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The Effect of Onset and Cessation of Raining Season on Crops Yield in Lafia

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ABSTRACT The study was aimed at analysing the effect of rainfall onset and cessation trends on crop yields in Lafia town of Nasarawa State from 1980 to 2010. The data was collected from the Nigerian Meteorological Agency Abuja for the said period. Data for crops yield were obtained from Nasarawa Agricultural Development project (NADP) Lafia from 1997 to 2010 for which data were available. The crop yields were used to examine the effect of onset and cessation on crops yield. Regression analysis revealed that that cessation of raining season has more effect on crops yield as compared to onset of raining season. Farmers and others interested in agro allied services should therefore ensure early planting of crops in order to avoid been caught up by the rainfall cessation.

INTRODUCTION

In the tropics, rainfall, more than temperature, determines the season and it is the amount and timing of rainfall that forms the chief criteria for distinguishing the various climatic characteristics. Contrary to the popular belief that climate is uniform in the tropical region, only a very small portion of the tropics has a year round rainy season. Investigations of the climatology of West Africa and Nigeria on precipitation have basically centered on the length of the stormy season, profundity and powers of the precipitation and its circulation. According to Oguntoyinbo (1987), one anomalous dry season is disastrous for farmers, while a run of years with below average rainfall may prove national calamitous.

The most obvious impacts of climate in Nigeria have been in the field of agriculture (Kowal and Knabe 1972; Dinesh et al. 2015; Ayanlade 2016). It has been accounted for that of all the climatic variables which impact the circulation and profitability of rain-bolstered farming in Nigeria, accessibility of water to the yields is by a long shot the most. This is reliant on the sum and term of precipitation which is dictated by the onset and discontinuance of the stormy season essential (Ranikes 1967; Salau et al. 2016).

For agro-climatological applications, the onset ought to be resolved on a station-by-station premise. Notwithstanding, if a definitive objective is the forecast of the onset (not only its observing), it must be characterised on territorial, and not absolutely nearby grounds. Truth be told, time-bound (particularly day by day) precipitation is influenced by arbitrary convective occasions, which may locally give enormous precipitation sums, enough to move the onset date by a couple of days or even weeks; yet those occasions are inherently capricious. There is accordingly a need to distinguish occasions (assuming any) which are of an adequately extensive scale (and continuing), and which would thus be able to be related to likewise huge scale barometrical changes, perhaps identified some days/weeks ahead of time. For example, Marengo et al. (2001), whose point was to relate varieties of the onset of the downpours to air progression, characterised provincial scale onset dates for various parts of the Amazon Basin. The dates were processed by averaging day by day precipitation information from many stations and building 5-day midpoints. Onset was the pentad in which precipitation surpassed a given edge, gave that the normal precipitation was well underneath the edge for a few pentads going be-

fore onset and well above for a few pentads after onset. A comparable approach was taken after for assurance of the finish of the drizzling season. In any case, the creators found that onset dates were delicate to changes in the edge.

According to Chowdbury (1978) and Mandal et al. (2015), specific rainfall condition are required for pre-sowing, preparation of the transplanting of nursery plants and even application of fertilizer to the crops for their most successful economic and growth circle. On the other hand, less rainfall is needed during the harvesting period. For instance, it has been found that too much of rainfall affect cowpeas, and this also applies to guinea corn for which too much rainfall during the harvesting period may cause the seed to rust (Namakka et al. 2016).

Literature Review

In Nigerian where the greater part of the work compel is focused on rural practices, a comprehension of precipitation qualities regarding the begin of the downpours the length of the blustery season, the spatial and worldly dissemination of the precipitation and additionally its fluctuation is of central significance in agri-business, as well as for other pragmatic reason. Furthermore, besides being vital for agricultural production rainfall also serves as the major input in the study of the water resources and river basins as a major parameter in the understanding of the flow of rivers (Essien-Ibok and Ekpo 2015).

In the middle belt region, Yahaya and Abubakar (2012) found the significance of regular precipitation changeability concerning onset, suspension, the length of drizzling season and its agro-climatic ramifications. It was watched that precipitation dissemination in Ilorin, Kwara State in Nigeria vacillates from place to place from East to West and South respectively and prescribed that land preparation and planting of harvests can be set out upon after 30th April as the dependable onset of precipitation period sufficient for most yields in the area. From the foregoing, in spite of the way that atmosphere is changing; precipitation length and down-pouring days are still extremely ideal for rural exercises in the investigation region. Late precipitation onset of April and early end of October was seen in Kogi state (Audu 2012). Despite the fact that it was found that late onset, early suspension, change/shortfall in yearly aggregate and also droughts are extremely basic in Kogi state, Nigeria. Audu (2012) suggested that agriculturists ought to be informed on the yearly dates concerning onset and suspensions of the downpours (April and October), harvests to be planted early, for example, melon which can withstand long stretch of nonattendance of downpours, half-breed trimming and also the utilisation of water system. The water system is critical not just because of high unconventionality of the downpours and incessant droughts additionally to help all–year-round editing to guarantee unfaltering sustenance supply for the ever growing populace of the investigation region, as well as Nigeria on the loose.

Statement of Problem

Climates varied in the past on different time scales. In recent times climate variability is increasing and climate may be changing. This has generated a lot of interest and concern among agro-meteorologists and agro-climatologists. Changes in rainfall characteristics in the tropical region have been studied particularly the arid tropics (Repapis and Philanders 1988; Oladipo and Kyari 1993; Challinor et al. 2015).

Agriculture would be seriously affected by increased variability and trends in the characteristics of rainfall in an environment where one of the major limiting factors of agricultural production is the amount of water available through rainfall. Agriculture is a vibrant occupation in the study area and anything affecting agricultural yields will affect the livelihood of the people. This research is to examine trend in rainfall onset and cessation and its implication on crops yield in Lafia town.

The study has covers a temporal scope of thirty two (32) years, from 1980 to 2012. The study relates the effect of rainfall onset and cessation of the yields of three crops to include; sorghum, millet and yam. This is because the three crops are the most cultivated crops in Lafia. The ten crops were selected based on their preference and dominance in Lafia.

The Study Area

Lafia is both the capital of Nasarawa State and the headquarters of Lafia Local Government. It is situated at the south-west piece of the state

on scope 80301N and longitude 70311E. Its area at the intersection of territorial streets gives on it great linkage with Makurdi (the capital of Benue State) to its south, Akwanga-Keffi and Abuja (the Federal Capital City) toward the north-west and Jos (Capital of Plateau State) toward the north-east.

Changing Climate and Precipitation Characteristics in Northern Nigeria

Environmental change alludes to the condition of the atmosphere that can be distinguished utilising actual tests by changes in the mean as well as inconstancy of its properties that continue for an augmented time of 10 years or more (Liu and Penner 2002). Environmental change might be ascribed to both regular and anthropogenic causes.

Environmental change at present constitutes a critical ecological issue confronting humanity in the 21st century. This marvel has genuine repercussions on man and his condition. The different outcomes of environmental change go from the dry season in a few territories while flooding and immersion of seaside arrive in others; influencing horticulture and nourishment security, adjusting both surface and underground water supply and destroying biological communities among others. It is currently a topical issue that has been perceived at both national and worldwide for an as a risk to supportable improvement.

More than sixty percent of ranchers in Nigeria are specifically subject to rain-nourished farming and normal assets (FAO 2003; Chima 2015). Nigeria is subsequently, exceptionally powerless against the effect of environmental change (Ayoade 2003; Oloukoi et al. 2015). The apparent effects of environmental change that bear coordinate repercussions on agrarian practices in Nigeria are on precipitation adequacy parameters. Precipitation viability parameters are vital lists gotten from precipitation. These parameters incorporate onset and end dates of the downpours, the length of the blustery season (LRS), precipitation sums in the months in the developing season. Others incorporate number of stormy days (RD), hydrologic proportion (HR), regularity record (SI), file of replicability (IR), particular water utilization or water proportionate to turn away dry season (SWC), mean power of precipitation (RI) and droughts of different lengths amid the blustery season.

METHODOLOGY

Research Design

A descriptive type of design using a case study method was used for the study while the daily rainfall data for Lafia Local Government Area from 1980 to 2012 were obtained from the Nigeria Meteorological Agency Abuja. Rainfall data were used to derive onsets and cessation dates. Secondly, data on crop yield were obtained from Nassarawa Agricultural Development Project (NADP PME) department Lafia from 1997 to 2010. The crop yields were used to examine the effect of onset and cessation on crop production in Lafia.

This study also investigated the effect of onset and cessation on the yield of crops in Lafia within the period of study. The major crops were vegetables, grains and tubers. This work however considered only guinea corn and yam because their planting to harvesting covers the period of onset to cessation as presented below.

Data Analysis

With the use of the Statistical package for Social Sciences, SPSS Partial correlation analysis was used to determine the effects of onset and cessation on crops yield in Lafia, hence the effect of other variables is controlled.

The significance of the partial correlation coefficient is determined in the same manner as for bivariate correlation. The only difference is that with three variables, the degree of freedom, V = (n-3). For four variables it would be (n-4).

RESULTS

Effect of Onset and Cessation of Raining Season on Sorghum Yield in Lafia

The effect of onset and cessation of raining season on sorghum yield in Lafia is presented in Table 1.

Interestingly, regression analysis of the effect of rainfall onset and cessation revealed a value of 0.349 and -0.286 respectively on sorghum yield. This means that, late rainfall onset results to more sorghum yields while late cessa-

Table 1: Regression showing effect of onset and cessation on sorghum yield in Lafia

Model		*Unstandardized coefficients*	*Standardized coefficients*	*T-value*	*Sig.*
1	Rainfall onset	11.899	.349	1.292	.95
2	Rainfall cessation	-15.349	-.286	-1.035	.95

Source: Computed by Author 2013

tion result to poor yields. The months were represented in ascending order with January having a value of 1 to December having a value of 12. Therefore the inverse relationship shows the lower the month, the higher the effect. This means, onset in March (with a value of 3) has more effect than onset in April (with a value of 4). The implication of this is that if the trend of onset is moving from March to April or May, there will be increase in sorghum yield.

On the other hand, there is a negative regression value of the effect of rainfall cessation on sorghum yield in Lafia.

Effect of Onset and Cessation of Raining Season on Millet Yield in Lafia

The effect of onset and cessation of raining season on millet yield in Lafia is presented in Table 2.

Regression analysis on the effect of onset and cessation of rainfall on millet yield revealed the value of 0.065 and -0.16 respectively. This shows that late onset of rainfall in Lafia increases millet yield while late cessation reduces yield. Years with early cessation tend to have more yields. Millet is widely cultivated in Lafia. It is one the ceral crops that are used by the locals to prepare soft foods such as pap, fura and gruwel. Cultivation of millet is common among the farmers and if it is affected by changes in onset and cessation, it will definitely affect their income and available food for consumption.

Effect of Onset and Cessation of Raining Season on Yam Yield in Lafia

The effect of onset and cessation of raining season on yam yield in Lafia is presented in Table 3.

Result of regression analysis of the effect of onset and cessation of rainfall on yam yield in Lafia revealed a regression coefficients of -0.083 and 0.124 respectively. That means that yam yields are higher during years of early onset than years of late onset. On the other hand, yam yields are higher during years of late cessation.

DISCUSSION

Regression analysis of the effect of rainfall onset and cessation revealed a value of 0.349 and -0.286 respectively on sorghum yield while

Table 2: Regression showing effect of onset and cessation on millet yield in Lafia

Model		*Unstandardized coefficients*	*Standardized coefficients*	*T-value*	*Sig.*
1	Rainfall onset	.665	.065	.226	.95
2	Rainfall cessation	-2.580	-.160	-.562	.95

Source: Computed by Author 2013

Table 3: Regression showing effect of onset and cessation on yam yield in Lafia

Model		*Unstandardized coefficients*	*Standardized coefficients*	*T-value*	*Sig.*
1	Rainfall onset	-48.028	-.083	-.288	.95
2	Rainfall cessation	113.091	.124	.433	.95

Source: Computed by Author 2013

on millet yield revealed the value of 0.065 and -0.16 respectively, which implies that, late rainfall onset results to more sorghum yields while late cessation result to poor yields. This is supported by the findings of Traore et al. (2013), who reported variability in crop yields as a result of rainfall onset and cessation in Mali. The months were represented in ascending order with January having a value of 1 to December having a value of 12. Therefore the inverse relationship shows the lower the month, the higher the effect. This means, onset in March (with a value of 3) has more effect than onset in April (with a value of 4). The implication of this is that if the trend of onset is moving from March to April or May, there will be increase in sorghum yield which is supported by Bekele et al. (2017). As millet is widely cultivated in Lafia, which is the crop used by the locals to prepare soft foods such as Pap, Fura and Gruvel, this will affect the income and available food for consumption, if it is affected by the changes in onset and cessation (Ngetich et al. 2014; Eludoyin et al. 2017).

In addition, result of regression analysis of the effect of onset and cessation of rainfall on yam yield in Lafia revealed a regression coefficients of -0.083 and 0.124 respectively. That means that yam yields are higher during years of early onset than years of late onset. On the other hand, yam yields are higher during years of late cessation. This is in line with the report of Oruonye et al. (2016), who documented that early cessation of the rainy season will result in the cutting short of the growing season of crops and consequently result in crops failing to reach their physiological maturity stage.

CONCLUSION

Crops are mostly affected by cessation of raining season. This demonstrates end has an awesome impact on crops yield as looked at that of onset of drizzling season. There ought to be an arrangement for early cautioning and reacts frameworks which are essential for diminishing the danger of life and rural misfortunes in Lafia postured by onset and end of the down-pouring season.

RECOMMENDATIONS

It is therefore paramount to recommend that agricultural development of crops varieties that can tolerant variation in onset and cessation dates be carried out and provided to farmers in Lafia and its environs.

Also a long time integrated program for community based climate change adaptation and implication to disaster risk reduction is required, taking into account assessment planning implementation, training and capacity building with particular action research.

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