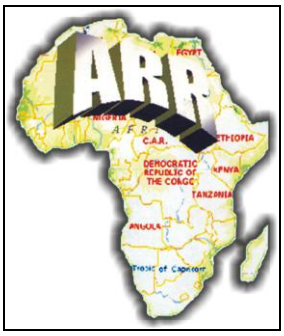

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# DETERMINATION OF SEASONAL RAINFALL VARIABILITY AND THEIR AGRO-CLIMATIC IMPLICATION IN ILORIN, KWARA STATE, NIGERIA

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## ABSTRACT

*The study investigated determination of seasonal rainfall variability and its Agro-climatic implication in Ilorin, Kwara State, Nigeria. Rainfall data on daily basis were collected from three agro-ecological zones in the study area from 1979 to 2008. These data were used to determine the monthly and annual rainfall mean, rainfall trends, and distribution pattern as well as rainfall characteristics. The difference in the onset and cessation was also employed in the estimation of the effective length of rainy season. The result of the study ascertained that weak zonal pattern in amount of rainfall from the South Western part of the North-East was noticed. Also there was a positive correlation with most of the years in Ilorin East with 1.5% R value, 4.4% R value at 95% level of significance in the South and 20% R value in the West, the highest in the agro-ecological zones in the study area. The study also indicated that the onset, cessation and length of rainy season vary from one ecological zone to another. Based on the findings, it was concluded that variation in rainfall distribution across the study area would assist the farmers in their farming activities leading to high yield in crops production.*

**Keywords: Agro-climatic, Seasonal Rainfall Variability, Determination**

## INTRODUCTION

Agro-climatology is the study of the relationship between climate and agriculture. This includes the effects of climate on crop growth yield as well as on the livestock production.

In the tropics and Kwara State in particular, of all the climatic elements, rainfall is probably the most important as far as crop production is concerned, and availability of water is one of the major climatic factors that affects plant growth, development and yield (Yahaya, 2011).

The drastic changes in the seasonal rainfall variability particularly in sudano-sahelian region part of the world since later part of the 1960s is well documented in the literature (Lamb, 1982, Nicholson, 1979, Donnet, et al, 1985, Adefolalu, 1986, Hoss, et al, 1995, Nicholson, et al, 2000, Bello, N.J. 2009). This phenomenon has been attributed to the complex interplay of sea surface temperature anomalies (SSTA) over the tropical Atlantic Ocean and attendant shift of circulation system during dry years. These drastic changes in the (SRV) were also compounded by human action in allowing both human and livestock population to increase beyond critical level in many parts of West Africa during wet years (Olasantan, F.O. et al, 2004, Hastenrath, 1990). It has also been noted by Ayoade, (2003) among others that when fluctuations in climate constitute significant departure from the normal climate state then there are problems of adjustment and the environment, man and his socio-economic activities most especially farming become very vulnerable. This paper therefore examines seasonal rainfall variability and its agro-climatic implication in Ilorin, Kwara State in order to assist the farmers in proper understanding of onset, cessation dates and length of raining season for high improvement in crops production.

## THE STUDY AREA

Ilorin is the capital of Kwara state. It is located on latitude $8^0$ 31N and $4^0$ 35E and longitude $4^0$ 57N and $8^0$ 52W with an area of about $100km^2$ squares (Kwara state Diary, 2007). For administrative purposes, it is divided into Ilorin town council (West), Ilorin East and Ilorin South. Being situated in the transitional zone, between the forest and the savanna region of Nigeria i.e. the North and the West coastal region; it therefore serves as a "melting point between the Northern and Southern cultures" Oyebanji, J.O. (1993) .fig 1.

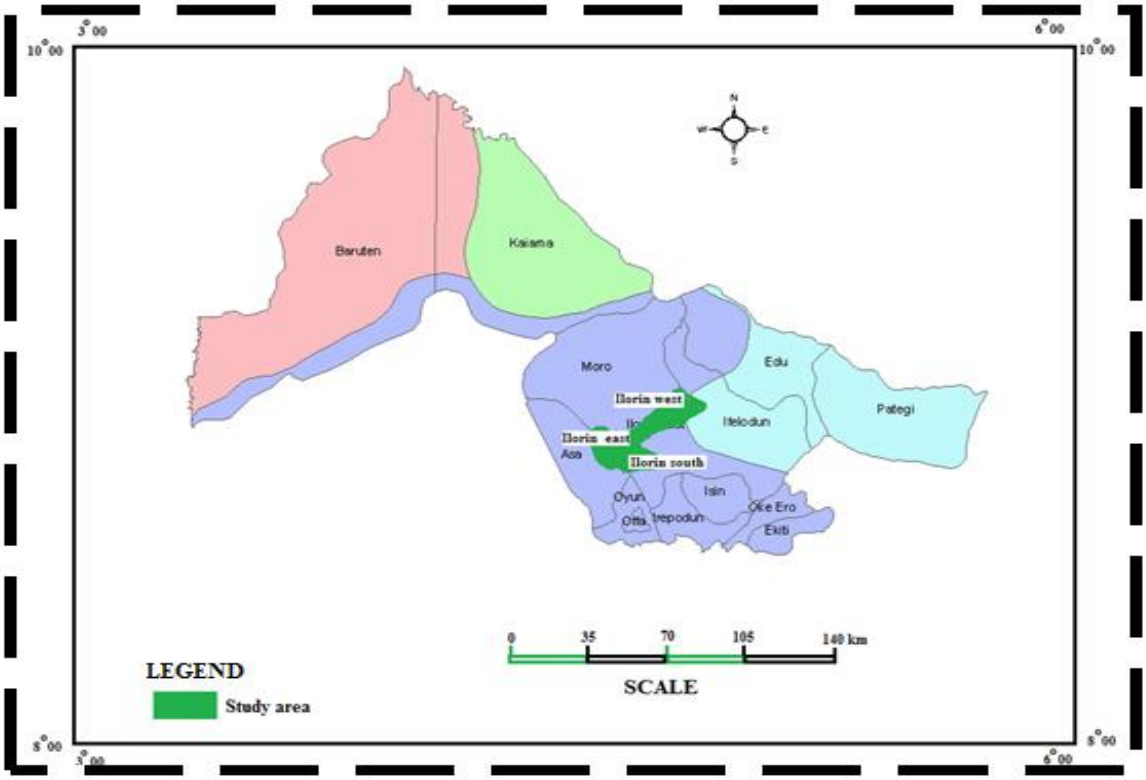


**Figure 1: Map of Kwara State Showing Local Government and the Study Area**
**Source: Geography Department FUT Minna**

## MATERIALS AND METHODS

Daily rainfall records from three agro ecological zones in the study area from 1979 to 2008 were collected. The stations include: Apado, Oke-Oyi, Panada, Osere, Egbejila, Maadi, Fufu, Tanke, Fate, etc.These data was obtained from the Nigerian Meteorological Services (NIMET), Oshodi, Lagos, Department of Geography, University of llorin and Meteorological section, Ilorin International Airport. The data was augmented with data collected from numerous agencies in Kwara state, most especially the ADP centers located in each of the local government areas. These data were used to derive the rainfall characteristics such as the onset, cessation, length of rainy season (LRS), which are very crucial in plant growth and development. The rainfall data was also used to ascertain the rainfall trends and distributional patterns of rainfall amounts in the study area.

The administrative map of Kwara State was acquired and scanned with an A0 scanner to allow further processing, that is, vectorizing/digitizing; the study area was then extracted. A hand-held GPS device was used to pick various points of the various areas of the study area and also the related attributes entered with the point. (Fig 2)

The mean was employed to analyze the rainfall distribution pattern and rainfall trends in the study area.

$$\mathbf{X} = \mathbf{1/n \sum n \ xi \ (i = 1.2\text{--------}n)} - \text{equation 1}$$

Where:

xi = rainfall amount for the 1st term
$\sum$ = summation of the terms from i to n
n = number of cases

The difference in onset and cessation dates of the rain was employed in the estimation of the effective length of the rainy season (LRS) as discussed by Ndagi et al (1989) and Adefolalu, D.O. (1990) expressed in the form:

$$\mathbf{LRS = ¢ - ǿ} \quad - \quad \text{equation 2}$$

Where: LRS represents the length of rainy season
¢ represents cessation date
ǿ represents the onset date of the rain

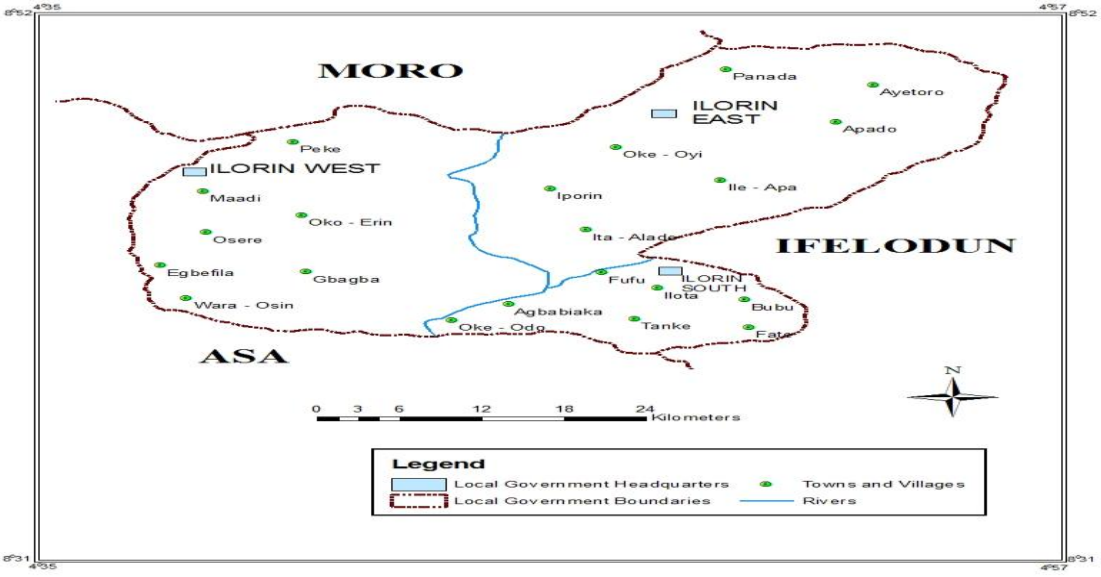


**Figure 2: The Study Area Showing Data Collection Centers**

## RESULT AND DISCUSSION

### Distribution Pattern of Mean Annual Rainfall Amount

Fig. 3 shows the distribution of mean annual rainfall in Ilorin of Kwara state. The figure shows a weak zonal pattern in nature and the amount of rainfall varies from the South Western part to the North East. For instance, the mean annual of rainfall received in settlements such as Iporin, Apado Panada oke-oyi and its environs all in Ilorin East ranges from 1056mm to 1150mm.

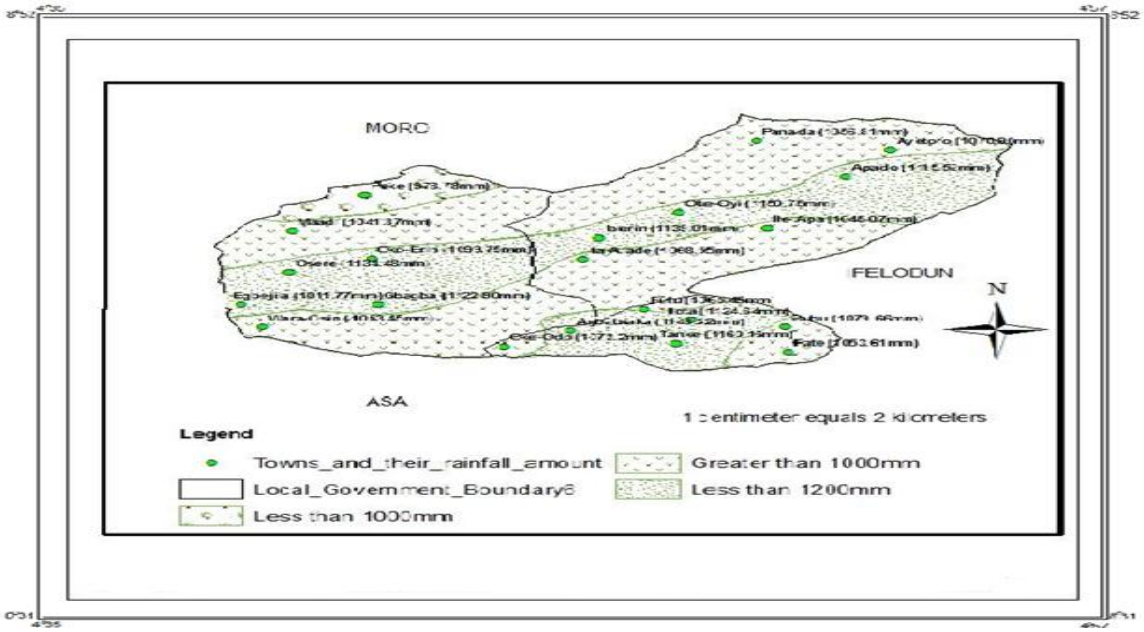


**Figure 3: Mean Annual Rainfall (mm) in Ilorin, Kwara State (1979 – 2008)**

In Ilorin, for instance, the mean annual rainfall was above 1130mm. the areas to the extreme west of the study area such as Maadi, Oko- Erin, Osere, Gbagba, Egbejila, Peke and Wara- Osin are also characterized with fluctuation with mean annual rainfall ranging from 978mm to 1122mm. Settlements such as Gbagba recorded a fairly amount of rainfall as compared with areas like Peeke and Wara Osin. The settlement in the Southern part of the study area such as Fufu, Ilota, Tanke, Agbabiaka, Fate, Oke- and Odu and Bubu also recorded different variation in the annual mean rainfall. Settlements such as Agbabiaka and Ilota had high rainfall.

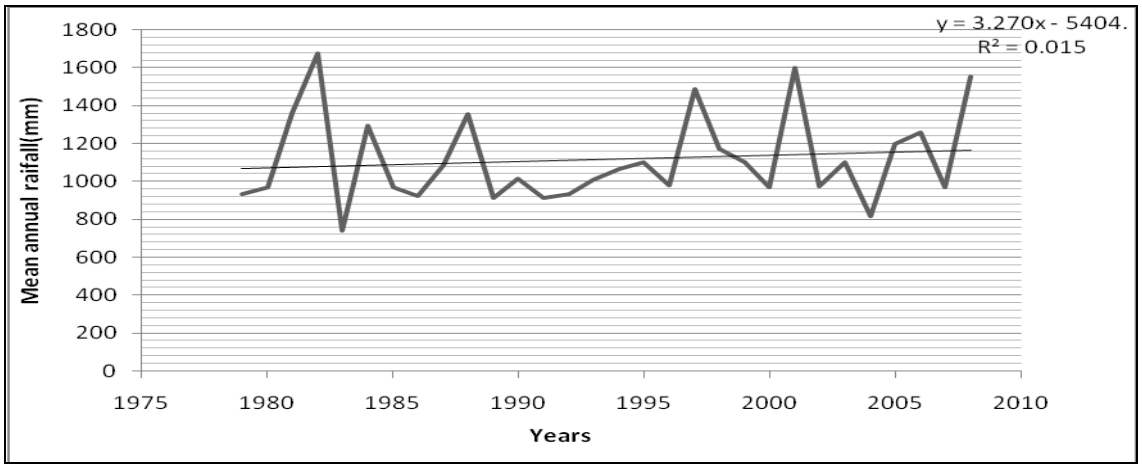


**Figure 4: Mean Annual Rainfall for Ilorin East (1979 – 2008)**

Figure 4 above and Table 3 show the mean annual rainfall for Ilorin East from (1979-2008). The figure shows that there is an upward trend in the rainfall with an indication that there is about 1.5% R value which shows a positive correlation with most of the years.

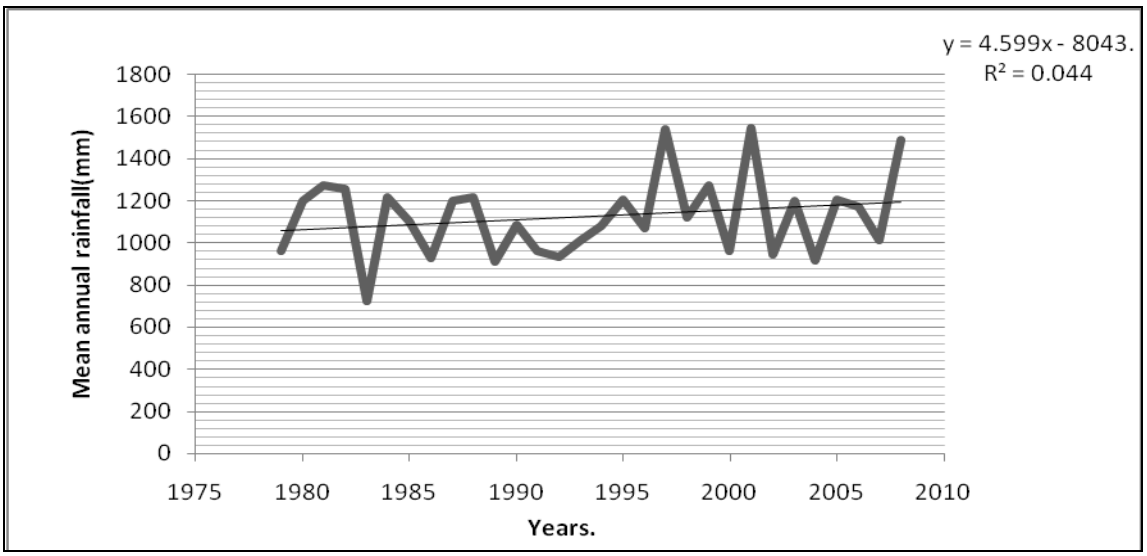


**Figure 5: Mean Annual Rainfall for Ilorin South (1979 – 2008)**

The mean annual rainfall trend for Ilorin- South from (1979- 2008) was as shown in figure 5.and Table 1. The graph shows an upward trend with about 4.4% R value at 95% level of significance.

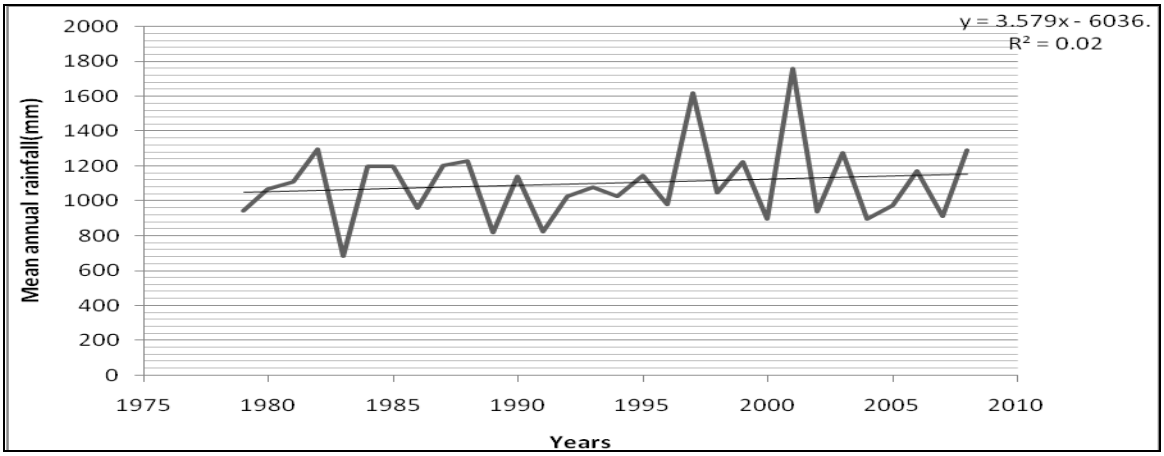


**Figure 6: Mean Annual Rainfall for Ilorin-West (1979 – 2008)**

The figure 6 and Table 2 show the mean annual rainfall trend for Ilorin-West (1979- 2008), the graph shows a positive trend which showed an R value of 20%, the highest so far in the three Local Government Areas under study. The trend showed an increasing trend for most part of the 1990s, 2000 up to the end of the 21st century.

In Agriculture, two of the most important phonological aspect of rainfall which are useful in decision making are the onset (ø) and cessation (¢) of the rains. The combination of these two determines the length of the rainy season (LRS). (Fig. 6 – 8) shows onset, cessation and length of the rainy season for the study area. The earliest onset dates of rain in Panada, Oke- Oyi, Iporin, Osere, Gbagba, Wara-Osin, Maadi, Gbagba and Egbejila is before 31st March. This implies that between 25th and 30th

February the above settlements would have expected the first rainfall in the year. In places such as Oke- Odo, Agbabiaka, Tanke, Fate, Fufu and Ilota, the onset date of the rain starts from 31st of March and extends to after 30th of April (Fig. 7).

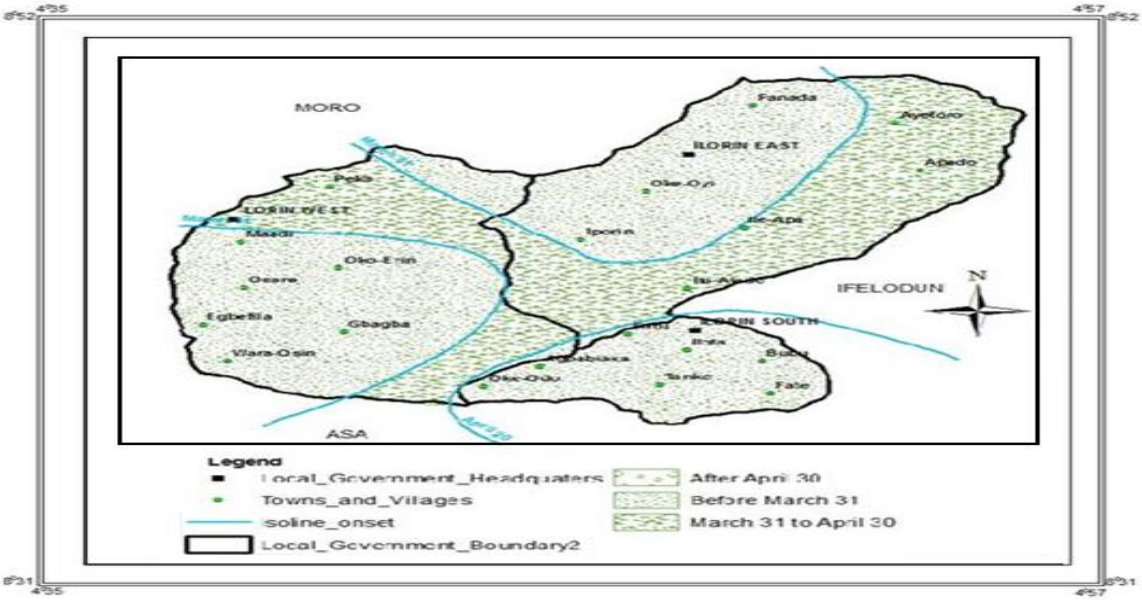


**Figure 7: Onset Dates of Rains in Ilorin, Kwara State**

This implies that land preparation for planting can be done between 25th and 30th of February. Actual planting of crops however can be carried out as from 31st March. This is because rain may not be steady until 1st of April or 15th April, for the purpose of crop production.

The dates of cessation for the study area are shown in (Fig. 8). The cessation dates in places like Panada, Ayetoro, Apado, Oke- Oyi and Ile- Apa occur before 7th October. The cessation dates of rains in Iporin, Ita Alade, Agbabiaka, Tanke, Fate, Oke Odo and Ilota is between 7th October and 27th October, while places like Peke, Oko Erin, Osere, Gbagba, Wara- Osin, Maadi and Egbejila had its cessation dates of rains between 27th October and 5th November (Fig. 8). There are periods when rain terminates either early or late. These are periods of anomalies. An early cessation will affect agriculture, these periods are critical to crop production/ maturity, and this may also lead to crop failure.

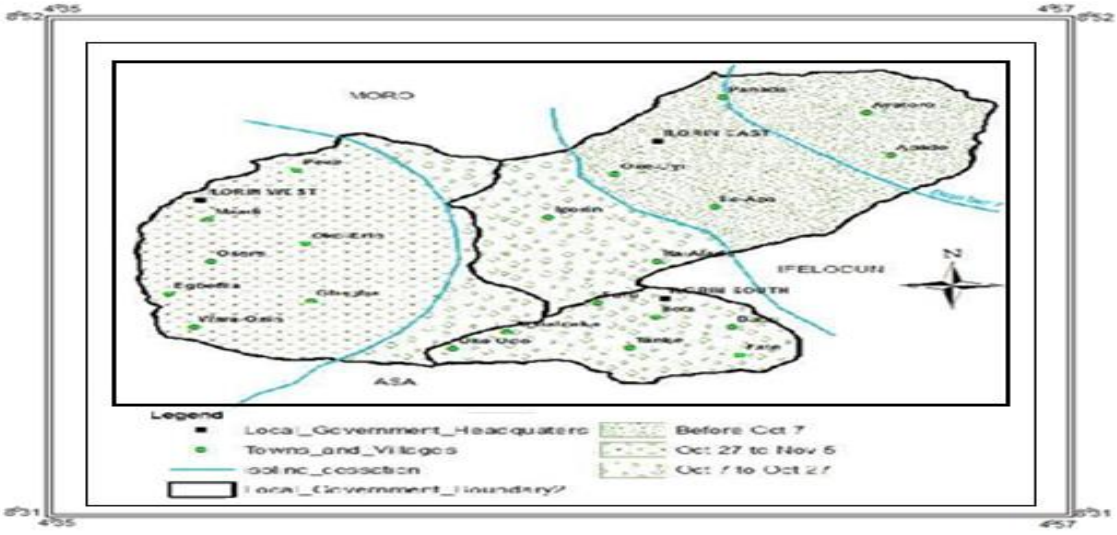


**Figure 8: Cessation Dates of Rains in Ilorin, Kwara State**

**Length of Rainy Season**

Figure 9 illustrates the length of rainy season. The length of rainy season in Gbagba, Ita Alade, Egbejila and Wara Osin ranges between (210 to 220 days) while the shortest LRS of less than 210-220mm was recorded in Oke – Ode, Tanke, Fate, Ilota, Bubu and Agbabiaka.

The LRS in Iporin, Ile- Apa, Apado, Oko- Erin, Maadi and Osere ranges from 220- 230 days and longest LRS of more than (230 days) was recorded in Peke, Panada and Ayetoro.

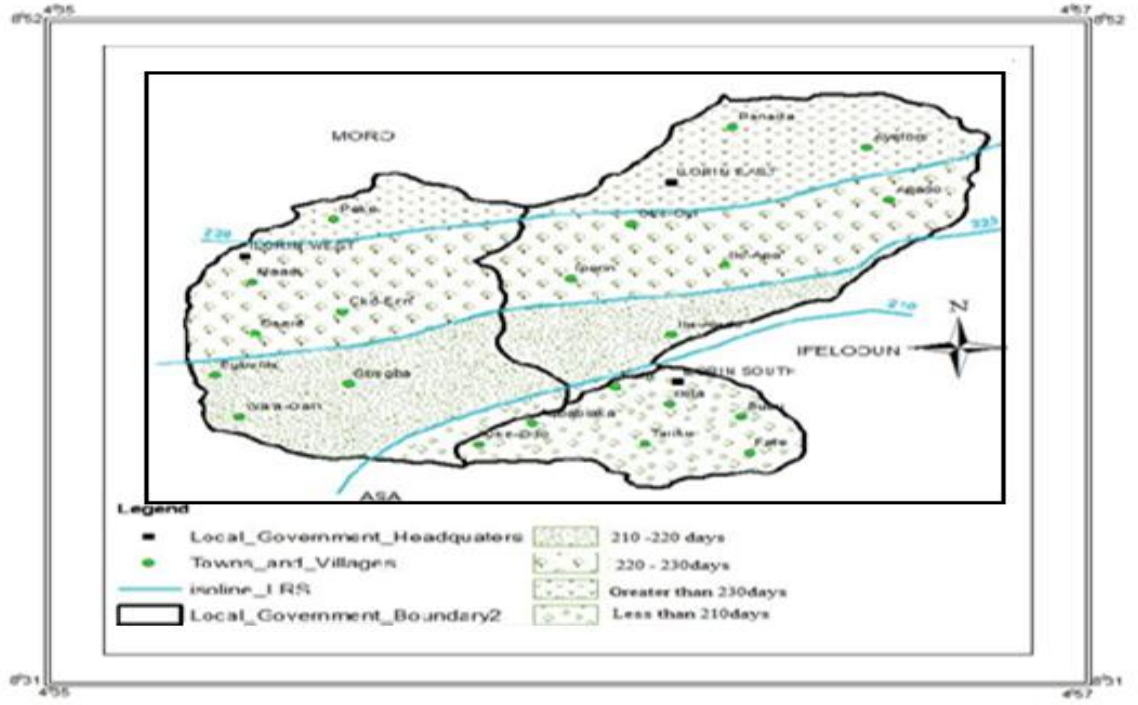


**Figure 9: Length of Rainy Season (L.R.S.) in Ilorin, Kwara State**

Generally speaking, LRS decreases from settlements such as Maadi, Oko Erin, Ile- Apa and Iporin both in the Western and Eastern parts of the study area to places like Oke-Odo, Tanke, Fate, Agbabiaka and Ilota in the Southern part of the study areas (Fig. 9). The implication of the above is that both cereal and root crops can be cultivated in the study area.

## CONCLUSION AND RECOMMENDATION

The analysis epitomized general information on the importance of seasonal rainfall variability with regards to onset, cessation, length of raining season and its agro-climatic implication. The study shows that rainfall distribution in Ilorin, Kwara State fluctuates from place to place from East to West and South respectively.

Investigation also revealed that the onset, cessation and length of rainy season varies from the three ecological zones, although the analysis showed that there was no significant difference in the amount of rainfall distribution across the zones in the study areas.

It is therefore recommended that land preparation and planting of crops can be embarked upon after 30th April and since the average length of LRS is about 220 days, this means that reliable rainfall period is adequate for most crops in the study area.

## Table 1: Mean Annual Rainfall for Selected Stations in Ilorin-South

| APPENDIX 4: - Mean Annual Rainfall for Selected Stations in Ilorin-South | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **YEARS** | **Fufu** | **Ilota** | **Tanke** | **Agbabiaka** | **Fate** | **Oke-Odo** | **Bubu** | |
| 1979 | 910.8 | 961.4 | 991.76 | 981.64 | 900.68 | 920.92 | 922.944 | 961.4 |
| 1980 | 1137.6 | 1200.8 | 1238.72 | 1226.08 | 1124.96 | 1150.24 | 1152.768 | 1200.8 |
| 1981 | 1206.9 | 1273.95 | 1314.18 | 1300.77 | 1193.49 | 1220.31 | 1222.992 | 1273.95 |
| 1982 | 1191.6 | 1257.8 | 1297.52 | 1284.28 | 1178.36 | 1204.84 | 1207.488 | 1257.8 |
| 1983 | 685.8 | 723.9 | 746.76 | 739.14 | 678.18 | 693.42 | 694.944 | 723.9 |
| 1984 | 1155.6 | 1219.8 | 1258.32 | 1245.48 | 1142.76 | 1168.44 | 1171.008 | 1219.8 |
| 1985 | 1045.8 | 1103.9 | 1138.76 | 1127.14 | 1034.18 | 1057.42 | 1059.744 | 1103.9 |
| 1986 | 880.2 | 929.1 | 958.44 | 948.66 | 870.42 | 889.98 | 891.936 | 929.1 |
| 1987 | 1137.6 | 1200.8 | 1238.72 | 1226.08 | 1124.96 | 1150.24 | 1152.768 | 1200.8 |
| 1988 | 1155.6 | 1219.8 | 1258.32 | 1245.48 | 1142.76 | 1168.44 | 1171.008 | 1219.8 |
| 1989 | 865.8 | 913.9 | 942.76 | 933.14 | 856.18 | 875.42 | 877.344 | 913.9 |
| 1990 | 1031.4 | 1088.7 | 1123.08 | 1111.62 | 1019.94 | 1042.86 | 1045.152 | 1088.7 |
| 1991 | 910.8 | 961.4 | 991.76 | 981.64 | 900.68 | 920.92 | 922.944 | 961.4 |
| 1992 | 885.6 | 934.8 | 964.32 | 954.48 | 875.76 | 895.44 | 897.408 | 934.8 |
| 1993 | 957.6 | 1010.8 | 1042.72 | 1032.08 | 946.96 | 968.24 | 970.368 | 1010.8 |
| 1994 | 1022.4 | 1079.2 | 1113.28 | 1101.92 | 1011.04 | 1033.76 | 1036.032 | 1079.2 |
| 1995 | 1141.2 | 1204.6 | 1242.64 | 1229.96 | 1128.52 | 1153.88 | 1156.416 | 1204.6 |
| 1996 | 1011.6 | 1067.8 | 1101.52 | 1090.28 | 1000.36 | 1022.84 | 1025.088 | 1067.8 |
| 1997 | 1461.6 | 1542.8 | 1591.52 | 1575.28 | 1445.36 | 1477.84 | 1481.088 | 1542.8 |
| 1998 | 1060.2 | 1119.1 | 1154.44 | 1142.66 | 1048.42 | 1071.98 | 1074.336 | 1119.1 |
| 1999 | 1207.8 | 1274.9 | 1315.16 | 1301.74 | 1194.38 | 1221.22 | 1223.904 | 1274.9 |
| 2000 | 910.8 | 961.4 | 991.76 | 981.64 | 900.68 | 920.92 | 922.944 | 961.4 |
| 2001 | 1465.2 | 1546.6 | 1595.44 | 1579.16 | 1448.92 | 1481.48 | 1484.736 | 1546.6 |
| 2002 | 894.6 | 944.3 | 974.12 | 964.18 | 884.66 | 904.54 | 906.528 | 944.3 |
| 2003 | 1137.6 | 1200.8 | 1238.72 | 1226.08 | 1124.96 | 1150.24 | 1152.768 | 1200.8 |
| 2004 | 867.6 | 915.8 | 944.72 | 935.08 | 857.96 | 877.24 | 879.168 | 915.8 |
| 2005 | 1141.2 | 1204.6 | 1242.64 | 1229.96 | 1128.52 | 1153.88 | 1156.416 | 1204.6 |
| 2006 | 1110.6 | 1172.3 | 1209.32 | 1196.98 | 1098.26 | 1122.94 | 1125.408 | 1172.3 |
| 2007 | 961.2 | 1014.6 | 1046.64 | 1035.96 | 950.52 | 971.88 | 974.016 | 1014.6 |
| 2008 | 1411.2 | 1489.6 | 1536.64 | 1520.96 | 1395.52 | 1426.88 | 1430.016 | 1489.6 |
| **Mean** | **1065.45** | **1124.64** | **1160.16** | **1148.32** | **1053.61** | **1077.29** | **1079.66** | |

## Table 2: Mean Annual Rainfall for Selected Stations in Ilorin-West

| APPENDIX 5: - Mean Annual Rainfall for Selected Stations in Ilorin-West | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **YEARS** | **Maadi** | **Oko-Erin** | **Osere** | **Gbagba** | **Egbejila** | **Peeke** | **Wara-Osin** | |
| **1979** | 894.6 | 944.3 | 974.12 | 964.18 | 868.756 | 840.427 | 904.54 | **944.3** |
| **1980** | 1013.4 | 1069.7 | 1103.48 | 1092.22 | 984.124 | 952.033 | 1024.66 | **1069.7** |
| **1981** | 1051.2 | 1109.6 | 1144.64 | 1132.96 | 1020.832 | 987.544 | 1062.88 | **1109.6** |
| **1982** | 1230.3 | 1298.65 | 1339.66 | 1325.99 | 1194.758 | 1155.799 | 1243.97 | **1298.7** |
| **1983** | 649.8 | 685.9 | 707.56 | 700.34 | 631.028 | 610.451 | 657.02 | **685.9** |
| **1984** | 1135.8 | 1198.9 | 1236.76 | 1224.14 | 1102.988 | 1067.021 | 1148.42 | **1198.9** |
| **1985** | 1135.8 | 1198.9 | 1236.76 | 1224.14 | 1102.988 | 1067.021 | 1148.42 | **1198.9** |
| **1986** | 912.6 | 963.3 | 993.72 | 983.58 | 886.236 | 857.337 | 922.74 | **963.3** |
| **1987** | 1141.2 | 1204.6 | 1242.64 | 1229.96 | 1108.232 | 1072.094 | 1153.88 | **1204.6** |
| **1988** | 1166.4 | 1231.2 | 1270.08 | 1257.12 | 1132.704 | 1095.768 | 1179.36 | **1231.2** |
| **1989** | 775.8 | 818.9 | 844.76 | 836.14 | 753.388 | 728.821 | 784.42 | **818.9** |
| **1990** | 1081.8 | 1141.9 | 1177.96 | 1165.94 | 1050.548 | 1016.291 | 1093.82 | **1141.9** |
| **1991** | 782.1 | 825.55 | 851.62 | 842.93 | 759.506 | 734.7395 | 790.79 | **825.55** |
| **1992** | 976.5 | 1030.75 | 1063.3 | 1052.45 | 948.29 | 917.3675 | 987.35 | **1030.8** |
| **1993** | 1024.2 | 1081.1 | 1115.24 | 1103.86 | 994.612 | 962.179 | 1035.58 | **1081.1** |
| **1994** | 976.5 | 1030.75 | 1063.3 | 1052.45 | 948.29 | 917.3675 | 987.35 | **1030.8** |
| **1995** | 1089.9 | 1150.45 | 1186.78 | 1174.67 | 1058.414 | 1023.901 | 1102.01 | **1150.5** |
| **1996** | 930.6 | 982.3 | 1013.32 | 1002.98 | 903.716 | 874.247 | 940.94 | **982.3** |
| **1997** | 1533.6 | 1618.8 | 1669.92 | 1652.88 | 1489.296 | 1440.732 | 1550.64 | **1618.8** |
| **1998** | 992.7 | 1047.85 | 1080.94 | 1069.91 | 964.022 | 932.5865 | 1003.73 | **1047.9** |
| **1999** | 1162.8 | 1227.4 | 1266.16 | 1253.24 | 1129.208 | 1092.386 | 1175.72 | **1227.4** |
| **2000** | 851.4 | 898.7 | 927.08 | 917.62 | 826.804 | 799.843 | 860.86 | **898.7** |
| **2001** | 1667.7 | 1760.35 | 1815.94 | 1797.41 | 1619.522 | 1566.712 | 1686.23 | **1760.4** |
| **2002** | 888.3 | 937.65 | 967.26 | 957.39 | 862.638 | 834.5085 | 898.17 | **937.65** |
| **2003** | 1211.4 | 1278.7 | 1319.08 | 1305.62 | 1176.404 | 1138.043 | 1224.86 | **1278.7** |
| **2004** | 851.4 | 898.7 | 927.08 | 917.62 | 826.804 | 799.843 | 860.86 | **898.7** |
| **2005** | 924.3 | 975.65 | 1006.46 | 996.19 | 897.598 | 868.3285 | 934.57 | **975.65** |
| **2006** | 1112.4 | 1174.2 | 1211.28 | 1198.92 | 1080.264 | 1045.038 | 1124.76 | **1174.2** |
| **2007** | 865.8 | 913.9 | 942.76 | 933.14 | 840.788 | 813.371 | 875.42 | **913.9** |
| **2008** | 1225.8 | 1293.9 | 1334.76 | 1321.14 | 1190.388 | 1151.571 | 1239.42 | **1293.9** |
| **Mean** | **1041.87** | **1099.75** | **1134.48** | **1122.90** | **1011.77** | **978.78** | **1053.45** | |

## Table 3: Mean Annual Rainfall for Selected Stations in Ilorin-East

| APPENDIX 6: - Mean Annual Rainfall for Selected Stations in Ilorin-East | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **YEARS** | **Panada** | **Apado** | **Oke-oyi** | **Iporin** | **Ile-Apa** | **Ita-Alade** | **Ayetoro** | **Mean** |
| 1979 | 887.4 | 936.7 | 966.28 | 956.42 | 877.54 | 897.26 | 899.232 | 936.7 |
| 1980 | 918.9 | 969.95 | 1000.58 | 990.37 | 908.69 | 929.11 | 931.152 | 969.95 |
| 1981 | 1288.8 | 1360.4 | 1403.36 | 1389 | 1274.5 | 1303.12 | 1305.984 | 1360.4 |
| 1982 | 1585.8 | 1673.9 | 1726.76 | 1709.1 | 1568.2 | 1603.42 | 1606.944 | 1673.9 |
| 1983 | 703.8 | 742.9 | 766.36 | 758.54 | 695.98 | 711.62 | 713.184 | 742.9 |
| 1984 | 1225.8 | 1293.9 | 1334.76 | 1321.1 | 1212.2 | 1239.42 | 1242.144 | 1293.9 |
| 1985 | 921.6 | 972.8 | 1003.52 | 993.28 | 911.36 | 931.84 | 933.888 | 972.8 |
| 1986 | 878.4 | 927.2 | 956.48 | 946.72 | 868.64 | 888.16 | 890.112 | 927.2 |
| 1987 | 1027.8 | 1084.9 | 1119.16 | 1107.7 | 1016.4 | 1039.22 | 1041.504 | 1084.9 |
| 1988 | 1283.4 | 1354.7 | 1397.48 | 1383.2 | 1269.1 | 1297.66 | 1300.512 | 1354.7 |
| 1989 | 865.8 | 913.9 | 942.76 | 933.14 | 856.18 | 875.42 | 877.344 | 913.9 |
| 1990 | 961.2 | 1014.6 | 1046.64 | 1036 | 950.52 | 971.88 | 974.016 | 1014.6 |
| 1991 | 865.8 | 913.9 | 942.76 | 933.14 | 856.18 | 875.42 | 877.344 | 913.9 |
| 1992 | 888.3 | 937.65 | 967.26 | 957.39 | 878.43 | 898.17 | 900.144 | 937.65 |
| 1993 | 955.8 | 1008.9 | 1040.76 | 1030.1 | 945.18 | 966.42 | 968.544 | 1008.9 |
| 1994 | 1011.6 | 1067.8 | 1101.52 | 1090.3 | 1000.4 | 1022.84 | 1025.088 | 1067.8 |
| 1995 | 1045.8 | 1103.9 | 1138.76 | 1127.1 | 1034.2 | 1057.42 | 1059.744 | 1103.9 |
| 1996 | 928.8 | 980.4 | 1011.36 | 1001 | 918.48 | 939.12 | 941.184 | 980.4 |
| 1997 | 1407.6 | 1485.8 | 1532.72 | 1517.1 | 1392 | 1423.24 | 1426.368 | 1485.8 |
| 1998 | 1110.6 | 1172.3 | 1209.32 | 1197 | 1098.3 | 1122.94 | 1125.408 | 1172.3 |
| 1999 | 1045.8 | 1103.9 | 1138.76 | 1127.1 | 1034.2 | 1057.42 | 1059.744 | 1103.9 |
| 2000 | 918.9 | 969.95 | 1000.58 | 990.37 | 908.69 | 929.11 | 931.152 | 969.95 |
| 2001 | 1515.6 | 1599.8 | 1650.32 | 1633.5 | 1498.8 | 1532.44 | 1535.808 | 1599.8 |
| 2002 | 923.4 | 974.7 | 1005.48 | 995.22 | 913.14 | 933.66 | 935.712 | 974.7 |
| 2003 | 1045.8 | 1103.9 | 1138.76 | 1127.1 | 1034.2 | 1057.42 | 1059.744 | 1103.9 |
| 2004 | 775.8 | 818.9 | 844.76 | 836.14 | 767.18 | 784.42 | 786.144 | 818.9 |
| 2005 | 1134.9 | 1198 | 1235.78 | 1223.2 | 1122.3 | 1147.51 | 1150.032 | 1197.95 |
| 2006 | 1193.4 | 1259.7 | 1299.48 | 1286.2 | 1180.1 | 1206.66 | 1209.312 | 1259.7 |
| 2007 | 918.9 | 969.95 | 1000.58 | 990.37 | 908.69 | 929.11 | 931.152 | 969.95 |
| 2008 | 1468.8 | 1550.4 | 1599.36 | 1583 | 1452.5 | 1485.12 | 1488.384 | 1550.4 |
| | 176.44 | 186.24 | 192.124 | 190.16 | 174.48 | 178.40044 | 178.7925 | 186.242 |
| **Mean** | **1056.81** | **1115.52** | **1150.75** | **1139.01** | **1045.07** | **1068.55** | **1070.90** | |

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