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Agroclimatic Resources and Food Production in the Humid Tropics: Akwa Ibom State in Focus

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It has long been established that climate is an important, if not the most important, determinate in agricultural output, especially in crop production. There are three main factors in cropping namely: the seed or plant, the climate (atmosphere) and the soil. Of these, the most uncontrollable and most unpredictable is the climate. The soil can be modified so is the seed but not climate. This paper examines the adaptation of the various climatic resources to increase food production, by examining the climatic resources themselves and their advantages and disadvantages within the tropical humid environment.

INTRODUCTION

In Nigeria and indeed in the world, there is the need for increased food production to meet the ever increasing population. The case of Akwa Ibom state is critical in that the bulk of the food consumed in the major towns are brought in from outside the state. the situation could lead to starvation if nothing is done to increase food production within the state in the nearest future. To increase food production requires the services of not only agriculturists but all sundry including the climatologists.

It has long been established that climate is an important, if not the most important, determinant in agricultural output especially in crop production (Adejuwon, 1962; Beniot, 1977; Chang, 1968; Cocheme and Frenquin, 1967; Oguntoyinbo and Heyward, 1987; Ayoade, 1983). Three main factors are significant in cropping namely: the seed or plant, the climate (atmosphere) and the soil. Of these three, the most uncontrollable and the most unpredictable is the climate. The soil and seed can be modified but not climate.

Inspite of recent technology and scientific advances weather and climate is to respond intelligently to the complex environment he has found himself, a knowledge of climate is a necessity. An understanding of climatic processes within the environment in which agriculture is taking place will allow for accurate adaptation and adjustments, and even predictions for increased food productive and sustainable growth.

STUDY AREA

Location: Akwa Ibom State is bound in the South by the Atlantic Ocean, on the East by the Cross River, on the North and North West by neighbouring Abia and on the south West by neighbouing Abia and on the South West by Rivers State (Fig.1).

Latitudinally it ranges between 4^0 30^1 N to 5^0 30^1 N and longitudinally, it covers from 7^0 E to about 8^0 25^1 E. it has an area of about 7.244 square Kilometers.

Climates: This area receives the highest amount of rainfall in the country. Rainfall which show some seasonal characteristic come extensively from March and lasts till October. However, it is clear that on the average there is no month that does not receive some amount of rainfall. (Table 1 and fig.2).

Table 1: Mean Rainfall Over Akwa Ibom State (mm)

	J	F	M	A	M	J	J	A	S	O	N	D	TOTAL
MEAN RAINFALL	35	71	136	230	277	323	347	290	392	273	169	38	2581
NO OF RAINFALL	3	4	12	13	15	19	22	22	21	22	10	4	165

Sources: Derived from Data Recorded at Agromet Station – University of Uyo

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Average annual rainfall is well over 2,000mm. The wettest part of the state is the coastal areas. This is understandable as the influence of the ocean water is close. November till February is relatively dry. There are the dry months with the influence of North-East Trade Wind being felt even at the coastal locations. It is dry little or no moisture.

Temperatures are high all year round as Akwa Ibom is in the tropics. Average annual temperatures range between $26^0 - 28^0c$ with annual range of about 2^0c. Relative humidity is also high, with an annual average of between 80 –90%, especially in the coastal areas, where the influence of the ocean is greatly felt. This factor also helps in moderating the air temperature of the coastal region. It is therefore of interest to note that climatically Akwa Ibom State lies in the zones of extremes; extremes in temperature, rainfall, relative humidity, etc.

AGROCLIMATIC RESOURCES

Rainfall (Moisture):

In the tropics moisture availability for crops growth has been the most important single climatic parameter that affects not only yield of crops but all facts in the growth and development of crops (change, 1968; Olaniran, 1984; Ekanem, 1986). (0_2) In solution to cells for photosynthesis and respiration; to transport raw material manufactured and waste products within the plant and to maintain the rigidity of the plant structure (More,1 969).

In Akwa Ibom state, as noted earlier, the amount of rainfall received is in excess of 2,000mm (fig. 2) annually. This is among the highest for the country. Akwa Ibom State is among the Wettest place not in Nigeria but in West Africa. This is an asset. First, when compared to the potential evapotranspiration of this place, in all places and for a greater part of the year the area has water surplus for a greater part of the year (fig.3). This surplus water stored up in the soil for used when the water need exceeds the water supply. The excess moisture is first used to recharge the ground water table and this will intimately find its way back to the stream and rivers. No wonder then that the rivers in the area hardly show any seasonal fluctuations.

From calculations it is then clear that in Akwa Ibom state cropping can be done about 10 months of the twelve calendar months in a year. Soil moisture availability will be no problem for crops in the first few dry months as crops can survive on the soil moisture storage that was recorded as a result of excessive rainfall and or with little irrigation.

The Start of the Growing Season

There are empirical methods available for determination of the start of the growing season. Rainfall data have been used to determine the start of the growing season (Walter, 1967; Ilesanmi, 1972).

Cocheme and Franquine (1967) and Beniot (1977) used rainfall evaporation methods. Olarinan (1983) undertook a comparative study of these various methods. Cocheme and Franquin (1967) technique was used to determine the mean start of the growing seasons for study. This is because the technique allows for the use of monthly records of rainfall and evaporation data.

In Cocheme & Franquin (1967) technique the start of the growing season falls between middle February and late March (Fig. 4). The early start of the growing season allows for longer time for cultivation and the practice of double to increase crop production.

Solar Radiation

Solar radiation is for fundamental importance to the growth and development of crops. It determines the available energy, the thermal characteristic of the air and the day length or photo-period.

Photosynthesis which is the basic process of food manufacture and photoperiodism (the response of flowering to day light) are both controlled by solar radiation. The maximum amount of plant tissue (dry matter) which can be produced within a crop depends on available radiation (assuming unlimited water, CO_2 and soil nutrients) Another relevant factors of radiation is its intensity. As noted by Ayoade (1983), most crops in the tropics are growing season will speed annual crops through their development (especially grain-filling stage), allowing less grain to be produced. In many mid and high latitude areas, where current temperature regimes are low, the increase in surface temperature tends to lengthen the growing season, thus increasing yields (Sorte, 1999). It will also thaw the temperate ice – cap thus providing more lands for cultivation

Moreover, strong regional differences are seen in these results (fig 1). In 2020s Canada is expected to gain 10-20% yield, U.S.A, Europe and Asia (0-10%), Central America, Middle East, North and South-West Africa will loss (10-20%) while South America, Australia and West, East and South Africa is expected to loss (O to 10%). By 2050s, USA, South America, Australia, Nigeria and some few countries of Africa will loss (0 – 10%). The lost in other African countries and South Western Asia will be (10 to 20%) while India, Pakistan and central America will decrease to (-20 to -30%). Canada and Eurasia will still maintain their gain of (10-20%) and 0-10% respectively. By 2080s, while the grain yield in Canada will increase to (30-40%), Eurasia will still maintain its (0 to 10%). U.S.A., South America, Australia, Nigeria, Zaire and South Africa will maintain their loss of (0 to –10%). The Middle East, North Africa and south West Africa will plunge into the loss of –20 to –30%, Central America (-30 to – 40%) will experience the worst recorded loss.

Throughout the study period the following areas have a constant loss of 0 to –10% crop yields -- South America, Australia, Nigeria, Zaire and South Africa among others. The former U.S.S.R, China and Japan also maintain their 10 to 20% gains. It is only Canada that has consistent increase from (10 to 20%) in 2020s to (30 to 40%) in 2080s. While India recorded a decline yield from (-10 to – 20) to (–30 to –40).

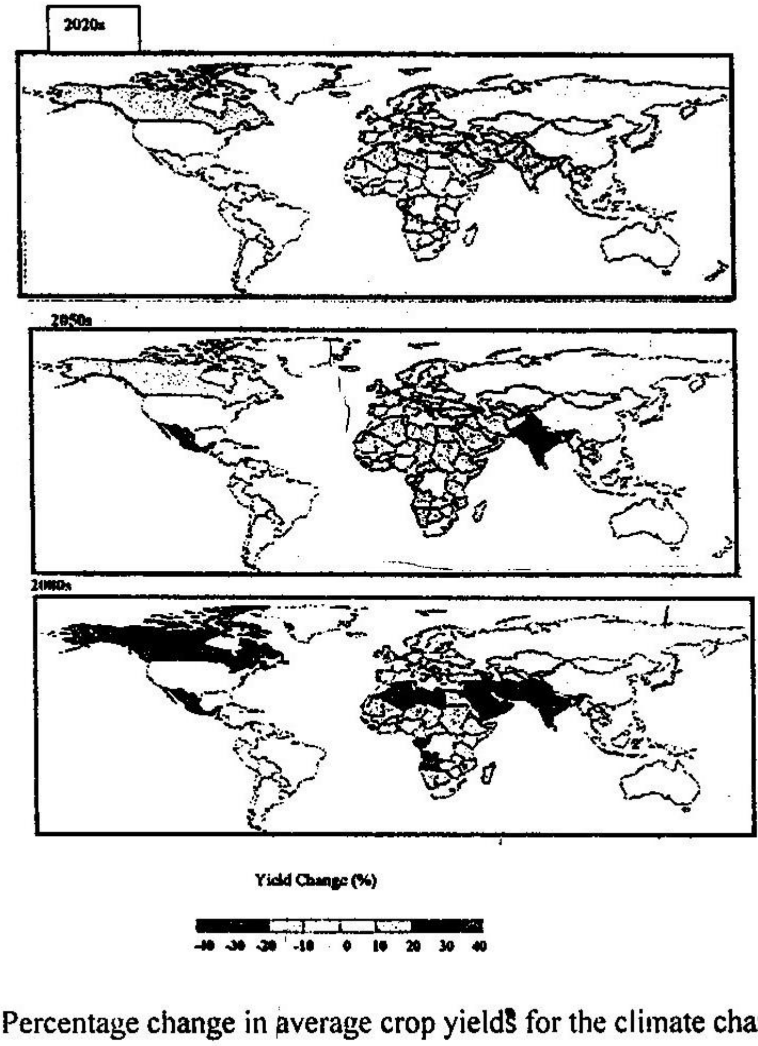

Fig. 1: Percentage change in average crop yields for the climate change scenario.

c. ***Windstorm:*** Windstorm is a prevalent climatic phenomena. This phenomena is peculiar to the tropics especially at the beginning and at the end of the rains. It is usually referred to as Line Squall or Squall Lines. It is a strong wing that travels within a path and usually followed by heavy intensity but short duration rainfall. It is capable and does affect agriculture in that it destroyed crops along its path of movement. It increases the rate of evapotranspiration. Very high wind speed such as the one mentioned above not only destroyed crops, it hinders the Co_2 activity on the leaf surface thereby affecting the rate of photosynthesis and subsequent Tate of dry matter production.

IMPLICATION FOR AGRICULTURE

The high radiation values, the high temperature and rainfall values and the early occurrence of rain all have serious implication for agricultural practices and production for Akwa Ibom State. The high radiation and temperature values have been under utilized in the dry matter production. This can be increased. The early occurrence of rain and the high rainfall values is a clear indication that cropping can be done if not year round, but langer than what is practiced now. The long duration of the rain make possible for double cropping and for crops that take a short time to mature, up to three or four sets can be obtained within a year.

The excessive rainfall resulting in water logging, flooding, and leaching implies that the soils will remain poor inertial throughout the cropping season, and requires the continuous and constant use of fertilizers.

SUGGESTIONS AND RECOMMENDATIONS

With the level of moisture availability there could be an all year round cultivation in Akwa Ibom. This is possible because of the long rainfall period of not less than eight months, cropping calendar should therefore be based on the crop characteristics. Crops that can adapt to flooding and excessive rainfall should be planted at the time of the heavy rains e.g. rice and some species of cassava. The dry season cultivation should also be encouraged for crops that cannot stand excessive rainfall e.g. yams. These dry season crops will make use of stored up water in the soil together with irrigation water which should become a part of the agricultural practices in Akwa Ibom.

Intensive and extensive application of fertilizer and other mineral nutrients should be seen as a must, due to poor soil fertility. Fast yielding varieties of crops like maize should be adopted to allow for than double cropping.

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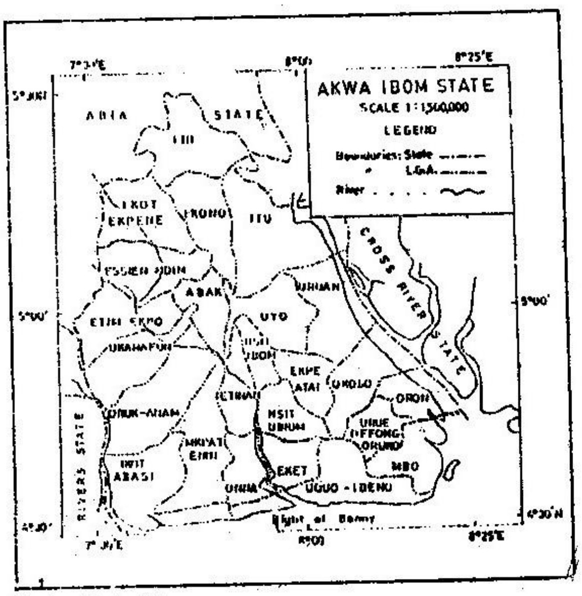

Fig. 1 : Study Area

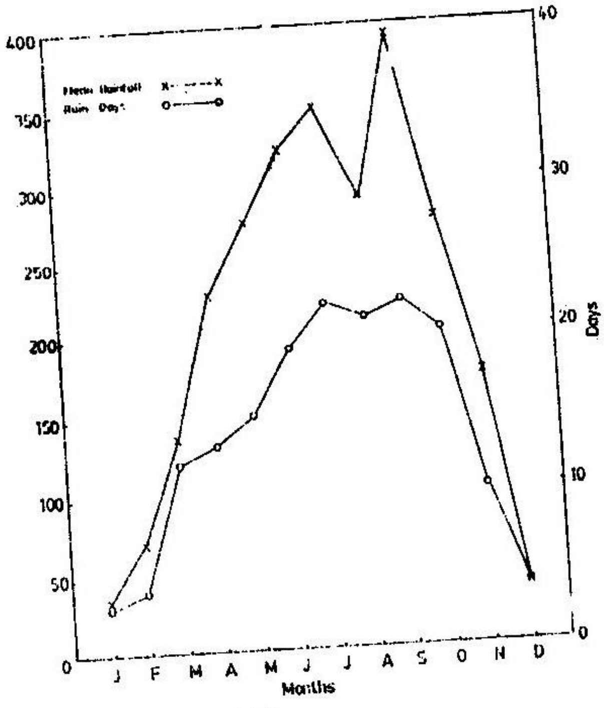

Fig. 2 : Mean monthly rainfall

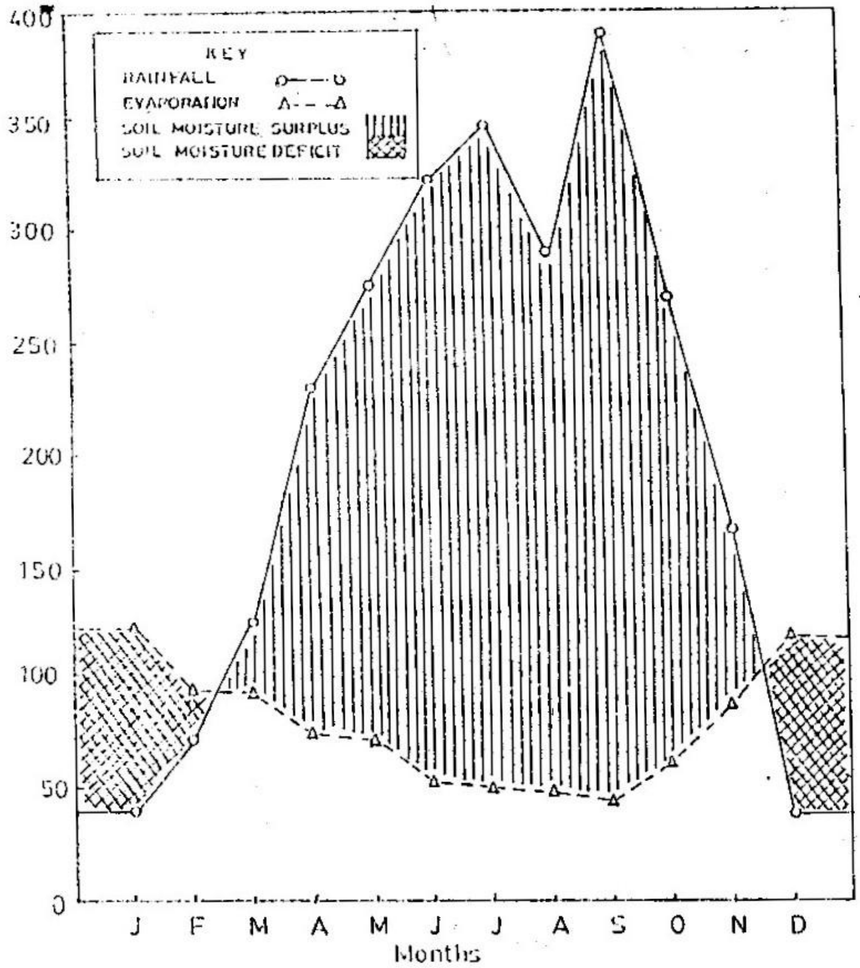

Fig. 3: Soil Moisture Availability

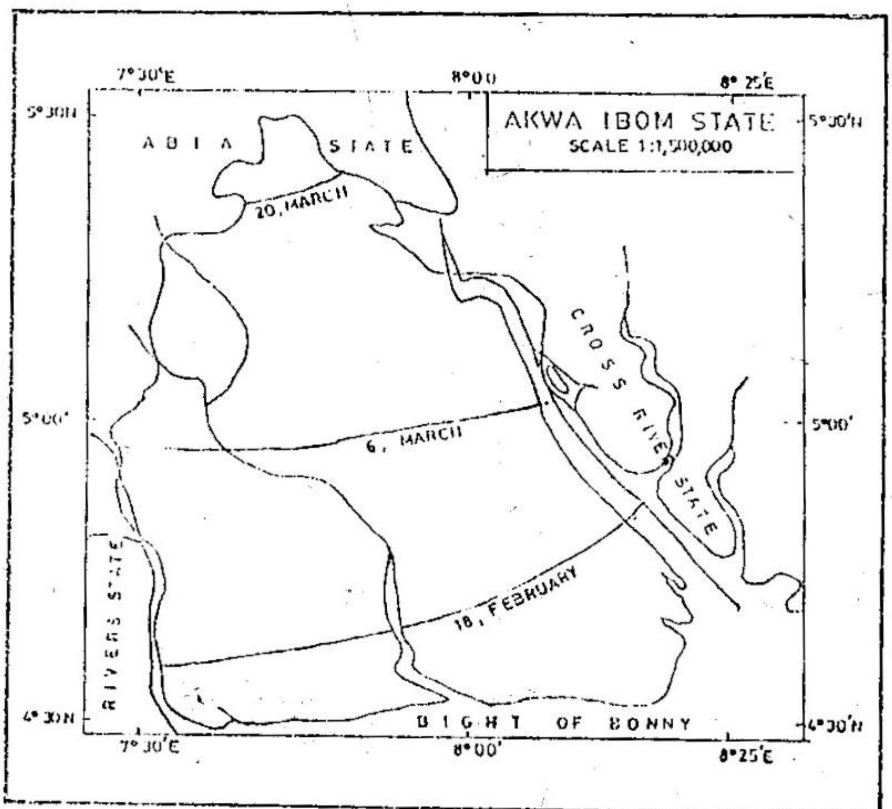

Fig. 4 : Mean start of Growing Season (After Beniel, 1977)

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