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# Adaptation Strategies to Climate Variability being Practiced by Farmers' in Bayelsa State, Nigeria

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## ABSTRACT

This paper determines adaptation strategies to climate variability being practiced by farmers in Bayelsa State, Nigeria. This information was gathered using structured questionnaire, 120 rural farmers in three Local Government Areas using purposive sampling technique. The data were analyzed using frequency, percentages, mean scores, correlation and T- test. The results revealed that the farmers were marginally dominated by females (60.0%). Majority of the farmers (82.0%) were married. A high proportion (65%) had farm sizes of 0.001-0.015 hectares. Majority of respondents (50.0%) were cassava farmers. The results revealed that adaptation strategies being practiced by farmers (use of improved genetic resource, improved production techniques, practiced zero tillage, postponing of planting period and crop rotation) were high than the bench mark mean scores (2.5) and was identified to be effective. The results of the correlation matrix revealed a positive correlation between age (.237**), farm size (.352**), educational status (.261**) and improve genetic resource and were significant at 5% respectively. The results confirmed that there is a positive correlation between adaptation strategies practice by farmers and socio economic characteristics. Hence, the study recommended that government should provide storage and processing facilities in the study area.

**Key words:** Adaptation strategies, climate variability and rural farmers

## INTRODUCTION

Climate variability affects agriculture in several ways. According to (UNEP 2007 cited in Nwosu, 2012) has observed that variability in climate are severely affecting agricultural production in Bayelsa. Such incidents as gas flaring, erosion, excessive rainfall, temperature rising sea levels affect agricultural production. An increase in rainfall, for example, will be conducive for proliferation of pest and diseases, which in turn, are detrimental to crop production. Excessive flooding can also lead to soil erosion and destruction of farmlands. At the other extreme, flooding could destroy the infrastructure used to store or transport food from production areas to markets thereby acting as disincentive for farmers who could produce more food (Muhammed *et al.,* 2011 cited in Nwosu 2012).

Similarly, climate variability affects livestock specially in dry weather conditions or desert prone zones/regions where long period of drought adversely affect the availability of and accompanying decrease in water availability tend to reduce the length of growing seasons and yield potential with attendant low agricultural productivity (Nwosu, 2012).

Adaptation to climate variability and variability necessitates the adjustment of a system to moderate the impacts of climate variability, to take advantage of new opportunities, and to cope with the consequences (IPCC 2001). Adaptation involves the action that people take in response to, or in anticipation of, projected or actual variability in climate to reduce adverse impacts or take advantage of the opportunities posed by climate variability (Parry *et al.* 2005). In terms of climate variability, this latter part of the definition is significant since climate variability also presents certain opportunities and advantages in Africa, particularly for increased rainfall in certain areas of the continent. Thus, it reduces communities' vulnerability or increases their resilience to climate shocks. It also enables ecosystems to coexist with the changing climate, thereby enhancing their capacity for providing the ecosystem services critical for human well-being (Parry *et al.,* 2005).

The local adaptive strategies developed by rural farmers in Bayelsa to deal with the changing climatic conditions are; the use of crop rotations, mixed cropping and/or the integration of bushes or trees; Planting of leguminous crops which they regard as part of their farming system and are widely planted as food crops; manure and compost are used as fertilizers to maintain soil fertility and the use of local seeds and crops which tolerate extreme conditions, changing seasonal migration and hunting patterns, heat, drought, cold or flooding; Diversification of the production system to reduce the risk of losing the harvest which can happen if just one or two major crops are planted; postponement of the time for planting and sowing of crops when rains are late ( IPCC, 2014). Therefore, this study was designed to determine the farmer's adaptation strategies to climate variability being practiced, the relationship between the socioeconomic characteristic and farmer's adaptation strategies.

## METHODOLOGY

The study was carried out in selected rural communities in Bayelsa State. Bayelsa State comprises eight Local Government Areas, namely: Brass, Ekeremor, Kolokuma/Opukuma, Nemebe, Sagbama, Southern Ijaw, Ogbia and Yenagoa Local Government Areas. The State is geographically located within latitude 04° 15′ North, 05° 22′ West and 06° 45 East. It shares boundaries with Delta State on the North, River State on the East and the Atlantic Ocean on the West and South. Bayelsa State lies in the heaviest rainfall area in Nigeria, with heavy rain forest and s short dry season from November to March (NPC, 2006). Purposive sampling technique was used to selected climate variability prone Local Government Area and twelve communities within these four Local Government Areas of the state. Within the state the three Local Government Area; Nembe, Ogbia and Yenagoa and were selected while, the communities are: Ogbomabiri, Bassabiri, Adukiri, Igbeta-Ewoama, Oloibiri, Otuoke, Otusega, Oruma, Akenfa-Epie, Bessein, Okorama and Tombia.

Ten rural farmers were selected from the aforementioned communities, which gave us a sample size of 120 respondents. A four point Likert – types scale of Never = 1, Rarely = 2, Occasionally = 3, Always = 4. Bench marks mean score of 2.5 was taken as a decision rule for acceptance or rejections.

## Model specification for correlation analysis

$$r = \frac{n \sum xy - (\sum x)(\sum y)}{\sqrt{n(\sum x^2) - (\sum x)^2 . n(\sum y^2) - (\sum y)^2}}$$

r = the Pearson produ

n = number of paired data

$\sum xy$ = sum of the products paired scores

$\sum x$= sum of Socio-economic characteristics scores.

$\sum y$ = sum of squared of the adaptation strategies

$\sum x^2$ = sum of squared of the sum of Socio-economic characteristics scores.

$\sum y^2$ = sum of squared of the adaptation strategies

T- test of significant on the correction coefficient will equally be carried out with model given as;

$$t = \frac{r \times \sqrt{n-2}}{1 - r^2}$$

Where,

t = t-test of significant

r = correlation coefficient

n = sample size

## RESULT AND DISCUSSIONS

Table1 shows that majority of the respondents (60.0%) were female farmers while (40.0%) were male farmers. This is in line with the assertion of (Akpabio, 2005) who reported that female farmers dominate the farming population in Nigeria rural farming communities. Werby (2001) confirmed that female farmers are often more motivated than their male counterparts to adopt new adaptation strategies. Majority of the respondents (82.0%) were married, (14.0%) were single, (4.0%) were divorced. The high percentage of the married respondents is consistent with Ekong (2003) who reported that getting married is highly cherished among rural dwellers in Nigeria. The size of the farm cultivated is a function of population pressure, family size and financial capacity of the farmers (Chikezie, *et al.*,2012). The study still show that majority of the respondents (65%) had farm sizes of 0.001-0.015 hectares. while, (17.5%) cultivated a farm sizes of 0.015-0.030 hectares while (17.5%) cultivated above 0.030 hectares. Ekong (2010) also noted these farmers that have small farm size, produce only for their family consumption. Majority of respondents (50.0%) were cassava farmers, (21.0%) were yam farmers, (19.2%) were cocoyam farming, (6.0%) were into fish farming and (4.0%) are civil servants. Implication of the findings shows that bulk (90.2%) of the work force are into arable crop production. While the (6.0%) of the rural farmers were fishermen and women. This is basically influenced by geographically location.

The distribution of respondents by educational status as shown in Table1 show that there is a high level of illiterate among rural farmers (40.8%) had no basic education (39.1%) completed tertiary education. While, (20%) completed primary education. Ogunbameru, (2001) and Ani, (2006) noted that education will likely enhance the adoption of modern adaptation strategies, thereby sustaining a virile farming population. In the same vein, Ojukaiye (2001) posited that education is important socio – awareness, perception, reception and the adoption of innovation that can bring about increase in agricultural production.

**Table 1** Distribution of respondents according to their socio-economic characteristics (n= 120)

| Variables | Frequency | Percentage |
|---|---|---|
| **Age** | | |
| 20 – 30 years | 12 | 10 |
| 31 – 40 year | 28 | 23.3 |
| 41-50 | 48 | 40.0 |
| 51-60 | 32 | 26.7 |
| **Sex** | | |
| Male | 48 | 40.0 |
| Female | 72 | 60.0 |
| **Marital status** | | |
| Single | 17 | 14.0 |
| Married | 98 | 82.0 |
| Divorced | 5 | 4.0 |

| | | |
|---|---|---|
| **Main occupation** | | |
| Fish farming | 9 | 6.0 |
| Cassava farming | 60 | 50.0 |
| Cocoyam farming | 23 | 19.0 |
| Yam | 30 | 25.0 |
| **Educational qualification** | 24 | 20 |
| Primary education completed | | |
| Secondary education completed | 49 | 40.8 |
| Tertiary education complete | 47 | 39.2 |
| Farm size | | |
| 0.001-0.015ha | 78 | 65 |
| 0.015-0.030ha | 21 | 17.5 |
| Above 0.30ha | 21 | 17.5 |
| **Total** | **120** | **100** |

*Source: Field Survey, 2016*

Table 2 shows adaptation strategies to climate variability being practiced. The finding revealed that adaptation strategies being practiced (use of improved genetic resource, improved production techniques, practiced zero tillage, postponing of planting period and crop rotation)) were higher than the bench mark mean score (2.5) while, processing and storage facilities was below the bench mark mean score. The various adaptation strategies being practiced by rural farmers to curb the vagaries of climate variability are: the use of improved genetic resource ($\bar{x} = 2.8$) was accepted based on the bench mark scale, improved production techniques ($\bar{x} = 2.6$) was accepted as an adaptation strategies being practiced. Practice zero tillage ($\bar{x} = 2.5$) was accepted, crop rotation ($\bar{x} = 2.6$) and post-poning of planting periods ($\bar{x} = 3.4$) were also accepted as an adaptation strategies identified by farmers while processing and storage facilities ($\bar{x} = 1.5$) was rejected based on the bench mark mean scale. The implication of findings implies that farmers count reasonable amount of loss in their farm produce due to lack of storage facilities.

**Table 2:** Distribution according to the adaptation strategies to climate variability being practiced by the respondents

| S/N | Items | Scores (n = 120) | | | | Total Score ∑F X | Mean Score X | Remark |
|---|---|---|---|---|---|---|---|---|
| | | Always 4 | Rarely 3 | Occasionally 2 | `Never 1 | | | |
| 1 | Use of improved genetic resource | 44 | 10 | 60 | 6 | 332 | 2.8 | Accept |
| 2 | Improved production techniques | 14 | 45 | 60 | 1 | 312 | 2.6 | Accept |
| 3 | Practice zero tillage | 25 | 17 | 75 | 3 | 304 | 2.5 | Accept |
| 4 | Post-poning of planting period | 80 | 10 | 25 | 5 | 405 | 3.4 | Accept |
| 5 | Process/storage facilities | 4 | 14 | 16 | 86 | 176 | 1.5 | Reject |
| 6 | Crop rotation | 21 | 35 | 63 | 1 | 316 | 2.6 | Accept |
| **Overall mean** | | | | | | | **2.5** | |
| **Total pooled mean ( bench mark mean score)** | | | | | | | **2.5** | |

*Source: Field Survey, 2016*

Table 3 shows the correlation between the socio-economic characteristics and farmers' adaptation strategies. Among the variables, age, farm size and educational status and improved genetic resource showed a positive correlation and were significant at 5%. While, farm size and occupation showed positive correlation with improved production techniques and were significant at 5%. Koyenikan and Omorejbee (2013) asserted that farm size was significant in the application of climate variability adaptation strategies. Sex and educational status showed positive correlation with Postponing of planting period and were significant at 1% and 10%. Occupational status showed a positive correlation and marital status and educational status 10% and 5% levels respectively. Farm size and occupational status showed positive correlation with crop rotation were significant at 10% and 5%.

**Table 3** Correlation matrix showing the relationship between socio-economic characteristics of farmers' climate variability adaptation strategies practiced

| Variables | Age | Sex | Marital status | Farm size | Occupation | Educational status |
|---|---|---|---|---|---|---|
| Improved genetic resource | $.237^{**}$ | $.142^{ns}$ | $.127^{ns}$ | $.352^{**}$ | $-.027^{ns}$ | $.261^{**}$ |
| Improve production Technique | $-.130^{ns}$ | $.034^{ns}$ | $.041^{ns}$ | $-.302^{**}$ | $-.299^{**}$ | $-.094^{ns}$ |
| Practice zero tillage | $.035^{ns}$ | $-.134^{ns}$ | $.109^{ns}$ | $.054^{ns}$ | $-.006^{ns}$ | $-.062^{ns}$ |
| Postponing of planting period | $-.039^{ns}$ | $.269^{**}$ | $-.094^{ns}$ | $.069^{ns}$ | $-.043^{ns}$ | $-.195^{*}$ |
| Processing and storage facilities | $.044^{ns}$ | $.068^{ns}$ | $-.189^{*}$ | $.061^{ns}$ | $.239^{**}$ | $-.186^{*}$ |
| Crop rotation | $-.011^{ns}$ | $-.085^{ns}$ | $-.042^{ns}$ | $.194^{*}$ | $.347^{**}$ | $.088^{ns}$ |

*Source: Field Survey, 2016.* Values in parenthesis are Sig. (2-tailed), ns = not significant, *** = significant at 1% level; ** = significant at 5% level, * = significant at 10%.

## CONCLUSION AND RECOMMENDATION

The study tried to examine adaptation strategies to climate variability being practiced by farmers' to curb climate variability. Findings showed the various adaptation strategies practiced were improve genetic resource, improve production techniques, zero tillage system, Postponing of planting period, processing and storage facilities and crop rotation. It further shows the positive correlation between some of the adaptation strategies practice and socioeconomic characteristics of the farmers. Government should provide storage and processing facilities in the study area.

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