

CONTEMPORARY JOURNAL OF SOCIAL SCIENCES

ISSN: 1115 - 959X

A JOURNAL OF THE FACULTY OF SOCIAL SCIENCES
Published in the Faculty of Social Sciences, Kogi State University, Anyigba, Nigeria

Volume 1 No. 1 & 2

June & December Edition, 2012

Contemporary Journal of Social Sciences
Vol. 1 No. 1 & 2 June & December Edition, 2012



CONTEMPORARY JOURNAL OF SOCIAL SCIENCES

Volume 1 No. 1 & 2 of June and December, 2012 Edition

Editorial committee:

Editor-in-Chief: Professor O.D Ogbonna

Editor: Professor A. Ogidiolu

Members:

Professor P.C Onokala, UNN

Professor M.M Daura, Unimaid

Professor Mala Galtima, FUTYola

Professor T. Ologunorisa, Uniosun

Dr. A.O Atubi KSU, Anyigba

Dr. E.O Oriola, Unilorin

Printed by
Haytee Press and Publishing Company Nigeria Ltd
No 2, Mejindadi Street off Taiwo Road, Ilorin
Kwara state, Nigeria.
08033604983, 08076016693
email: hayteepress@yahoo.co.uk

CONTEMPORARY JOURNAL OF SOCIAL SCIENCES

Volume 1 No. 1 & 2 of June and December, 2012 Edition

Articles in volume one:

- Petroleum Exploitation, Oil Spillage and its Effects on the Mineral Producing Areas of Nigeria
H.I Jimoh and K.A Iroye4
- Analysis of Traffic Flow Patterns and Network Characteristics in Lagos Mainland, Nigeria
Atubi, Augustus .O. 15
- Stock Market Development and Financing Choices of Firms in Nigeria
Tarurhor.M. Emmanuel.....22
- An Empirical Estimation of Average Return on Equity Investment in the Nigerian Stock Market
Abdullahi, I.B., Lawal, W.A. & Ibrahim, R.O.....32
- Limited Policy Engagement of Non Governmental Organisations (NGOs): A Guilt Trip on the Nigerian State
Adedoyin J. Omede & Segun Oshewolo.....39
- Road Traffic Accidents for Sustainable Development in the Third Millennium: Interventions for Nigeria
Atubi, Augustus .O......55
- Analysis of Rainfall Variability Over Northern Nigeria
Ojoye, Samsideen and Adeleke, Elisha A.....69
- Impact of Agriculture on Food security in Nigeria: Issues and Prospects
Irewolede, Fashagba79

Analysis of Rainfall Variability Over Northern Nigeria

By

Ojoye, Samsideen¹ and Adeleke, Elisha A.²

1. Department of Geography,
Federal University of Technology, Minna, Nigeria.
2. Department of Geography and Environmental Management,
University of Ilorin, Nigeria.

Abstract

This is an assessment of the analysis of the variation of rainfall trends over four Kano, Yelwa, Sokoto and Katsina rainfall zone. Rainfall data for 50 years in the zone were tested using 5-year and 10-year running mean. The whole period was divided into decades and the decadal means compared with long-term mean. Subsequently, the results indicate a decrease in annual rainfall in the zone from the mid 1970s up to the mid 1990s. Recent trends, however, shows increase in annual rainfall from the mid 1990s. The importance of this rainfall variability is fundamental in agricultural and water resources planning and development in Nigeria.

Introduction.

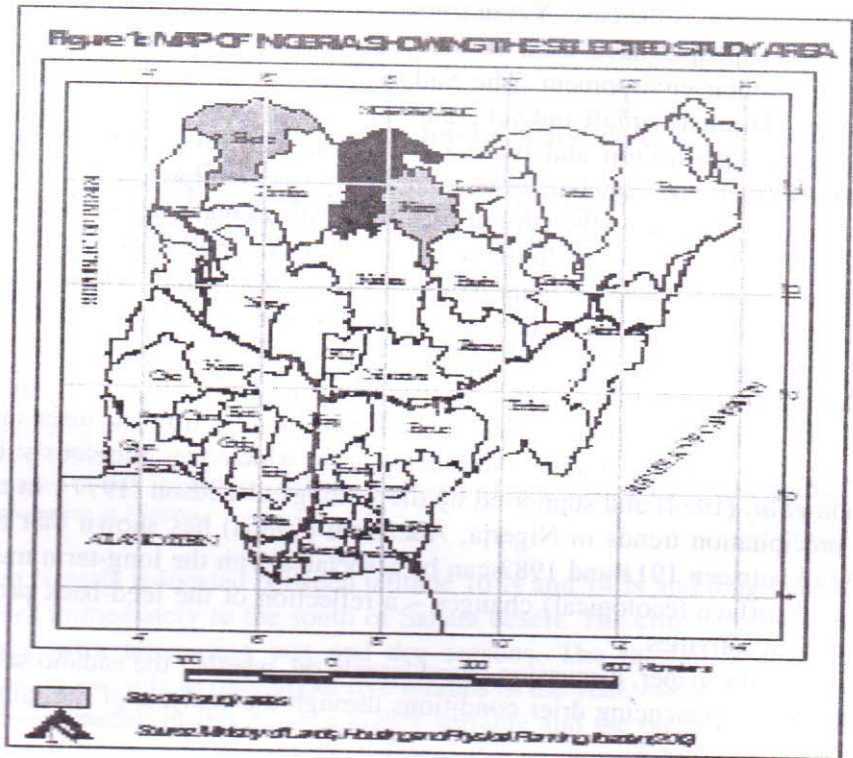
Northern Nigeria is located between latitude 10°N and 14°N and longitude 4°E and 14°E and lies immediately to the south of Sahara desert. The climate of the zone is savannah type with alternating wet and dry seasons. The rainfall is less than 1000mm per annum and it is in only about five months in the year, especially between May and October. Rainfall in this zone is highly variable and the onset of the rain is erratic. The rainfall intensity is very high between the months of July and August. There is intra-zonal difference in the amount of rainfall received by the region. The southern part receives more rain and is less variable compared to the northern section.

The gross features of rainfall patterns in this region, as in other parts of Nigeria are usually in association with what is often called the Inter tropical Discontinuity (ITD). The movement of the ITD northwards across the country between January and August, and its retreat from the southern fringe of the Sahara desert, after August, cause much of Nigeria to experience seasonal rainfall. The ITD itself is the boundary at the ground between the dry Tropical Continental (cT) air of northern origin and the moist Tropical Maritime (mT) air of southern origin. Within the mT air mass is enclosed a number of rainfall producing systems, such as the disturbance lines (especially the easterly waves), squall lines and the two tropospheric jet streams. It is the magnitude of these systems that influences the amount and seasonal distribution of rainfall over the region.

The emission of green house gases into the atmosphere has lead to changes in atmospheric composition and global climate change. The effect of global climate change on the environment varies from one ecological zone to another. In some areas,

it has resulted in higher atmospheric temperature and rainfall, while in some other areas the reverse is the case. Yet in some areas, the effect is insignificant. Worldwide, people have tried to study the nature of the effect of global climate change on their environment. The Sudano-Sahelian ecological zones of Nigeria are zones of marginal rainfall and yet contribute immensely to the agricultural production of Nigeria's grain crop and livestock. The sahelian drought of the 1970s and the 1980s ravaged the sahelian zone and left farmers impoverished. It is therefore, important to investigate the current trend in weather conditions in the sudano-sahelian zone of Nigeria. Although alternating wet and dry years have always been observed in tropical rainfall data (Oguntoyinbo, 1978; Adefolalu, 1972), the declining precipitation effectiveness due to anomalous rainfall patterns since the 1972-73 drought suggests that a dangerous trend in mean conditions is taking place (Adefolalu, 1986a, b). It is therefore of interest to understand the mean precipitation patterns in order to find out the major trends which can then be used to infer the causes and effects of recent precipitation ineffectiveness, which was previously diagnosed by Flohn *et al.* (1974) and supported by the findings of Kidson (1977). In a recent study on precipitation trends in Nigeria, Adefolalu (1986a) has shown that time-trends in rainfall between 1911 and 1983 can be associated with the long-term multiplier effect of land surface (ecological) changes – a reflection of the feed-back process induced by human activities.

In this paper, discussion based largely on whether the sudano sahelian zone of Nigeria is experiencing drier conditions through the analysis of the rainfall trend (fig 1).



Materials and Methods of Study

The data used for this study is rainfall data spanning a period of 50 years from 4 synoptic stations in Northern Nigeria (see Table 1).

Table 1. List of rainfall stations and periods of available Data.

Station	Station No	Latitude	Longitude	Period	No of Years
Zaria	1107.4	11,11	07,38	1958-2007	50
Yelwa	1145	10.3	9.8	1958-2007	50
Sokoto	1305	13,01	05,15	1958-2007	50
Katsina	1307.04	13,01	07,41	1958-2007	50

Source: The Authors

The data were collected from the Nigeria Meteorological Agency (NIMET), Oshodi, Lagos. The series of data for the selected stations was tested for normality using the standardized coefficient of skewness (Z_1) and Kurtosis (Z_2) especially as defined by Brazel and Balling. Z_1 is calculated as: Where x_i are the yearly rainfall totals; and for the onset series, yearly onset dates (in Julian days), x is the long term mean and N is the number of years in the sample. The normalizing limit is 95% of the error margin. If the absolute values of Z_1 and Z_2 are greater than 1.96, a significant deviation from the normal curve is indicated at 95% confidence level. 5-year and 10-year running means were calculated for annual rainfall for the selected stations. To further specify the nature of annual rainfall trend for the stations each data period was divided into decades and the mean for each decade calculated. The decadal means were compared with the long-term mean.

Data Analysis and Discussion of Results

Samaru: From figure 1, 10-year and 5-year running means show annual rainfall to be below the long-term mean. The rainfall fluctuates all round the year. The trend line showed an overall decrease in the rainfall (See fig 2).

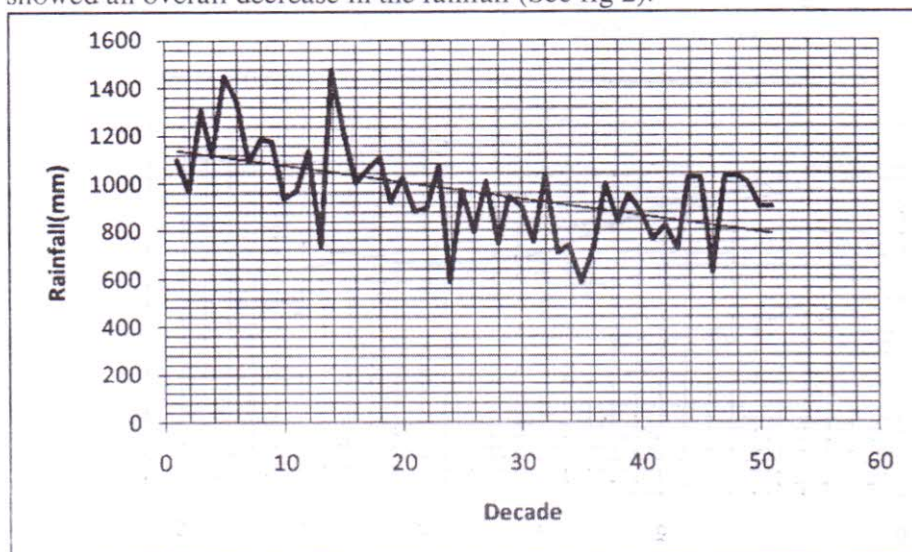


Fig. 2: Trends in annual rainfall amount for Samaru.

The decadal statistics of the annual rainfall totals for Samaru are presented in table 3 and figure 3. The decadal means were on the decrease with the decade 1998-2007 the minimum. In overall the trend line showed a general decrease in the decadal mean of the 50 years under consideration.

Yelwa: From figure 3, 10-year and 5-year running mean shows annual rainfall above the long-term mean. From the late 1960s to the early 1990s the rainfall was above the

long-term mean. The rainfall was on the increase generally when the trend is considered. Decadal statistics of the annual rainfall totals for Yelwa are presented in table 3 and figure 4. The decadal means were above the long-term in the decade 1989-1997 and in the last decade (1998-2007)

Sokoto: The annual rainfall totals for Sokoto are normal at 95% confidence level. 10-year and 5-year running means show annual rainfall above the long-term mean from the beginning of the data up to the mid of the first decade. From the later part of the first decade to the early part of the last decade was below the long-term mean.

Table 2: Coefficient of Skewness and Kurtosis for the selected stations

	Zaria	Yelwa	Sokoto	Katsina
Skewness	0.488894	0.359626	0.38992	0.097691
Kurtosis	0.96991	0.08783	0.06647	-0.49321

All the stations were found to be normal at 95% confidence interval

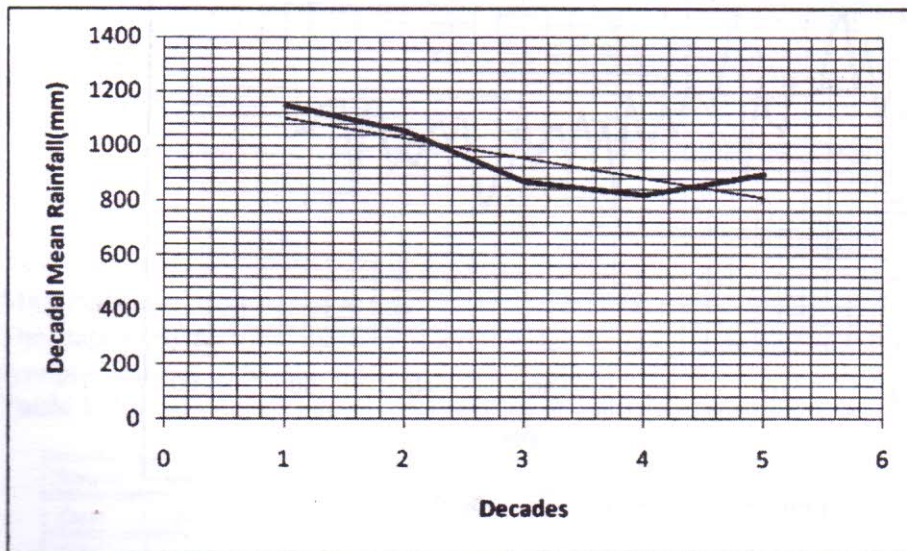


Fig. 2 The trend of the Decadal means for Zaria.

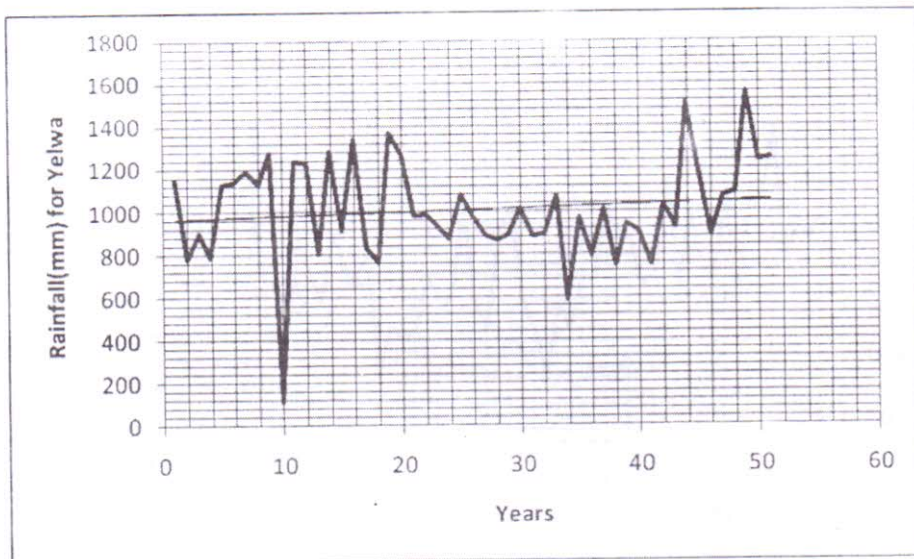


Fig. 3. Trend in annual rainfall amount for Yelwa

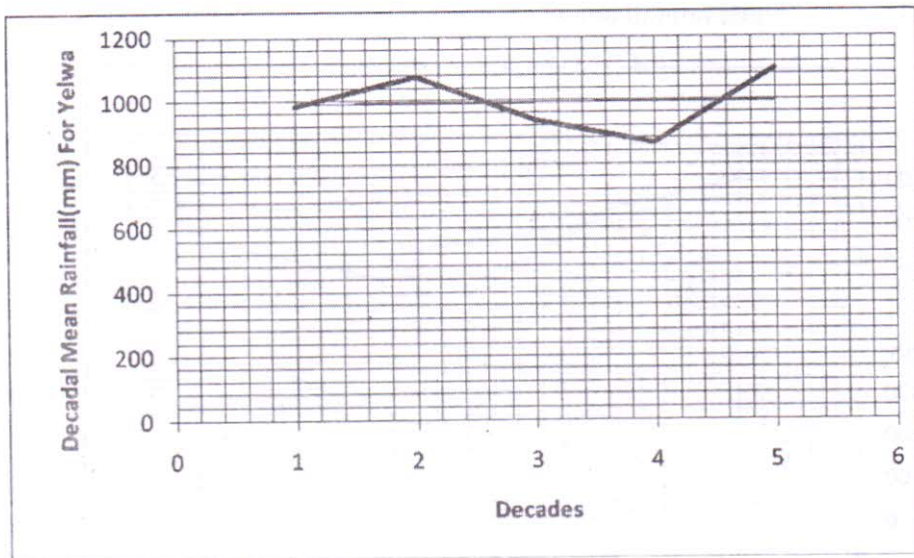


Fig. 4. The trend of the Decadal means for Yelwa.

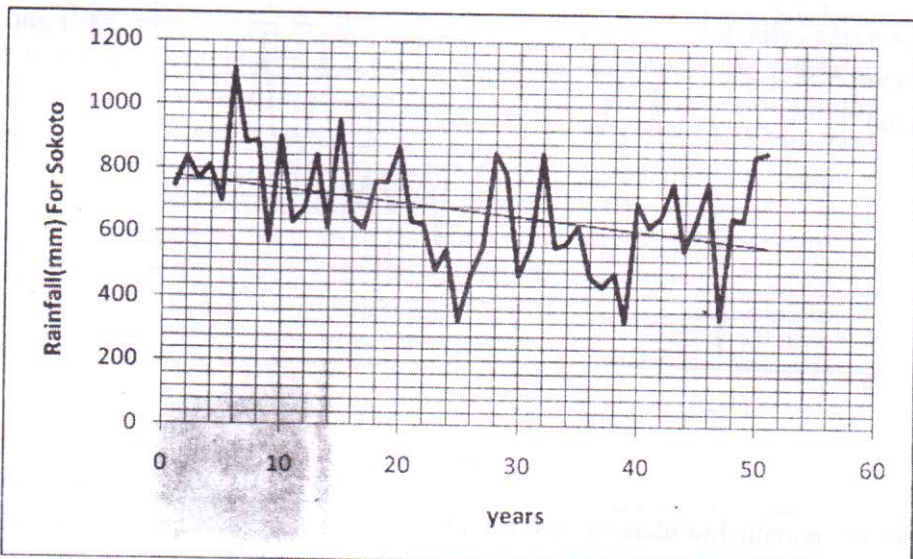


Fig. 5: Trend in annual rainfall amount for Sokoto

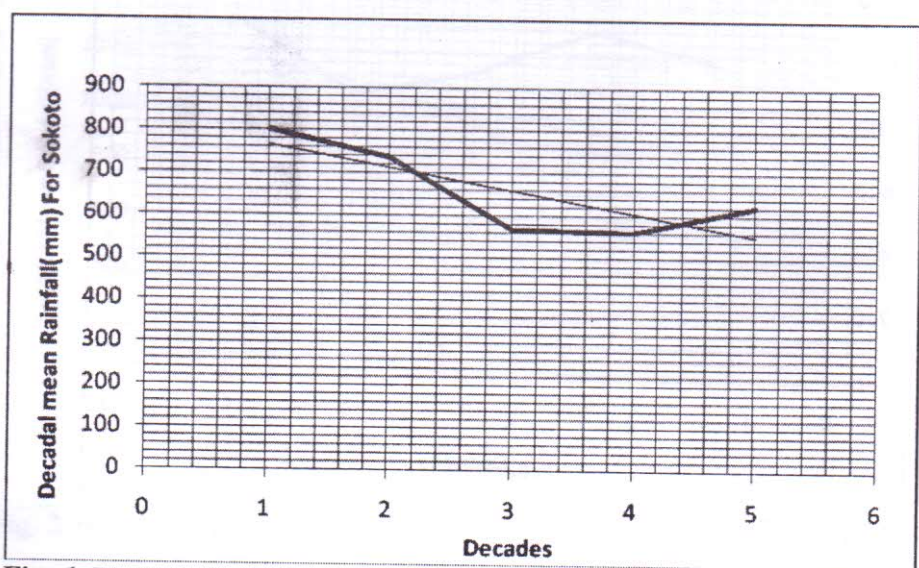


Fig. 6: The trend of the Decadal means for Sokoto

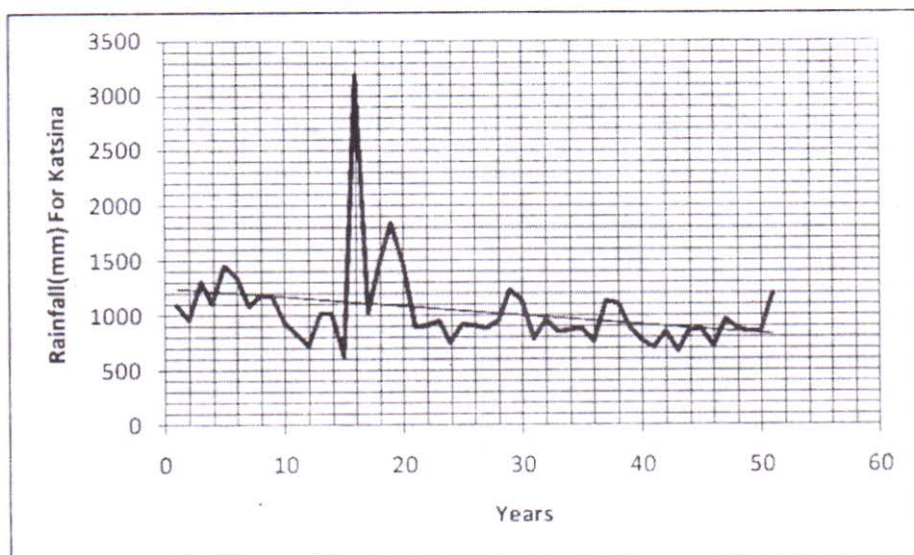


Fig. 7: Trend in annual rainfall amount for Katsina.

Table 3. Decadal statistics for Zaria, Yelwa, Sokoto and Katsina.

Station	Annual	1958- 1967	1968- 1977	1978- 1987	1988- 1997	1998- 2007
Zaria	962.33	1145.96	1053.47	866.73	820.36	895.62
Yelwa	1007.16	984.54	1076.32	937.68	866.73	1098.33
Sokoto	670.48	802.86	735.87	567.67	562.52	621.96
Katsina	1035.6	1132.77	1331.25	941.53	894.08	828.34

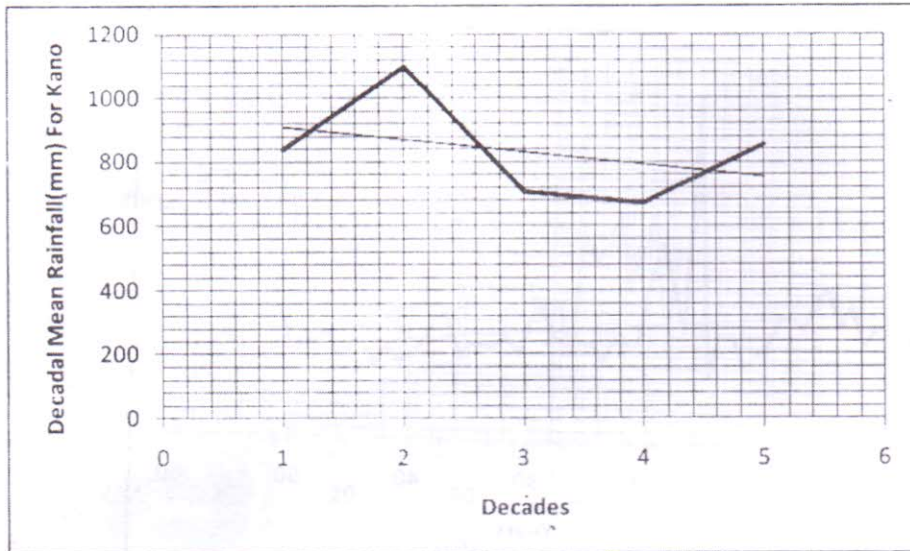


Fig. 8: The trend of the Decadal means for Katsina.

Katsina: The annual rainfall totals for Katsina are normal at 95% confidence level. 10-year and 5-year running-means shows annual rainfall above the long-term mean from the beginning of the data up to the mid 1980s and from the late 1980s up to the mid 1990s and from the late 1990s up to the end of the period. Decadal statistics of the annual rainfall totals for Katsina are presented in Table 3 and figure 8 as well. The decadal mean were above the long-term mean for decades 1958-1967 while the means were below the long-term mean for 1989-1997 through 1998-2007. Though, the last decade was below the long-term mean, there is evidence of increasing rainfall in the last decade.

In general, the earlier decade of 1958-1967 shows higher mean rainfall than the long-term mean. The decades from the early 1970s to the mid 1990s shows declining rainfall totals. This observation is in agreement with earlier studies (Olaniran, 1989). However, for all the stations there is evidence of increasing rainfall totals in the last decade 1998-2007. This implies a positive trend in annual rainfall totals towards the end of the study period. This trend is likely to continue into subsequent decades.

Conclusion

It has been observed that in this study there is significant increase in annual rainfall amount in the last decade of the study. It therefore means that we are experiencing wetter conditions in the sudano-sahelian zone of Nigeria. This is at variance with earlier conclusions drawn on the rainfall trends in the zone. However, these previous studies were based on data covering up to the late 2000. Increasing

annual rainfall totals portends both good and ills. It is good because there is improvement in water supply to an otherwise marginal area. This is important for agricultural production and water resources management. On the other hand, the ills relates to flooding incidents, dam collapse as a result of excessive rainfall on an impervious terrain could lead to damage to life and properties.

References

- Adefolalu, D.O., 1972: On the mean troposphere and lower tropospheric features over West Africa, M.Sc. Thesis, FSA-Tall U.S.A. 321pp.
- Adefolalu, D.O., 1986a: Rainfall trends (1911-1980) in relation to Water-use problems in Nigeria. *Theor. Appl. Climatol.*, 37, 205-219.
- Adefolalu, D.O., 1986b : Further aspects of Sahelian drought as evident from rainfall regime of Nigeria. *Arch. Met. Geoph. Biocl., Ser. B*, 36, 277-295
- Balling R.C and Brazel S.W., 1986. Temporary analysis of summer-time weather street level in Phoenix, Arizona. *Arch. Met Geog. Brod. Sec. B36*, pp331-342.
- Flohn, H.D., Henning, C., Korff, H.C., 1974: Possibilities and Limitations of a large-scale water budget modification in the Sudan-Sahel Belt of West Africa. *Meteorol. Rdsch.*, 27, 97-100
- Hastenrath S. 1991: *Climate Dynamics of the Tropics*. (KAP: Dordrecht), 488 pages
- Hayward, O.F and Oguntoyinbo, J.S. 1987: *The Climatology of West Africa (B and N Books)* 263pp
- Kamara, S.I 1986: "The origin and types of rainfall in West Africa" *Weather*, Vol. 41, 48-56
- Kanote, M. 1984: "Climate of the sorghum and millet cultivation zones of the Semi-Arid tropical regions of West Africa" In *Agromet. of Sorghum and Millet in the Semi-Arid Tropics*. Proceedings of the International Symposium, ICRISAT Centre, India
- Kidson, J.W., 1977: African rainfall and its relation to the upper air circulation. *Quart. J. Roy. Meteor. Soc.*, 103, 441-456
- Muller, R.A and Orbeelander, T.M, 1987: *Physical Geography Today: A Portrait of a planet* (Random House Inc: New York)
- Nicholson, S.E., 1981: "The nature of rainfall fluctuation in subtropical West Africa" *Monthly Weather Review*, 108(4): 473-487.
- Oguntoyinbo, J.S., 1978: Climate, In: *A Geography of Nigerian Development*. (Ed. Oguntoyinbo et al.): Heinemann, 14-39.
- Ojonigu, F.A, Edwin, O.I, and Afolayan O.J, 2007: "Are we experiencing drier conditions in the Sudano-Sahelian Zone of Nigeria" In *Journal of Applied Sciences research*, 3 (12): 1746-1751.
- Oladipo, E.O., 1993. "Some aspects of the spatial characteristics of drought in Northern Nigeria". *Natural Hazards*, 8: 171-188.
- Olaniran, O.J. and Sumner G.N, 1989. "A study of climate variability in Nigeria based on the onset, retreat and length of the rainy season" *Int. Journal of Climatol.*, 9: 253-269.