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## Implication of the Late Onset of Rains in a Coastal Ecological Area: The Case Study of Lagos and Its Environs.

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### Abstract

*Variations in the frequency of different onsets (early and late) of the rains were computed over Lagos and its environs. The periods of study covered forty years (1960-1999), which was partitioned into four decades of 1960-1969, 1970-1979, 1980-1989, and 1990-1999 respectively using rainfall records of Lagos station. Modified version of Walter's (1967) method was used to compute the onset of the rains. The results showed an increase in frequency of the occurrence of late onset of the rains from the first decade (1960-1969) through the third decade (1980-1989). The implication of the findings on the agricultural industry was discussed. Also, the shift of climate towards aridity in coastal area was confirmed. Suggestions were made on methods of ameliorating the negative impacts of such hazards on man and his agriculture below economic level.*

### Introduction

Agriculture plays a vital role in the economy of Nigeria through the provision of food and employment. Onset of rain is crucial in determining the time to plant with minimum risk of crop failure in Nigeria. This is because an agricultural practice in most tropical countries is rain-fed. The definition of the onset of the rain from agricultural point of view represents the date when rainfall is able to provide sufficient water to compensate for water losses through evaporation from the plant environment.

Provision of food for the Nigerian rapidly growing population is a challenge of the new millennium. Climate is the most important variable in agricultural production and the most climatic parameter that determines crop performance in the tropics is rainfall. However, for purpose of optimal crop yield rainfall amount is not as important as rainfall distribution.

Studies have confirmed that rainfall particularly at the beginning of the rainy season in Nigeria does not effectively satisfy the evaporative demands of the atmosphere. This has inflicted a lot of damages to crop during the early growth stage throughout Nigeria including areas described as wet region (Oguntoyinbo 1981, Olaniran 1987). Hence, low crop yield characterized Nigeria agricultural industry. This in turn has led to food scarcity and inflation in food crop prices. Thus this study

aimed at examining implication of late onset of the rains on agriculture in a coastal ecological area of Lagos and its environ.

### **Late Onset of Rain on Agricultural Industry of Nigeria**

The parallelization of the crop performance with the reliable onset of the rain in Nigeria has been stressed by Bello (1996a) and (1996b), Olaniran (2002), Owolabi and Adebayo (2003), Bernard (2003), Nnoli (2003), Olanrewaju (2003) and Ati (2005) among others. These works cut across all ecological zones of Nigeria.

Bello (1996a) investigated the incidence and distribution of the late onset of the rains in the coastal area of Nigeria using daily rainfall and potential evapotranspiration (mm) for the period of 1959-1993.

Late onset of rains in the coastal areas varies with latitude. For instance, late onset of the rain years occurred in 40% of the years around Port Harcourt and Calabar, 54% occurred around Benin, Enugu and Lagos while 63% of the year occurred at Ondo which represents the northern limit of the coastal area. This makes southern Nigeria to be increasingly vulnerable to crop failure.

However, Owolabi and Adebayo (2003) limit their study to Ekiti state in the southwest. They worked on the variability and trends in the length of growing season, rainfall amount and crop yield between 1981 and 2000. The result showed a significant reduction in the length of the growing season over the years. This has brought a colossal reduction in crop production in the southwest Nigeria as a whole and Ekiti state in particular. Similarly, Olanrewaju (2003) focused rainfall pattern on the growth of melon in the guinea savanna ecological zone of Nigeria. A decline in the normal onset of rain through decades was established. For instance, the frequency was in order of 6, 3 and 2 for the three ten years (1971-1980, 1981-1990 and 1991-2003) under study. It was confirmed that late onset of rain is the major factor responsible for poor performance of melon in this area.

Nnoli (2003) noticed a progressive delay in the distribution of the onset dates of growing season throughout the period of study nation wide. Specifically South-eastern area, the western border area and North-eastern border area of Nigeria experienced progressively from earlier than normal within 1911-1940 to normal within 1941-1970 and then to later than normal onset dates of growing season within the period of 1971-2000. Ati (2005) examined variations and trends in rainfall and its onset series for Kano using rainfall data for the period of 1916-2002. The result showed a decrease in rainfall total below the long term mean for the last 30 years but with an exception towards the end of the last decade when annual rainfall totals exceeded the long term mean. However, there was no significant trend noticed for rainfall onset. It was however concluded that if the present upward trend in annual



totals continues, a statistically significant shift in the onset dates which would be dangerous to agriculture may be expected.

A close study of the research works discussed above shows that attention of researchers on the implication of late onset of rain on agriculture is focused mainly on the hither land but for Bello (1996). This might stem out of an erroneous belief that coastal areas receives adequate rainfall. However this present study examined implication of the late onset of the rains on agricultural industry of a coastal ecological area. This is an extension of Bello (1996) to see whether late onset of rain still occurs in coastal areas and to what extent. This becomes necessary for proper agricultural planning towards food security in Nigeria.

The study area is Lagos and its environ. Lagos is located approximately on latitude  $6^{\circ} 20'N$  and longitude  $3^{\circ} 27'E$ . Based on Koppen's (1918) system of classification, Lagos has a tropical wet and dry climate.

### **Methodology**

The rainfall data used covered forty years period of 1960 to 1999. This period was partitioned into four decades and onset of the rains was calculated for each decade. Also the percentage of the frequency of the occurrence of onset was calculated.

Many methods have been attempted for determination of onset of the rain in Nigeria. Cocheme and Franquin (1967) and Benoit (1977) adopted Water budget approach. They used rainfall-evapotranspiration relation model. Ilesanmi (1972) and Walter (1967) employed the approach of accumulated rainfall total for a specific period. According to Walter (1967) the growing season commence when a location has received an accumulated rainfall of about 51mm.

$$\text{Days in the month} \times \frac{51 - \text{accumulated rainfall of previous months}}{\text{Total rainfall for the month}}$$

Where the month under reference is that in which the accumulated total rainfall is in excess of 51mm.

Olaniran (1983) noted that the accepted date of onset of rain computed using Walter's (1967) method may be followed by a dry-spell in the savanna ecological zones. Base on this Olaniran (1988) modified Walter's method to take care of such lapses. This

method says where the planting date is followed by a prolonged dry spell such planting date is disregarded and new planting date is re-established using Walter's method.

However, contrary to the view of Olaniran (1983) the dates of onset of the rains computed according to the method of Walter (1967) may now be followed by

prolonged dry spell in the humid climatic environment as well such as Lagos. Hence, modified version of Walter's method was used in this study. This method makes sure that the accepted date of onset of the rains computed by Walter's method was not followed by a month of less than 51mm of rainfall.

Bello (1996b) used this method to determine the mean onset of the rains for Lagos to be 27 March. Onset of the rain for the period of 40 years (1960-1999) was computed for Lagos and the departure from the date recognised by Bello (1996) as the mean onset of the rains for Lagos was also computed. That is, any date before 27<sup>th</sup> March is described as early onset of the rains while periods after is designated as late onset for Lagos and its environs. This reveals the erratic pattern of onsets that characterize the period of study. The period of study was further partitioned into four decades and the frequency of occurrence of late and early onset of the rains is compared. This serves as a signal to what the climate of Nigeria is changing to vis-à-vis crop production.

### Result And Discussion

The distribution of onsets (early and late) of the rains during different decades is shown on Table I below. The pattern of onsets showed some regularity in occurrence. For instance, the first three ten years in each instance (1960-1969, 1970-1979 and 1980-1999) reflect a general progressive delay in the onset of the rains. The frequency is 1 (10%), 5 (50%) and 6 (60%) respectively. This above trend changed during the last decade of study (1990-1999) in which eight out of ten years witnessed early onset of rain and 20 percent of the years witnessed late onset.

Table 1: Frequency and percentage of Occurrence of onsets of the Rains (1960-1999)

Onset	1960-1969		1970-1979		1980-1989		1990-1999	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Late onset of the rains	1	10	5	50	6	60	2	20
Early onset of the rains	9	90	5	50	4	40	8	80

Source: Author's Computation, 2005

This finding seems to agree with that of Bello (1996) to a certain extent. For instance, during the second and third decade (1970-1979, 1980-1989) the percentages of years that witnessed late onset of rains were 50 and 60 respectively. However during the first decade the percentage was very low (10%). The method of examining the long term (1959-1993) rainfall onsets adopted by Bello (1996) might have masked

this decadal details and facts. The pattern experienced during the first decade was almost re-established during the last decade when only 20% of the years considered witness late onset of rains.

Table 2: Range of the Dates of Onset of the Rains during the four decades of 1960-1999 in Lagos

Range	1960-1969	1970-1979	1980-1989	1990-1999
Range in the dates of onset of the rains	8 <sup>th</sup> Jan to 4 <sup>th</sup> April	10 <sup>th</sup> Feb to 12 <sup>th</sup> April	15 <sup>th</sup> Feb to 9 <sup>th</sup> May	14 <sup>th</sup> Feb to 1 <sup>st</sup> May

Source: Author's Computation, 2005

The range of the dates of onset of the rains was considered for different decades in Table 2 above. The range extends from the first decade through the fourth decades. For instance, during 1960-1969 which represents the first decade, the range was 8<sup>th</sup> Jan - 4<sup>th</sup> April and the last decade witnessed the range of 15<sup>th</sup> February - 1<sup>st</sup> May.

### Implications of Late onset of Rains in the Study Area

Germination of most crop seeds planted depends largely on the status and reliability of the onset of rain. In the tropics the onset, cessation and duration of the rainy season form important components of moisture resource status for determining the production potential of various crops.

From the above result for Lagos and its environ, crop experienced less moisture stress at the early stage of growth during the first decade and as the year progress crops faced greater stress which latter reverted during the last decade. According to Shaw (1979) moisture stress is capable of reducing the crop leaf area and if the reduction reaches below 3 - 3.5 Leaf Area Index (LAI) yield reduction can be very large. This might be related to the observation made by Edafienene (2003) which identified variations in coastal climate as being the critical factor influencing socio-economic activities in general and agriculture in particular.

### Conclusion

Erratic pattern in the onset of the rains has been described as an indicator of climate change. The pattern of the onset of the rains observed in this study is an evidence of a climate change towards aridity in the coastal area of Nigeria. The Federal Government of Nigeria should be sensitised towards its consequences on man's economic activities and agriculture in particular for maximum food security in the new millenium.



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**Appendix I: Frequency of onset of rain and the range of dates of different decades**

A. First decade			
Year	Onset of rain	Frequency of late onset	Range of the dates of onset
1960	8/1	1	8/1 - 4/4
1961	9/3		
1962	2/3		
1963	31/2		
1964	1/3		
1965	23/2		
1966	7/3		
1967	9/3		
1968	4/4		
1969	2/3		

B. Second decade			
Year	Onset of rain	Frequency of late onset	Range of the dates of onset
1970	4/4	5	10/2 - 12/4
1971	12/4		
1972	5/4		
1973	3/3		
1974	7/3		
1975	5/4		
1976	10/2		
1977	6/4		
1978	11/2		
1979	1/3		

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C. Third decade

Year	Onset of rain	Frequency of late onset	Range of the dates of onset
1980	3/3		
1981	13/3		
1982	9/5		
1983	21/4		
1984	5/3	6	15/2 - 9/5
1985	22/4		
1986	26/2		
1987	15/2		
1988	4/4		
1989	2/5		

D. Fourth decade

Year	Onset of rain	Frequency of late onset	Range of the dates of onset
1990	4/4		
1991	28/2		
1992	1/5		
1993	12/3		
1994	1/3	2	14/2 - 1/5
1995	14/2		
1996	1/3		
1997	15/3		
1998	N.A		
1999	2/3		

Source: Author's Computation, 2005