire tagged: Impact of climate change on the establishment of school farms in secondary schools' questionnaire (ICCESFSSQ) was developed by the researcher from literature reviewed. A five-point Likert scale of strongly agree (SA), agree (A), undecided (U), Disagree (D), Strongly Disagree (SD) with a numerical value of 5, 4, 3, 2 and 1 respectively were used for data collection. Three experts from Niger Delta University in the department of agricultural education validated the instrument. Their corrections and contributions were used to develop the final copies of the instrument. Pearson Product Moment Correlation Coefficient was used to determine the consistency and reliability of the

instrument and a reliability coefficient of 0.85 was obtained. One hundred and five (105) copies of the questionnaires were administered to the respondents with the help of two research assistants each from the various L.G.As of the study area. All the one hundred and five (105) copies of the instrument were retrieved and analyzed using mean and standard deviation to answer the research questions and t-test to test the null hypothesis at 0.05 level of significance.

Research Question I:

- 1. How does climate change affect the establishment of school farms in secondary schools in Bayelsa State?

Table 1 shows the mean response and standard deviation of both male and female respondents towards the causes of climate change on the establishment of school farms in secondary schools. All the identified causes ranged between mean score of 3.7 and 4.4 and standard deviation of 1.04 and 1.37 in male and that of female teachers ranged between 3.8 and 4.2 and standard deviation of 1.23 and 1.48 implying that the responses are close to each other and regarded as causes of climate change on the establishment of school farms in secondary schools.

Research Question 2:

- 2. What are the effects of climate change on the establishment of school farms in secondary schools?

Table 2. Mean Response and standard deviation on the effect of climate change on the establishment of school farms in secondary schools

S/N	Item Statement	Males (n=66)			Females (n=39)		
		X	SD	RMK	X	SD	RMK
1	Changes in temperature & precipitation	3.9	1.29	Agree	4.1	1.28	Agree
2	Drought and water scarcity	4.2	1.08	Agree	4.0	1.22	Agree
3	Shifts in growing seasons	4.1	1.06	Agree	3.9	1.16	Agree
4	Loss of biodiversity	4.4	0.96	Agree	4.1	1.20	Agree
5	Soil erosion and degradation	3.9	1.25	Agree	4.0	1.42	Agree
6	Economic losses	4.1	1.08	Agree	3.8	1.29	Agree
7	Limited access to water	4.1	0.97	Agree	3.9	1.27	Agree
8	Changes in soil temperature	3.9	1.35	Agree	3.8	1.17	Agree
9	Increased risk of crop failure	4.0	1.31	Agree	3.9	1.16	Agree
10	Reduced student participation	3.9	1.35	Agree	4.3	1.13	Agree
	Grand Mean and Standard Dev.	4.05	1.17		3.9	1.23	

Key: Field Survey, 2024

From Table 2 all the items in the research question for both male and female were above the cut off mean of 3.0 and were agreed. For the male response in research question 2, all items were agreed, ranging from item 1-10 and the mean score were above 3.0 with a grand standard deviation score of 1.17 and 1.23 for male and female. The grand mean scores for male and female ranged between 4.05 and 3.98 which is above the cut off mean of 3.0. This implies that the above items are relevant and considered as an impact of climate change on the establishment of school farms in secondary schools in Bayelsa State.

Table 3. t-test Analysis of mean responses of agricultural science teachers for both male and female on the impact of climate change on the establishment of school farms in secondary schools in Bayelsa State

Variable	N	\bar{x}	SD	D.F	t.cal	t-crit	Sig	Decision
Male teachers	66	4.05	1.17	103	0.31	1.96	0.05	Accepted
Female teachers	39	3.98	1.23					

Key: Field Survey, 2024

Table 3 reveals that the calculated t-test value of 0.31, do not differ significantly as it is less than the critical value of 1.96 at 0.05 level of significance. Therefore, there is no significant difference between the mean response of male and female Agricultural science teachers on the impact of climate change on the establishment of school farms in secondary schools in Bayelsa State.

Table 4. T-test Analysis of mean response of male and female agricultural science teachers on the causes of climate change on the establishment of schools farms in secondary schools in Bayelsa State

Variable	N	\bar{x}	SD	D.F	t.cal	t-crit	Sig	Decision
Male teachers	66	4.0	1.18	103	0.38	1.96	0.05	Accepted
Female teachers	39	3.9	1.33					

Key: Field Survey, 2024

Table 4 reveals that the calculated t-test value of 0.38, do not differ significantly as it is less than the critical value of 1.96 as at 0.05 level of significance.

Therefore, there is no significant difference between the mean response of male and female agricultural sciences teachers on the causes of climate change on the establishment of school farms in Secondary Schools in Bayelsa State.

DISCUSSION OF FINDINGS

The result in Table 1 clearly showed that all the 9 items were causes of climate change as identified by the agricultural science teacher in secondary schools in Bayelsa State. This result is in line with the works of Suwari&Osemene (2024), Kumar *et al.*, 2019 and Adeola *et al.*, 2020 who found out that soil pollution reduce fertility and affect crop yield. They also emphasized in their works that industrial agriculture contributes to greenhouse emission and resource depletion. And that over exploitation of natural resources depletes, water, soil and biodiversity as causes of climate change. In Table 2, the result of the study revealed that all the identified 10 item statements were relevant as impact of climate change on the establishment of school farms in secondary schools as agreed by the respondents. This result also agreed with the findings of Oladele *et al.* 2020 and Iwerawumi 2020 that drought and water scarcity affect crop productivity, increased frequency of flood lead to damage of school farms and disrupt agricultural activities, shifts in growing seasons leads to disruption of traditional farming practices and schedules.

Conclusion

In conclusion, climate change poses significant threats to the establishment and sustainability of school farms in secondary schools in Bayelsa State. Rising temperature, changing rainfall

patterns, and increased frequency of extreme weather event affect crop yield, livestock productivity and the overall of school farms including health of man. The study revealed that: climate changes affect agricultural productivity leading to reduces crop yields and livestock productivity, limited awareness and knowledge of climate change among teachers and students hinder adaptation and mitigation efforts, inadequate infrastructure and resources exacerbate the vulnerability of school farms to climate change, integrate trees into the farms landscape to enhance biodiversity.

Recommendations

1. Bayelsa State Government should provide funding and support for climate resilience school farms infrastructure (e.g greenhouses, solar-powered irrigation).
2. The Ministry of Education should integrate climate change education into the agricultural curriculum.

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