CHAPTER FOUR

CLIMATE

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Introduction

Ayoade (1983) stated that weather and climate must have dominated the life of pre-historic humans for thousands of years. Even in this days of technological shelter from climatic extremes, the major essentials of life for mankind namely: air, water, food and shelter are climate dependent. Therefore the impact of climate as a resource on the life of man has both benevolent and malevolent aspects. The benevolent aspect refers to the advantages that accrue from climatic conditions obtain in any given location, while the malevolent aspect refers to the discomfort suffered as a result of the prevailing climate in any given location. For example, the amount and intensity of rainfall received in any location is always a function of its climate. The importance of the study of regional climatology cannot be overemphasized as demonstrated in the works of Adebayo(1999), Olaniran(1988) and Adefolalu(1989). Regional analysis of climate has helped tremendously in the planning of agricultural activities in the various regions where such studies were conducted. Nasarawa state with its vast agricultural potentials is overdue for a study of this nature. It is against this background that this chapter is focused to discuss the spatial and temporal pattern of climatic elements in Nasarawa state. These include sunshine, temperature, evaporation, relative humidity and rainfall.

Climatic Elements

Temperature

Temperatures are generally high in Nasarawa state partly because of its location in the tropical sub-humid climatic belt. The high radiation income in this part of the globe, which is also evenly distributed throughout the year, also accounts for the high temperature recorded in the state. However, there is a marked seasonal variation in temperature in the state as shown in Fig 4.1. There is a gradual increase in temperature from January to March. The onset of rains in April ushers

in a noticeable decline in temperature. This is made possible by the blanket effect of cloud cover over the region.

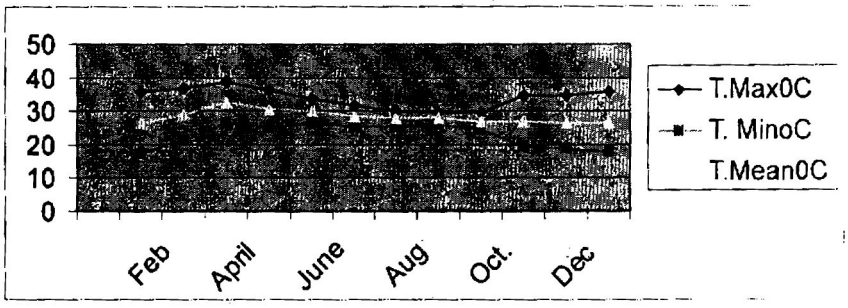

Figure 4.1: Temperature Values for Nasarawa State

This continues in the cessation periods by October ending when a further decline is made possible in November/December by the coming of the harmattan winds. A single maximum is achieved in March when maximum temperatures can reach 39° C. Minimum temperatures on the other hand in Nasarawa state can drop to as low as 17° C in December and January as shown Table 4.1. There is also a spatial variation in the temperature pattern in Nasarawa state. Mean monthly temperatures ranges between 26.8° C in the southern part of the state to about 27.9°C in the northern part of the state.

Table 4.1. Average climatic conditions in Lafia (8°30'N, 8°34'E)

Month	*T.Max°C*	*T.Min°C*	*T.Mean°C*	*RH%*	*RF(mm)*	*W/vel Km*	*Sunshine (hrs)*	*Evap Mm*
Jan	35.9	17.5	26.7	37	0.0	8.9	N/A	N/A
Feb	36.9	21.4	29.15	58	2.95	9.6		
Mar	38.8	26.3	32.55	68	0.08	8.9		
April	36.2	25.0	30.6	75	40.49	9.1		
May	33.8	26.7	30.25	80	156.79	7.1		
June	31.7	25.5	28.6	85	214.69	8.9		
July	30.1	25.7	27.9	88	221.77	6.9		
Aug	29.7	26.2	27.9	85	328.65	7.2		
Sep	29.6	24.4	27.0	86	203.99	6.5		
Oct.	34.6	19.5	27.05	82	68.16	7.0		
Nov	34.9	18.7	26.65	83	1.15	-		
Dec	35.7	17.8	26.75	81	0.0	9.1		
Mean								

Source: *Nigerian Meteorological Services Department, Lafia.*

Relative Humidity

The temporal variation in the relative humidity in Nasarawa State is shown in table 4.1. The January figure is quite low(less than 40%). Relative humidity is a measure of the dampness of the atmosphere which varies greatly from place to place at different times of a day. The actual amount of water vapour present in the air which is expressed in grammes per cubic meter is called the absolute humidity. But more important from the point of view of weather studies is the relative humidity. This is the ratio between the actual amount of water vapour and the total amount the air can hold at a given temperature expressed as a percentage.

Relative humidity continues to rise as from February to a maximum of about 88% in July. Steady rains commence in April, when the relative humidity will be at about 75%. At this period, the southern part of the state is coming under the influence of the humid maritime air mass. By August when the Inter Tropical Discontinuity (ITD) is at its northernmost position, the entire state will be under the influence of the tropical maritime wind (mT). This high relative humidity will continue to December, though with a noticeable slight decline from October through to December as shown in Fig 4.2.

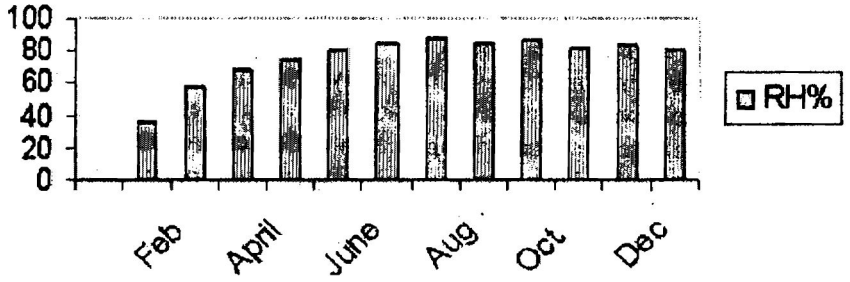

Figure 4.2: Relative Humidity Pattern for Nasarawa State

Rainfall

This is a very important element in tropical climate. Its occurrence varies greatly in time and space with major distinguishing characteristics such as amount, frequency, and intensity. Variation in rainfall characteristics has significant effect on economic activities particularly rain fed agriculture. Therefore a careful analysis of rainfall pattern in Nasarawa state is undertaken in this section and presented in Figures 4.4, 4.5, 4.6, and 4.7.

Rainfall occurrence in the tropics and any other part of the world is mostly attributed to frontal, convectional and orographic nature. In the tropics, the frontal and convectional types seem to dominate. The frontal rainfall occurs when two contrasting air masses, the dry continental air mass (cT) and the moist humid maritime air mass (mT) comes into contact. The dry, lighter cT under cut the moist mT and lifting occurs. This in turn results in cooling and subsequent condensation to yield rainfall. The point at which these two air masses meet has often been called various names ranging from Inter Tropical Zone of Convergence (ITCZ) if they meet on the sea and Inter Tropical Discontinuity (ITD) if they meet on land. Depending on the season, the stronger wind for the season will dominate and push back the other. In the case of rainfall occurrence for Nasarawa State, by November through to January, the ITD is at its most southerly position in the country (between 2-5°N). Therefore the whole of Nasarawa state will be under the influence of the harmattan winds which are dry, cold and dusty winds. This is a rather stable continental air mass that originates from the Sahara and enters the country during its period of dominance.

As the ITD continues it northward movement at a speed of 160km per month, by March the line is at the southern part of Nasarawa state. Therefore, the southern parts of Toto, Doma, Keana and Awe begin to enjoy limited rainfall. By April, the ITD would have moved up to 11°N thereby subjecting the whole of Nasarawa state under the influence of the moist Maritime air mass. The spatial pattern of rainfall in Nasarawa state is slightly influenced by the north central highlands as depicted in figure 4.4. The early rains are characterized by thunderstorms and squally activities. These phenomena are also noticeable towards the cessation period of rainfall. Analysis of the mean onset, length of the rainy season and cessation dates are presented in figures 4.5, 4.6 and 4.7. The ITD reaches its Northern most position of 22°N by August. Therefore the entire state will be enjoying its maximum rainfall as shown in Table 4.1 and Figure 4.3 respectively. By that time the average rainfall as received in the state amounts to about 328mm, while the build up to that maximum begins in May when average rainfall received in the state amount to 156mm. It drops to about 68mm in October. This sudden decrease is because of the rapid retreating of the ITD at a speed of about 320km per month compared to its 160km per month for the South north movement (Ayoade, 1983). Convectional rainfall is common in the afternoon and evening in Nasarawa State. This is because of the high insolation value that encourages evaporation which in turn leads to condensation and subsequent late evening showers.

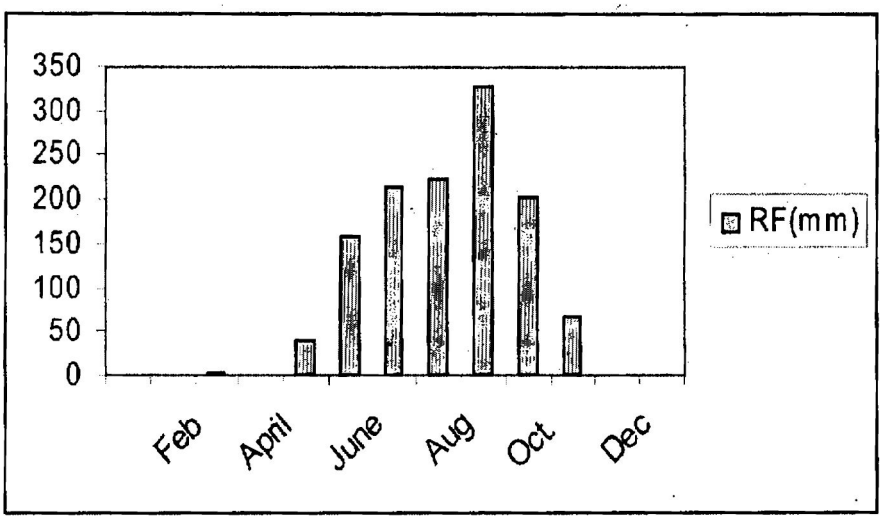

Figure 4.3: Seasonal Variation of Rainfall in Nasarawa State

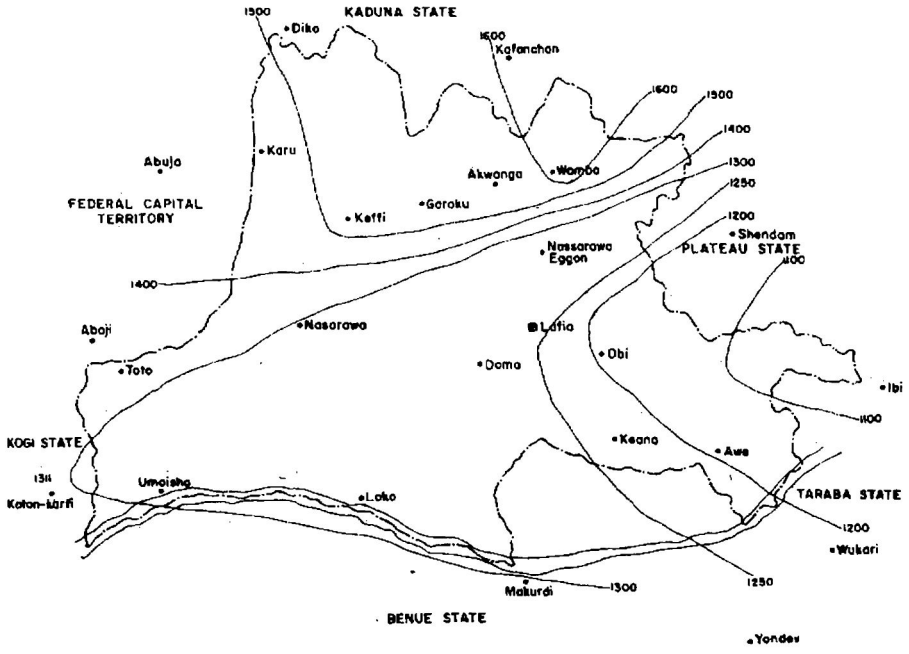

Figure 4.4: Mean Annual Rainfall of Nasarawa State (mm)

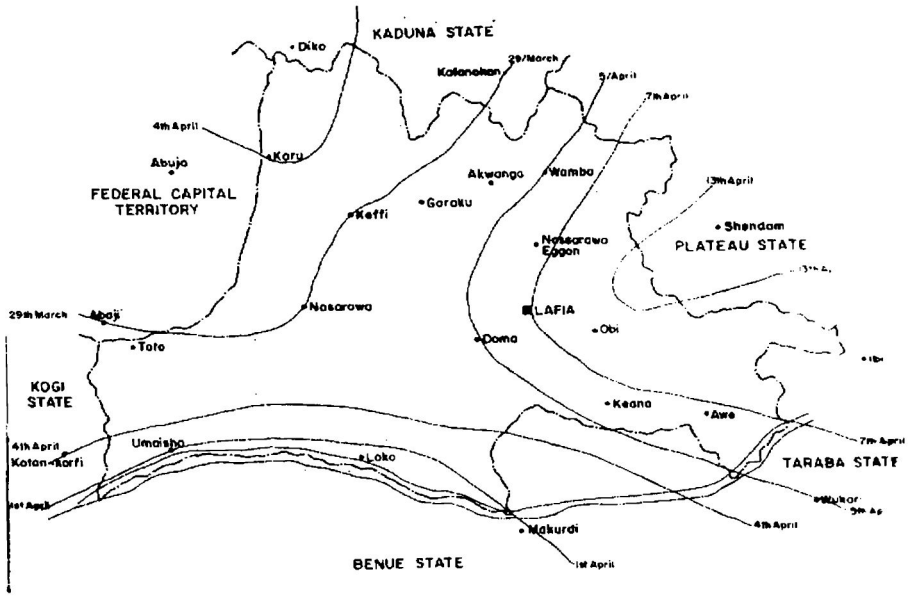

Figure 4.5: Mean Onset Dates of Rains

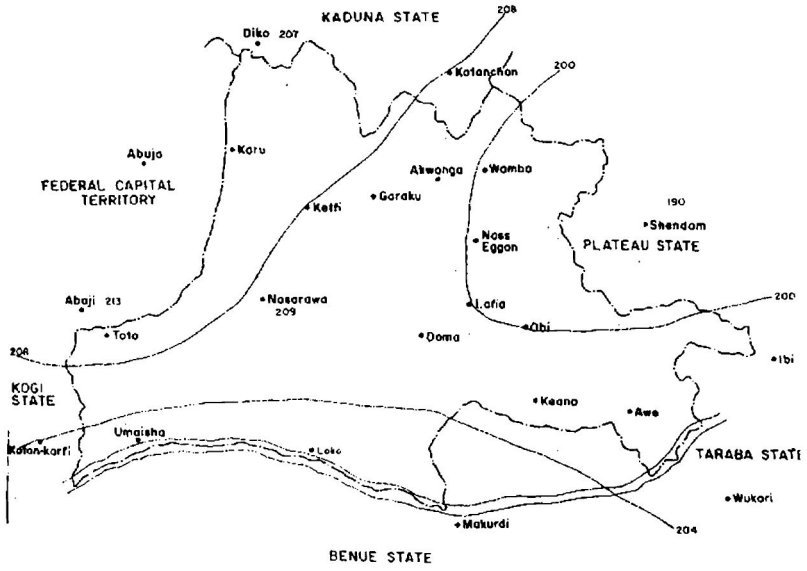

Figure 4.6: Mean Length of Rainy Season (days)

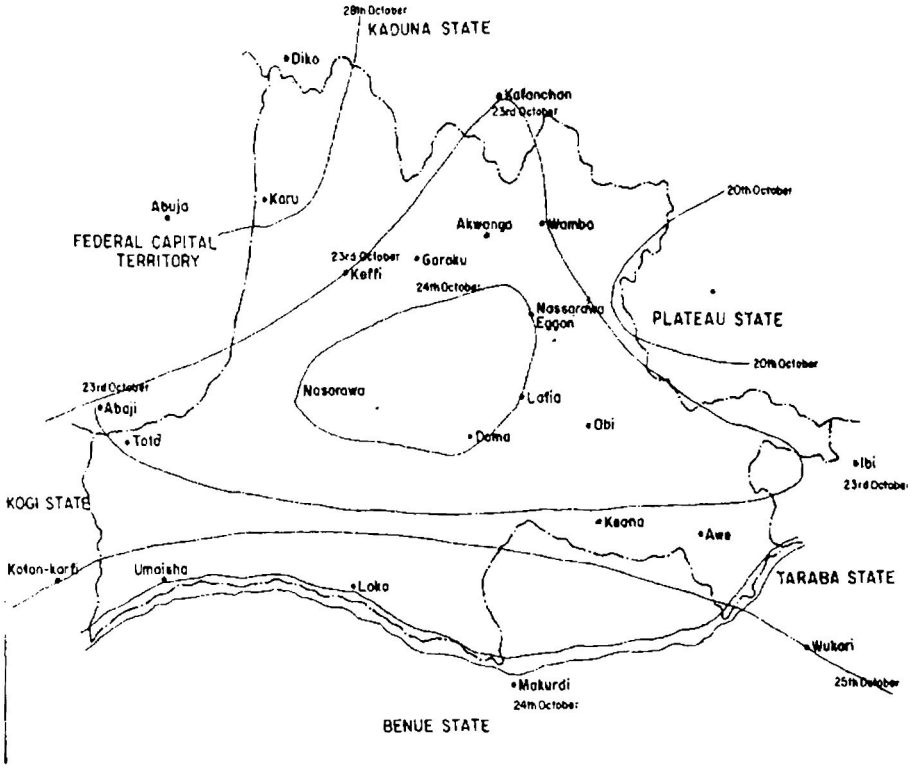

Figure 4.7: Mean Cessation Dates of Rains

Wind Velocity

Unlike the other elements, wind velocity in Nasarawa state is relatively steady. Generally, places near the equator normally experience very low wind velocity. This has inhibited the use of this element as a resource in the state. However, there seems to be a slight increase in wind velocity at the onset and cessation of rains. This is due to the thunderstorms and squally activities associated with the systems. Diurnal wind variation is only of climatological importance if it occurs frequently and regularly. Moreover, because of their limited duration, diurnal wind systems usually are effective only over relatively small areas where the main cause of their development prevails. In this regards, coastal settlements in the southern local government areas of Toto, Doma, Nasarawa and Awe tend to enjoy land and sea breezes whereas inland settlements near areas of variable relief enjoy the mountain and valley winds.

Sunshine

This is a very important element of climate that is vital to human existence. Nasarawa State by virtue of its location has the advantage of double passage of the sun over head. This therefore means that insolation is relatively constant and sunshine hours high. Though the state meteorological station Lafia has no record of sunshine hours for the state, the Nasarawa State University keeps such record that serves as reference point for the state. Generally sunshine hours are high for the state averaging about nine hours in the dry season but a little lower for the wet season because of the effect of cloud cover.

Conclusion

The foregoing discussion has attempted a description of the climatic elements in Nasarawa state. This is often sum up as the tropical type of climate with a distinct dry season (Aw). The term tropics have no exact definition except for the 23½ parallel north and south of the equator. Therefore the region is often referred to as the low latitude zone. There are areas outside these regions that have climate similar to the equator as well as areas near the equator that has contrasting climate to its immediate environment. There is however the need to undertake an in depth analysis of rainfall characteristics in the state with a view to identify cyclic trends and variability.

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