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The Tropical Rainforest

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Highlights

Flora Species Diversity

Climatic Variables in Taraba

Discovering Thoughts, Inventing Future

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An Assessment of the Trends of Climatic Variables in Taraba State Nigeria

By E. D. Oruonye
Taraba State University, Nigeria

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Keywords: *assessment, adaptation, climate change, trend, variables.*

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Keywords: assessment, adaptation, climate change, trend, variables.

I. Introduction

Climate change is perhaps the greatest challenge facing our planet today (Adebayo and Oruonye, 2013). Some of these challenges manifest themselves in the form of drought, flooding and inundation of coastal lands, low agricultural productivity, alteration of surface and ground water and devastation of ecosystems among others. There is a growing consensus in the scientific literature that over the coming decades, higher temperature and changing precipitation levels caused by climate change will depress crop yields in many countries (Orindi *et al*, 2006; Stige *et al*, 2006). This is particularly crucial in low-income countries, where adaptive capacity is perceived to be low (IPCC 2007). Hulme *et al* (2000) estimated that by 2100, Nigeria and other West African countries are likely to have agricultural losses of up to 4% of GDP due to climate change. Other scholars have also observed that countries that depend on rainfed agriculture could experience decline agricultural yield of up to 50% between 2000 to 2020, due to increasing impact of climate change (Oxfam, 2007; IPCC, 2007 and Ifeanyi-Obi *et al*, 2012).

Several studies have shown that temperature is rising and rainfall frequency and intensity is fluctuating (Mendelsohn *et al*, 2000; Paavola, 2006, Ozor and Cynthia, 2010, Mohammed *et al*, 2013). The world average temperature rise has been given as 0.91°C (Dube and Phiri, 2013). Available meteorological data in the country shows evidence of increasing air temperatures since about 1920s (NEST, 2003). For example, Anuforom (2010) and Odjugo (2010) observed that within 105 years, temperatures increased by 1.2°C and 2°C in the coastal cities of Niger Delta and northern extreme of Nigeria respectively. Mohammed *et al* (2013) observed that in Adamawa State of Nigeria, climatic data (temperature and rainfall) analysis over the past 25 years (1980-2005) shows that temperature has increased by 0.3°C and rainfall fluctuated over the years (Adebayo, 2010; Sawa and Adebayo 2010; Audu 2013). In Taraba state, evidence of climate change includes delayed onset date of rains, increase in number of dry days during the raining season and increase in maximum temperature (Adebayo and Oruonye 2012a, b; Adebayo and Oruonye, 2013 and Adebayo 2012). This leads to warmer seasons, increased frequency and intensity of weather extreme events such as drought, decline in rainfall amount by about 15-20%, increased incidence of dry spell (Adebayo, 1998 and Anuforom 2010 cited in Mohammed *et al*, 2013). The problems of flood, high temperature and incidences of pests and diseases have also aggravated the farmers' loss which consequently increases the incidence of poverty and malnutrition in the state (Adebayo *et al*, 2012).

Taraba State is one of the states in the country that is well endowed with abundant natural resources. However, it is among the least developed parts of the country. Agriculture is the source of livelihood to an overwhelming majority of the population of the state. This sector employs more than 80% of the labour force (TSEED, 2004). The State's agricultural sector is

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dominated by small scale rural farmers. Farming is mainly subsistence with very few commercial base farms. Agriculture in the state is heavily dependent on natural rainfall, with irrigation agriculture accounting for less significant percentage of the total cultivated land. The types of cropping system practiced in the state are mixed farming, mixed cropping and mono cropping. Thus, the amount and temporal distribution of rainfall and other climatic factors during the growing season are critical to crop yields and food productivity in the state. Taraba State has suffered from periodical extreme climate events, manifested in the form of frequent flooding (Oruonye, 2012; Oruonye and Adebayo, 2013). Thus any change in climate, mostly manifested as an increase in frequency and severity of extreme weather events such as flood, has a potential to significantly reduce agricultural production and household food security.

For the fact that majority of the state population lives in rural areas and depends heavily on rain-fed agriculture for food and income, climate change presents a formidable challenge to the state's attempts to reduce rural poverty, which currently is on the increase. Not only does climate change affect crop production but also water access and availability, human and livestock health and may also cause damage to dwellings and infrastructure. Information on climate change and its interaction with agriculture is important for farmers and policy makers. With this information, farmers are better able to plan for possible changes in yields, water shortages, and possible increases in pests and livestock disease incidence. Planners and decision makers can also benefit from such information as it provides a basis for designing effective climate change adaptation interventions.

There is need to have a state wide research that examines the trend and pattern of climate change and local information and knowledge about this pattern. This knowledge gaps may greatly reduce the failures in measures to develop a state wide effective monitoring, adaptation and mitigation measures to climate change in the study area. it is against this background that this study examines the trend in climatic variables in the state.

II. Materials and Methods

a) *Description of study area*

Taraba State is located at the north eastern part of Nigeria. It lies between latitude 6° 30' and 8° 30' north of the equator and between longitude 9° 00' and 12° 00' east of the Greenwich meridian. The state shares boundaries with Bauchi and Gombe states in the north, Adamawa state in the east, and the Cameroon Republic in the south. The state is bounded along its western side by Plateau, Nassarawa and Benue states (Fig. 1). The state has a land area of 60,291km^2 with a population of about 2.5 million people (projected from the 2006 National Population Census). It is divided into sixteen Local Government Areas (LGAs) and three senatorial districts (Taraba north, central and south).

Taraba State is regarded as Nature's Gift to the Nation because of its abundant natural resource endowment. The state is well endowed with abundant solid mineral resources, surface water resources, arable and grazing land. The major occupation of the people of Taraba State is agriculture. The state is blessed with climate and vegetation types that cut across the country, ranging from a more humid climate and forest vegetation in the south to a more seasonal wet and dry climate and savanna vegetation in the north. These favour the growth of tree crops such as palm oil, banana/plantain, orange etc. Root crops in the state include cassava, potato and yam, while cereals include maize, rice, millet, sorghum and guinea corn. Cash crops produced in the state include coffee, tea and groundnuts. In addition, cattle, sheep and goats are reared in large numbers, especially on the Mambilla Plateau, and along the Benue and Taraba river valleys (Oruonye and Abbas, 2011). Communities living on the banks of River Benue, River Taraba, River Donga and Ibi (on the bank of River Benue) engage in fishing activities all year round. The state is also a tourist haven in the country. The famous Mambilla plateau with its beautiful landscape characterized by valleys and waterfalls and its lush green vegetation makes the state a potential pace-setter in the field of tourism in the country. The Gashaka-Gumti National Park located at the foot of the Mambilla plateau is another major outstanding tourist landmark in the

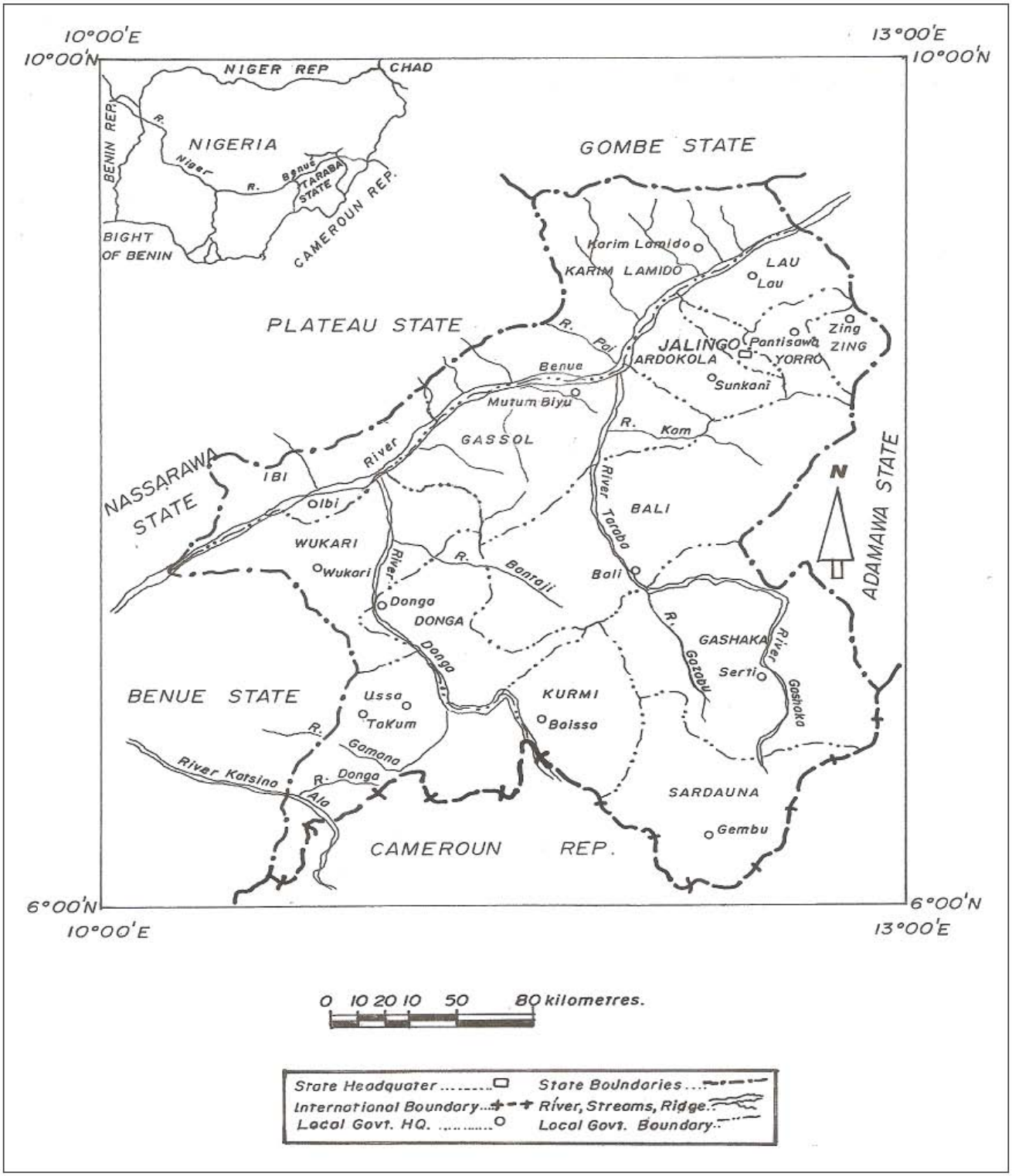

Figure 1 : Map of the study area (Taraba state)

state. It is not only the largest of the eight National Parks in the country, but it is the most diverse in terms of species in the whole of West Africa, harbouring such rare animals like the colobus monkey and warthogs, including buffalo, roam ante¬lope, chimpanzee, hippopotamus, hyena, giant forest hog, lion and leopard (Oruonye and Abbas, 2011). Taraba State is one of the Nigerian states with the most diverse ethnic groups comprising over 80 ethnic groups.

b) Data Collection

The data required for this study includes monthly and annual temperature and rainfall totals and rain days per annum for the different senatorial zones of the state for a period of 30/35 years depending on the

availability of data. The monthly rainfall data for the various stations were used in calculating the mean monthly rainfall, annual rainfall, the onset, cessation and length of rainy season.

Although, there are many methods of calculating the onset and cessation of rains, the Walter's method (Walter, 1967), which utilizes monthly rainfall data, was adopted in this study. The choice of Walters's method is because it is relatively easier to accomplish, more economical and original as it requires no derivation of other indices for the computation but utilizes only the rainfall records which are measured directly (Umar, 2010). The method used to determine the actual date of the onset of rains is as follows;

$$\frac{\text{Days in the month (51 – accumulated rainfall of previous months)}}{\text{Total rainfall for the month}}$$

Where the month under reference is that in which the accumulated total rainfall is in excess of 51mm^3 for the cessation dates of rains, the formula is applied in the reverse order from December.

Monthly rainfall and temperature data were collected from all the meteorological stations in the state for 30/35 years. These were the Upper Benue River Basin Development Authority (UBRBDA) Meteorological stations at Lau (latitude 9°15'N) (Northern Taraba), Gassol (latitude 8°31'N) and Gembu (latitude 6°41'N) towns (Taraba Central) and Nigerian Meteorological Agency (NIMET) Meteorological station at Ibi (latitude 8°11'N) town (Southern Taraba). These were the only stations with long term and consistent climatic data (Adebayo, 2012). Thus, all the three senatorial districts have one or more weather stations. The data were obtained from the archives of the Nigerian Meteorological Agency Headquarters in Oshodi, Lagos and the Upper Benue River Basin Development Authority Headquarter in Yola.

The decadal and inter annual variability in the time series of annual temperature and rainfall were analyzed using the trend analysis. Minitab statistical package was used for the analysis. The decadal and inter annual variability in the time series of annual rainfall, length of rainy season, onset and cessation was determined using coefficient of variation (CV), while the trends in the time series of these parameters (annual rainfall, length of rainy season, onset and cessation) were determined using simple regression and correlation analysis. The coefficient of variation is given as;

$$CV = \frac{\sigma}{\bar{x}} \times 100\%$$

where $\bar{x}$ the mean of the entire series and σ is the standard deviation from the mean of the series. In order to determine the trend in the time series of the annual rainfall, length of rainy season, onset cessation and temperature in all the stations considered for the period 1978/80 – 2010/12, the simple regression analysis was used where by the values in the time series were regressed on time. The equation of the line of best fit was then computed using the Minitab statistical software. The equation is as follows; $Y = a - b\bar{x} + c$

Where a = intercept of the regression, b = regression of the coefficient and c = error term or residuals of the regression.

To determine whether the trend line in the time series analysed is upward or downward, the simple correlation coefficient (r) was used and defined as follows;

$$r = \frac{\frac{\sum xy}{N} - \overline{xy}}{\sigma x - \sigma y}$$

where r is correlation coefficient, N is total number of observations in the series, Y is the observation in the series, x is the time in years, σx is the standard deviation of x and σy is the standard deviation of y. Where the value of (r) is positive, it indicates upward trend in the time series analysed and where the value of (r) is negative, it indicates down ward trend in the time series analysed. The data were presented using tables, frequencies, figures and percentages.

III. Result of the Findings

a) Description of the trend of the climatic elements

The climatic data collected were processed and subjected to trend analysis. The summary of the trends of the climatic elements studied is presented in Table 1 and 2, while the Graph of the trend analysis are shown in Figures 2 – 35.

b) Temperature

Looking at Table 1 and Figures 2, 3, 29, 30, all the stations exhibited a similar trend of increasing temperature with exception of Gembu where the temperature is decreasing. The trend of temperature in Gassol and Ibi indicates that there is an upward movement in this element over the years in these locations and in most parts of the state. Temperature data for Lau station was not available. This upward trend in temperature is a reflection of the global warming resulting into general increase in the earth's temperature (Adebayo 2012). However, the reverse is the case at Gembu station where the temperature is reducing. This situation was earlier reported by Adebayo (2012) and on the Jos plateau by BNCR (2011). The equation of the temperature trend shows that the temperature increases by 0.025°C at Ibi station.

Table 1 : Summary of the Trends of Climatic Elements Studied

Climatic elements	Lau	Ibi	Gassol	Gembu
Temperature	N.A.	Increasing	Increasing	Decreasing
Annual rainfall	Decreasing	Increasing	Increasing	Increasing
Onset date of rains	Late	Late	Late	Late
Cessation date of rains	Early	Early	Early	Late
Length of rainy season (LRS)	Decreasing	Stable	Decreasing	Decreasing
July monthly rainfall	Decreasing	Increasing	Increasing	Increasing
August monthly rainfall	Decreasing	Increasing	Increasing	Increasing
September monthly rainfall	Decreasing	Increasing	Increasing	Increasing

Source: Computer analysis (NA = data not available)

c) Annual Rainfall

Annual rainfall show increasing trend in the southern and central part of the state with exception of Lau in the northern part of the state where the rainfall is decreasing. The trends of annual rainfall in Gembu, Ibi and Gassol showed an upward trend in the southern and central parts of the state while the trend in Lau showed a general downward trend of annual rainfall in the northern part of the state (Fig. 4-6 and 28). A look at the distribution pattern of rainfall in the state shows that the rainfall decreases from south to north. Annual rainfall decreases as latitude increases. Rainfall averages in the state for the period 1978 to 2012 vary from 1807mm^3, 1047mm^3, 958mm^3 to 866mm^3 at Gembu (Lat. 6°41'N), Ibi (Lat. 8°11'N), Gassol (Lat. 8°31'N) and Lau (Lat. 9°51'N) stations respectively (Table 2).

d) Length of Rainy Season (LRS)

Length of Rainy Season (LRS) is the difference between the cessation date and onset date. Length of rainy season show decreasing trend in all the stations with exception of Ibi, where it is relatively stable (Table 1 and Fig. 13 – 15 and 27). The implication of such a trend, mean a reduction in annual rainfall, and hence reduced crop yield, especially if the trend persisted for a long period of time, which can lead to a tendency towards a drier condition. The implication of this is that the length of rainy season is decreasing in all the locations. The mean length of rainy season (LRS) shows Ibi 166 days, Lau 155 days, Gassol 145days while Gembu has a higher LRS of 210 days.

Table 2 : Summary Analysis of Climatic Data

Variable	IBI (8°11')	Lau (9°15')	Gassol (8°31')	Gembu (6°41')
Temperature				
Mean (°C)	28.1	NA	34.22	21.39
Coefficient of Variation (%)	1.4	NA	3	6
Annual Rainfall				
Mean (mm)	1046.5	866	957.7	1807.4
Coefficient of Variation (%)	21.6	19	15	12
Onset date of rain				
Mean (date)	26th April	10th May	10th May	25th March
Coefficient of Variation (%)	15	8	6	19
Cessation date of rain				
Mean (date)	11th Oct.	11th Oct.	6th Oct.	21st Oct.
Coefficient of Variation (%)	4.4	3	4	3
Length of rainy season (LRS)				
Mean (days)	166	155 days	145 days	210 days
Coefficient of Variation (%)	14.8	10	9	9

Source: Computer analysis (NA = data not available)

e) Onset and Cessation

The onset refers to the time a place receives an accumulated amount of rainfall sufficient for the growing of crops. It is not the first day the rain falls (Adebayo and Oruonye, 2013). Walter (1967) define onset of rains in Nigeria in terms of time of receiving an accumulated amount of rainfall in excess of 51mm. Rainfall cessation means the termination of the effective rainy season. It does not imply the last day rain fell, but when rainfall can no more be assured (Adebayo and Oruonye, 2013). The end of the rains is the date after which no more than 51mm of rain is expected (Umar, 2010). All the four stations where synoptic data were obtained (Gembu, Gassol, Ibi and Lau) shows late onset of rain, while only Gembu show late cessation of rains (Table 1 and Fig. 7-12). It is important to stress that from Tables 1, the onset and cessation of the rains at all the stations tended to be concentrated around the months of April/May and October/September respectively. Onset date of rain exhibits an upward trend in all the four locations. This

indicates that the rain is starting late and hence the beginning of growing season is being delayed all over the state. The mean onset of rainfall is much earlier in Gembu than Ibi, Gassol and Lau. This was reported in previous studies in the state by Adebayo 2012. Cessation date of rain exhibits a downward trend in all the locations except Gembu. This clearly shows that the rains now end earlier in the state. The specific date of occurrence of either the onset or cessation of the rains is an important consideration in determining the beginning and end of the growing season in an area (Umar, 2010). Efficient crop production in the tropics is equated with the onset of rain and cessation of rainy season and its variability. This is because, onset, cessation and length of the rainy season form important components of moisture resources status for determining the potential of various crops (Olanrewaju 2006).

In regions characterized by seasonal rainfall which is associated with dry spells of varying magnitudes as is the case with the study area, a reliable determination of the onset of the rains is not only pertinent to the determination of the time to plant or transplant with minimum risks of crop failure but also critical to good crop yield (Umar, 2010). On the other hand, a fairly accurate determination of the cessation of the rains might not only facilitate the determination of a dependable duration of the rains at a given location but is also beneficial to the selection of crop varieties that will mature by the end of the growing season.

IV. Discussion of Results

The rainy season is of variable length in the state but usually occurs between April to October. It occurs as a result of the northward movement of the Inter Tropical Convergence Zone (ITCZ). The rainfall distribution pattern in the state is also significantly influenced by altitude because of orographic factor (Adebayo, 2001, 2012). The annual rainfalls, length of rainy season, onset and cessation dates are important crop growing season parameters. This makes growing season variability an important indicator of climate change. Hence, better knowledge of the characteristics of the rainfall regimes is required to make assessment of agricultural potential more realistic. Although temperature varies considerably from year to year, it is the variability in the rainfall in time and space, from one year to another that is the real problem. Annual rainfall in the state poses serious constraint on agricultural activities in the state.

From the findings of the study, July and August monthly rainfall show increasing trend in Gassol, Gembu, Ibi and decreasing trend at Lau. The monthly rainfall of September show increasing trend in Gembu and Ibi, while that of Gassol and Lau show decreasing trend (Fig. 18, 19, 21-24). In Gassol, monthly rainfall in July and August is increasing while that of September is decreasing. This finding is corroborated by the result of an earlier study by Adebayo (2012). Increase in rainfall in August and September is usually accompanied with floods. Adebayo (2012) observed that the floods are being aggravated in many parts of Taraba and Adamawa states by the release of excess water from Lagdo dam in the Republic of Cameroon.

The onset of the rainy season determines the commencement of the growing season and date of planting for the farmer. A delay in the onset of the rainy season, particularly in the wet and dry environment like the study area will delay the date of planting and will result in crops extending their growing into the winter season, where the prevailing lower temperatures will negatively affect crop yield. On the other hand, an early cessation of the rainy season will result in the cutting short of the growing season of crops and consequently result in crops failing to reach their physiological maturity stage. The length of rainy season which also determine the length of the growing season is defined as the period in days from the date of the onset to the date of cessation of the rainy season.

Adebayo (2001) conducted a study in Taraba State using monthly rainfall data collected from 19 stations for the period 1979 – 1997 to derived vital agro-climatic parameters such as onset, cessation and length of rainy season, seasonality index and hydrological ratio. The result of his study showed that mean onset dates vary from 16th March in the extreme south on the Mambilla Plateau to 26th April around Zing and Jalingo (Adebayo, 2010). Mean cessation dates range from 10th October in the north to 31st October in the south. Based on the outcome of his study, Adebayo (2001) divided the State into three zones for the beginning of growing season.

a. The southern zone where growing season commences as early as 16th March including Sardauna, Kurmi and Takun LGAs.
b. The central zone where onset date starts from 6th April comprising of Bali, Ibi, Gashaka, Wukari and Donga LGAs.
c. The northern zone where onset date starts from 26th April covering Gassol, Zing, Yorro, Lau and Jalingo LGAs.

The finding of this study using climatic data of 30 years (1978/82–2010/12) for four stations shows slight deviation from the above results. The onset of rainfall ranges from 25th March at Gembu, 26th April at Ibi to 10th May at Gassol and Lau stations respectively (Table 2). The mean dates of cessation also range from 6th, 11th and 21st October at Gassol, Lau, Ibi and Gembu stations respectively (Table 2).

Dry spells cause Poor germination, increase the need for replanting and leading to wilting and drying out of crops. Most of the respondents interviewed

complained that temperatures are becoming hotter and the rains are arriving late and becoming more intense and concentrated which reduces the length of the growing season and triggered more floods. Onsets of rainfalls are becoming more uncertain and unpredictable with dry spells after planting. It use to rain for few days (i.e.5days), then dry for a couple of days. The dry spell could not be calculated for all the stations studied because of difficulty of getting the daily records for the past 30/35 years. Dry spell is usually the number of days (often 5days) in each month without rainfall. You can have a single dry spell (5 days) or double or 15 days dry spells as the case may be. Since farming in the state usually follows the start of the rains, if a long dry spell occurs, the seedlings die (false start) and the farmers are compelled to replant. In many parts of the state some of the causes of crop failure have been attributed to dry spells of about 10 days or more length, as well as a shorter growing season due to replanting or late onset and/or early cessation of the rains. Therefore, a reliable estimation of the onset and cessation dates of the rain could help maximize rainwater use by farmers in the state.

V. Conclusion

This study has examined the trends of climatic variables in Taraba State. The result shows that all the stations exhibited a similar trend of increasing temperature with exception of Gembu where the temperature is decreasing. Annual rainfall show increasing trend in the southern and central part of the state with exception of Lau in the northern part of the state. All the four stations where synoptic data were obtained (Gembu, Gassol, Ibi and Lau) shows late onset of rain, while only Ibi show late cessation of rains. Length of rainy season in the study area show decreasing trend in all the stations with exception of Ibi, where it is relatively stable. The implication of such a trend, mean a reduction in annual rainfall, and hence reduced crop yield, especially if the trend persisted for a long period of time, which can lead to a tendency towards a drier condition. With persistent changes in the environment, the farmers are having difficulty to properly time their planting because of the changing climatic patterns, a situation that makes it imperative for experts to trace the new trends and come up with conclusive recommendations on when to plant. The heavy dependence of agriculture on the seasonal characteristics of rainfall in the state and the increasing evidence of decreasing rainfall and length of rainy season in the state particularly in the northern part means that it is essential that these characteristics are predicted accurately.

VI. Recommendations

1. Part of the problem with climate change is the incidence of pest and diseases, particularly during dry spells. This is further exacerbated by the fact that farmers are often poorer and rarely have access to safe and effective pesticides, robust varieties of plants/seeds and adequate irrigation facilities. The government can do well by assisting the farmers with these necessary inputs at subsidized rate.
2. It is important that government make issues of climate change adaptation top of its political agenda. Policies of reducing poverty and ensuring food security need to include climate change strategies. A detailed analysis of the risks and possible solutions could assist in finding appropriate adaptation strategies and play an important role in achieving food security and fighting poverty.

VII. Aknowledgement

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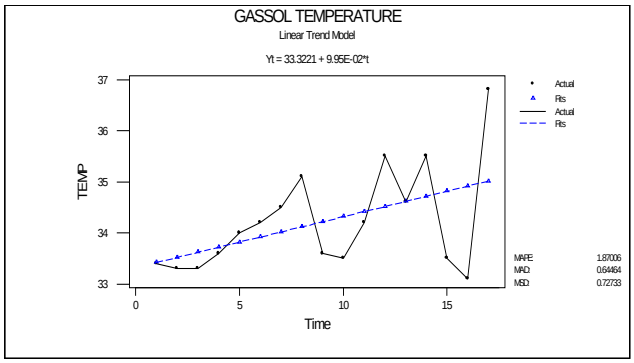


Figure 2 : Trend of Mean Temperature in Gassol

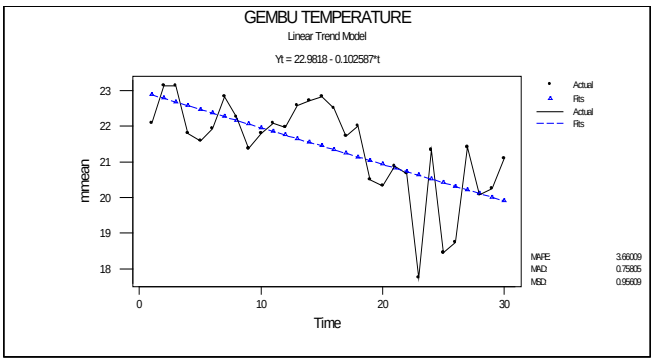


Figure 3 : Trend of Mean Temperature in Gembu

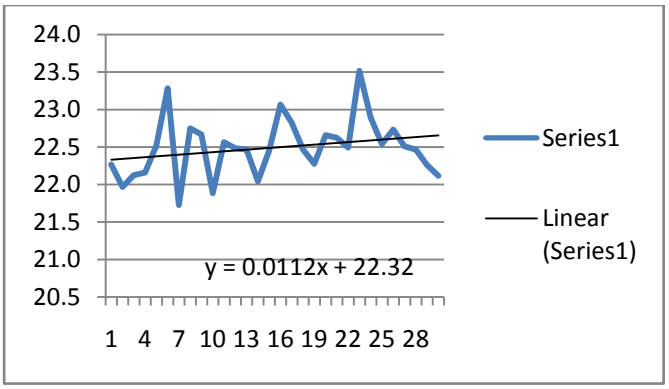


Figure 4 : Trend of Mean Temperature in Ibi

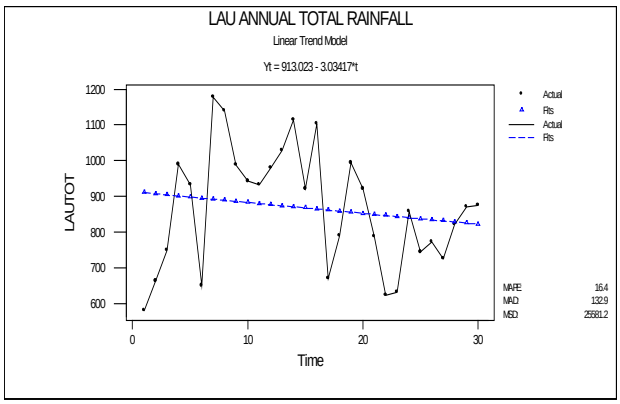


Figure 5 : Trnd of Annual Total Rainfall in Lau

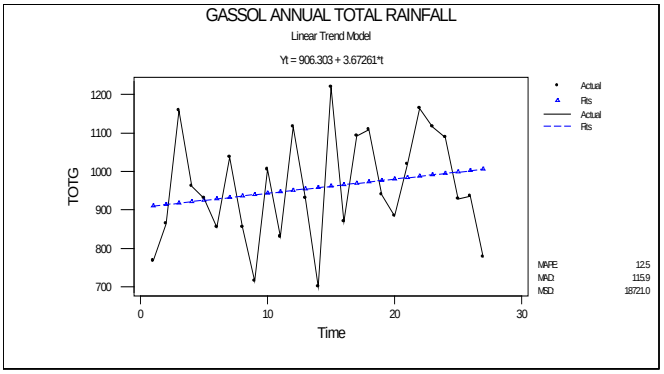


Figure 6 : Trend of Annual Total Rainfall in Gassol

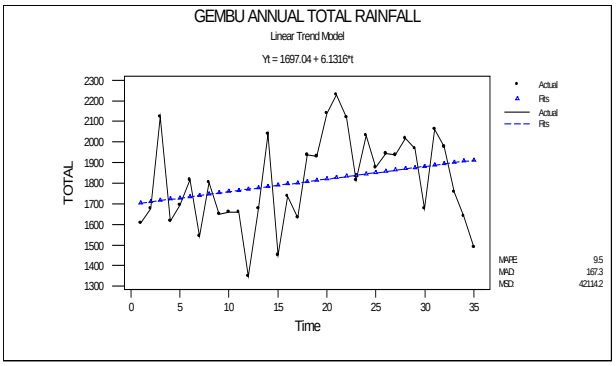


Figure 7 : Trend of Annual Total Rainfall in Gembu

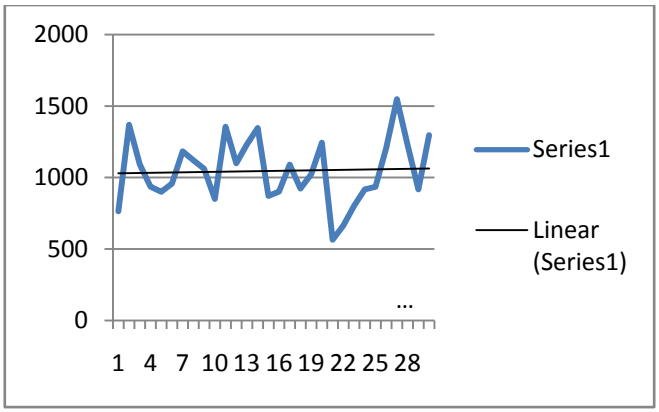


Figure 8 : Trend of Annual Total Rainfall in Ibi

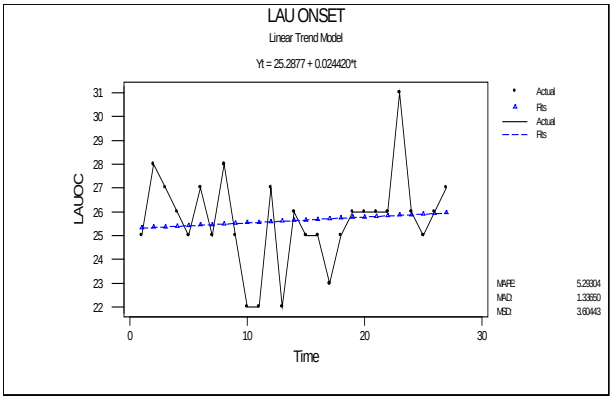


Figure 9 : Trend of Onset Dates of Rain in Lau

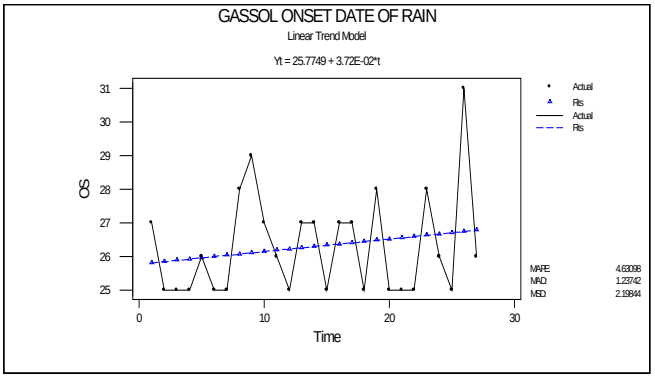


Figure 10 : Trend of Onset Dates of Rain In Gassol

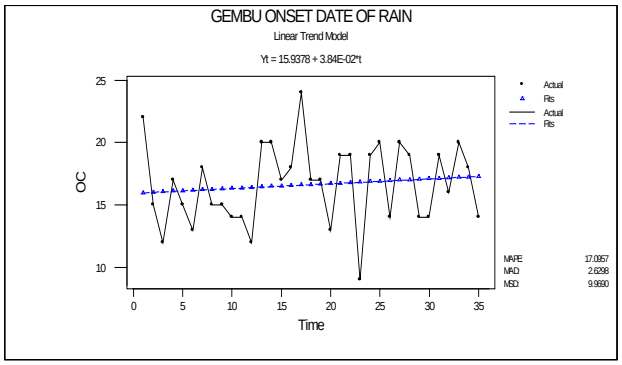


Figure 11 : Trend of Onset Dates of Rain in Gembu

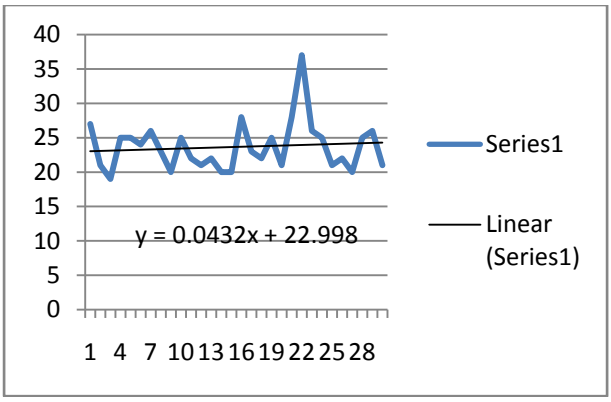


Figure 12 : Trend of Onset Dates of Rain in Ibi

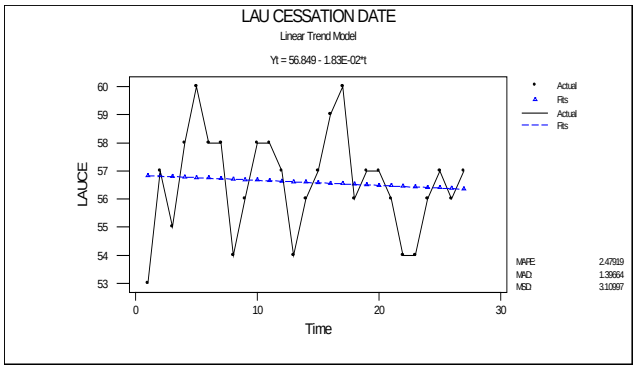


Figure 13 : Trend of Cessation Dates of Rain in Lau

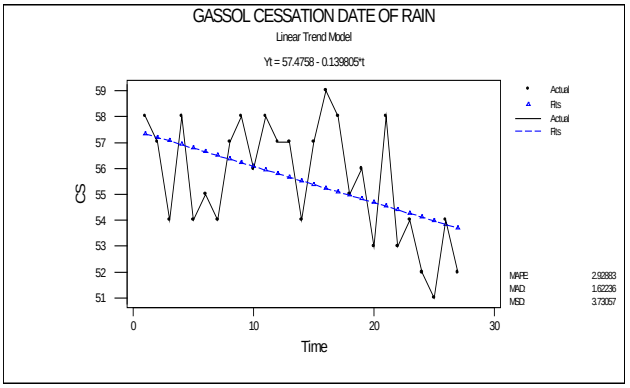


Figure 14 : Trend of Cessation Dates of Rain in Gassol

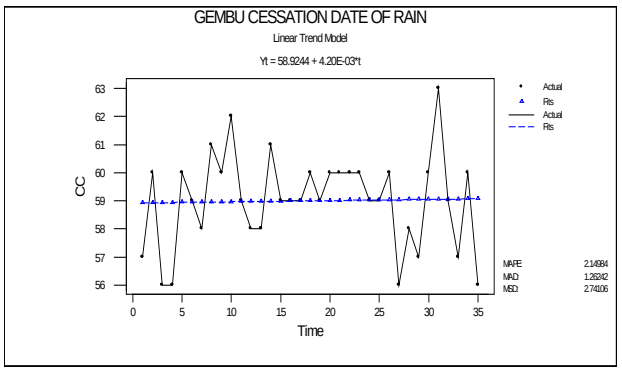


Figure 15 : Trend of Cessation Dates of Rain in Gembu

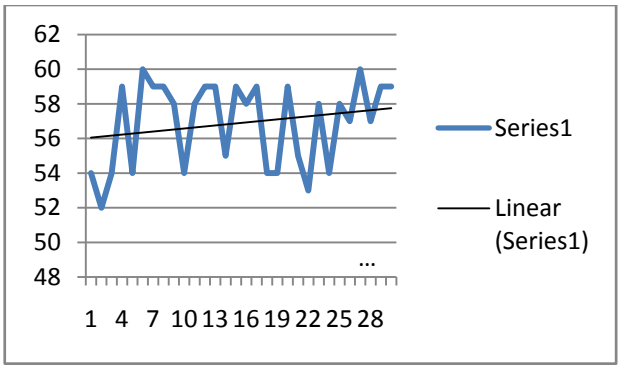


Figure 16 : Trend of Cessation Dates of Rain in Ibi

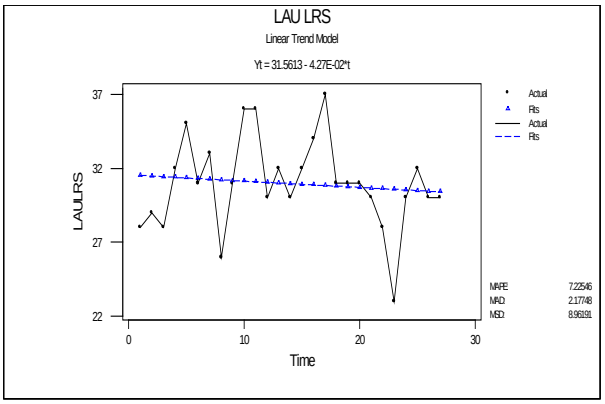


Figure 17 : Trend of LRS in Lau

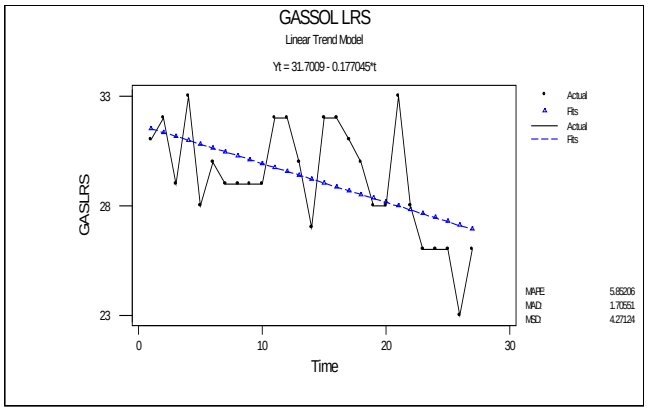


Figure 18 : Trend of LRS in Gassol

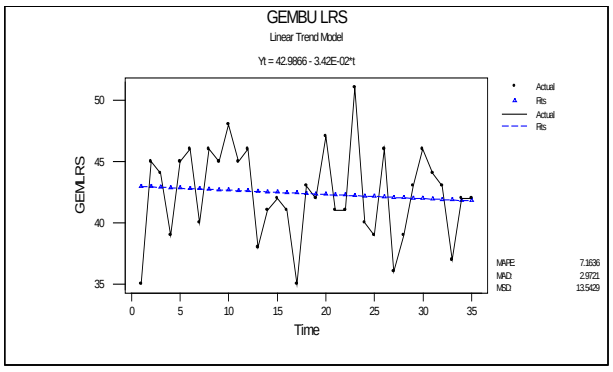


Figure 19 : Trend of LRS in Gembu

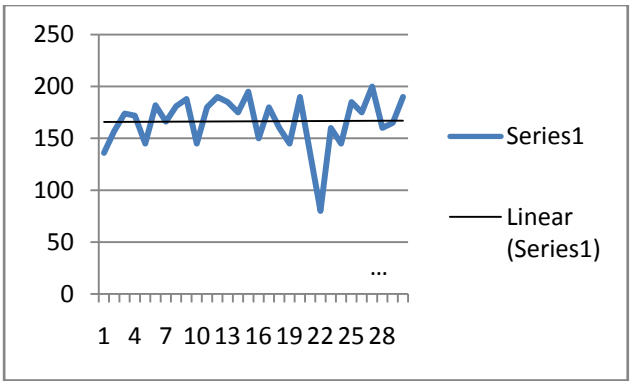


Figure 20 : Trend of LRS in Ibi

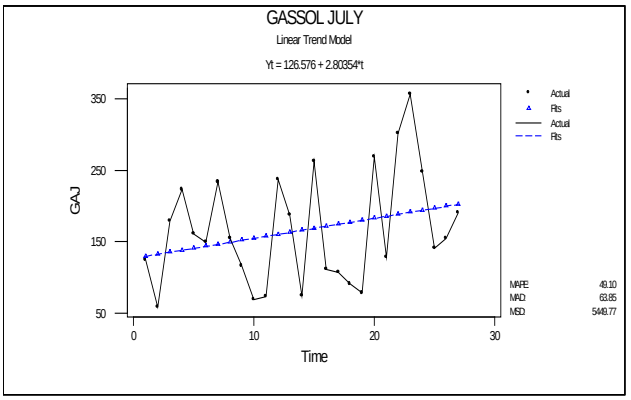


Figure 21 : July Rainfall in Gassol

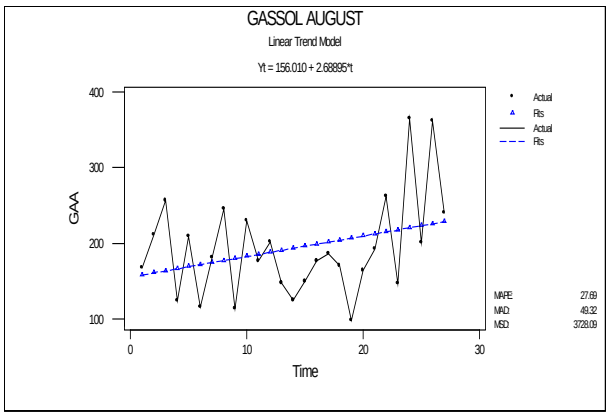


Figure 22 : August Rainfall in Gassol

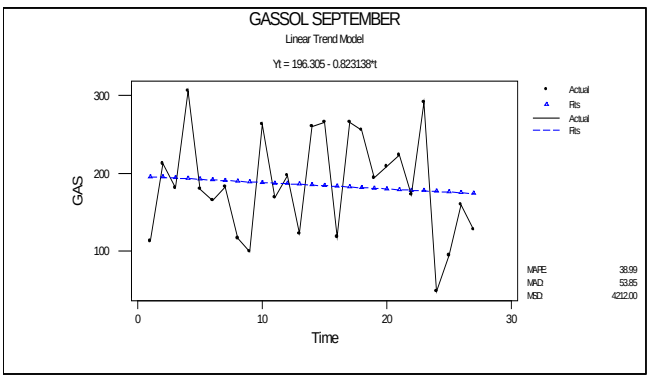


Figure 23 : September Rainfall in Gassol

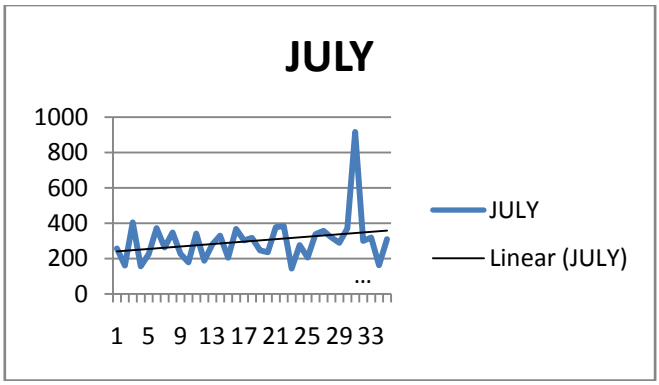


Figure 24 : July Rainfall in Gembu

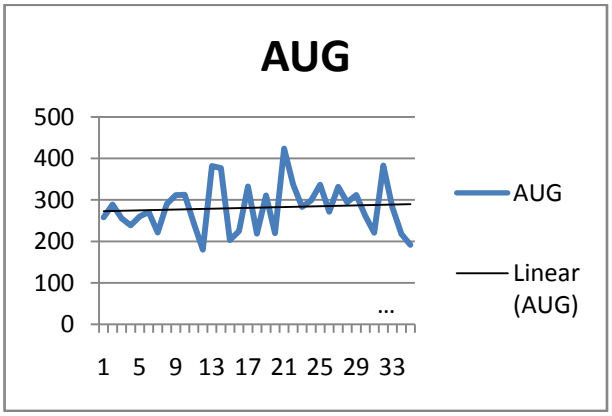
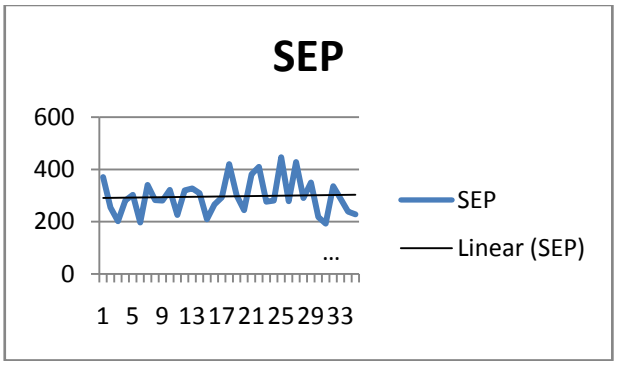


Figure 25 : August Rainfall in Gembu



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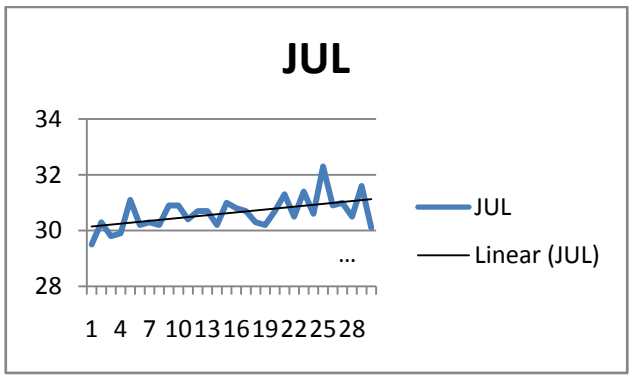

Figure 27 : July Rainfall in Ibi

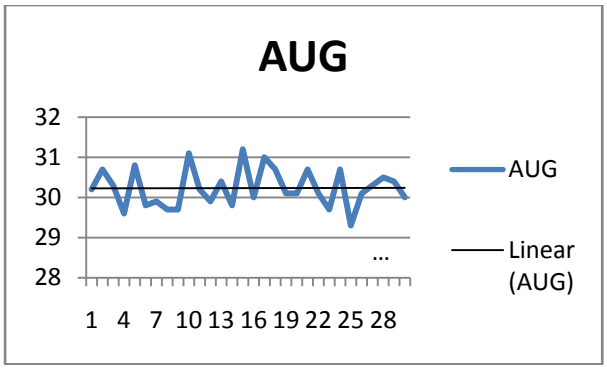

Fig.28: August Rainfall in Ibi

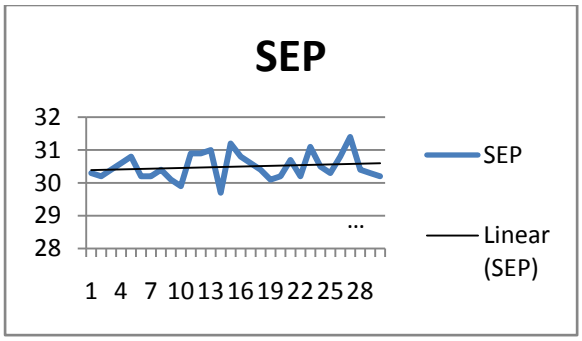

Figure 29 : September Rainfall in Ibi

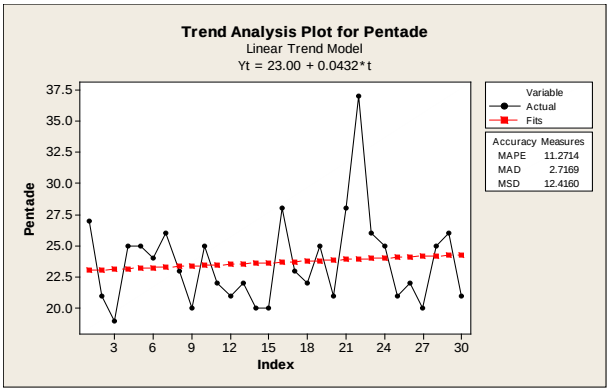

Figure 30 : Trend Analysis graph for Pentade

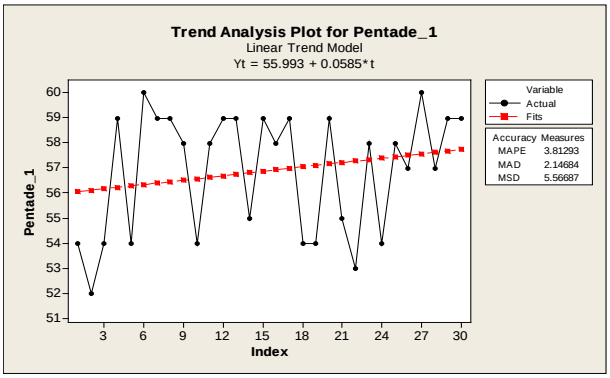

Figure 31 : Trend Analysis graph for Pentade _1

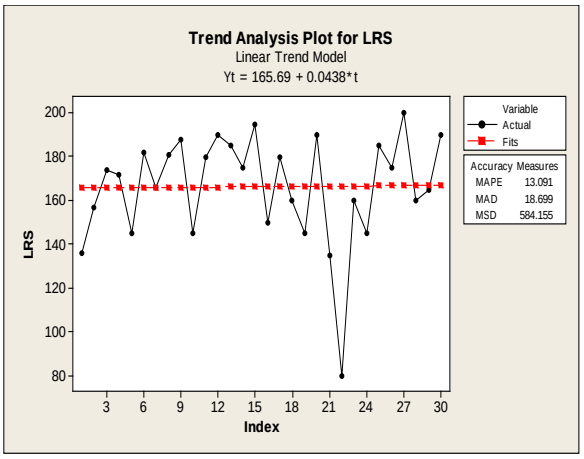

Figure 32 : Trend Analysis graph for LRS

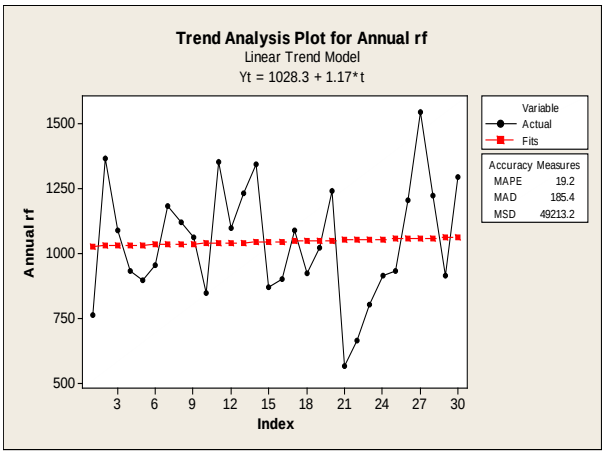

Figure 33 : Trend Analysis graph for Annual Rainfall

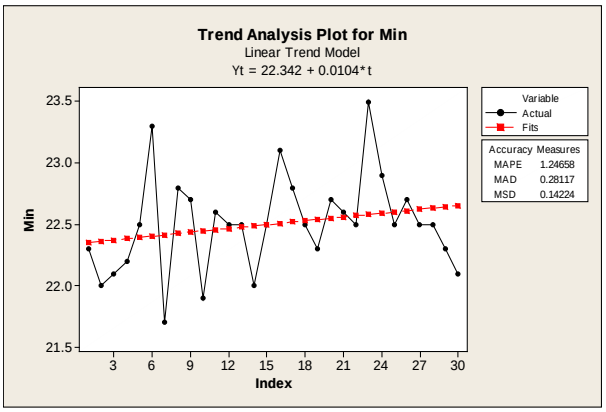

Figure 34 : Trend Analysis graph for Minimum Temperature

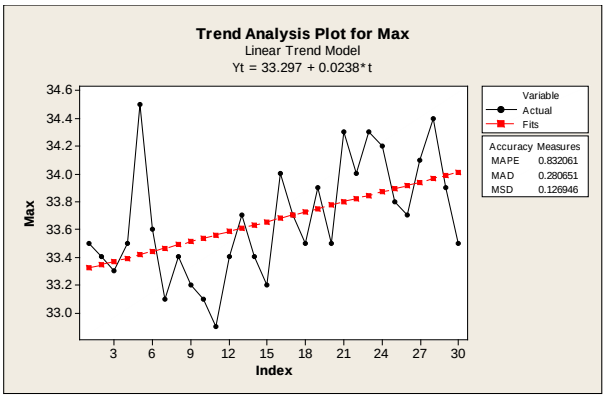

Figure 35 : Trend Analysis graph for Maximum Temper

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The T-Rflp Analysis of Methanogenic Community during the an Aerobic Fermentation of Tofu Liquid Waste

By Sunarto, Artini Pangastuti, Suranto, Edwi Mahajoeno & Eti Setioningsih

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The T-Rflp Analysis of Methanogenic Community during the an Aerobic Fermentation of Tofu Liquid Waste

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Keywords: methanogenic, euryarchaeota, methanosph-aerula palustris, terminal restriction fragment length polymorphism (TRFLP), tofu liquid waste.

I. Introduction

The increase demand in the near future caused by population growth and resource depletion of world oil reserves and concerns emissions from fossil fuel requires any country to immediately produce and use renewable energy. Besides, the increase in world oil prices up to 100 U$ per barrel is also a serious reason that afflicts many countries in the world, especially Indonesia. According to data from EMR (2006) Indonesia's oil reserves were only about nine billion barrels. If it continues to be consumed without the efforts to discover of new oil reserves, it is estimated oil reserves will be depleted within the next two decades. As a country that is endowed by abundant energy the renewal energy source. Biogas can be one of the alternative energy sources. This is a kind of gas formed by various organic waste biomasses, such as tofu liquid waste that can be optimized as energy through anaerobic digestion process. This process will result in a massive alternative energy production so that the effect of fossil fuel use will decrease.

At the present time, the organic waste biomass has hardly been studied. The characteristics of chemical, physical, and biological waste biomass of tofu industry are significant to be analyzed. The anaerobic digestion refers to various reactions and interactions that occur between methanogenic and non-methanogenic as well as materials (biomass) which is fed into the digester as inputs. This degradation process is a complex physical-chemical processes and biological processes that involve numerous factors and stages of transformation. Destruction of organic material input is achieved in three stages, namely: (a) hydrolysis, (b) acidification, and (c) the formation of methane (methanization) (de Mezt, *et al*., 2003). According to Raskin *et al*. (2007) the anaerobic fermentation process is divided into 4 stages of decomposition, *i.e.* hydrolysis, asidogenesis, asetogenesis and methanogenesis. Each stage will involve different bacterial groups that will work in synergy between one group against the other bacteria to form a consortium of bacteria.

Methanogenics are the Archaea that produce a methane gas in the entire process of its chain in anaerobic way. Information on the characteristics of microbial community during anaerobic fermentation of waste biomass of tofu industry can be a basis in the understanding of this research focusing on the identification and quantification of methanogenic. T-RFLP (Terminal Restriction Fragment Length Polymorphism) method is used to determine the dynamics of bacterial community structure as a whole. This method has been used in the analysis of structural dynamics of lactic acid bacteria Cheese (Bulut Cisem, 2003), agricultural soil bacterial communities in potato (Lukow *et al*., 2000), larvae of *Litopenaeus vannamei* (Pangastuti, 2008), and plankton bacteria on the Black Sea (Stoica, 2009).

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II. Material and Methods

The laboratory research was done in January 2012 to July 2012. The research sample was taken from one of the tofu industry in Nglorog, Sragen. The molecular research was done in the Faculty of Mathematics and Natural Science laboratory of Sebelas Maret University, Surakarta.

Digester construction: volume of 330 ml bottle, hose diameter of 0.5 and 30 cm long, hose diameter of 1 cm and 30 cm long, *Alteco* glue. Physics analysis (pH and temperature): pH meter and thermometer. DNA Extraction: sterile micro tube, micro pastel, UltraClean Soil DNA Kit MoBio as the manufacturers recommended procedures, along with the micropipette tip, centrifuges, vortex. Electrophoresis: electrophoresis apparatus, the micropipette along with tip, gel dock. Gene amplification of 16S sRNA: *Mung Bean Nuclease* (NEB, MA), QIAquick Gel Extraction Kit (Qiagen, Germany), micropipette, vortex, centrifuge, microtube, miniprep spin coloum. Digestion of amplicons: QIAquick Gel Extraction Kit (Qiagen, Germany), micropipette, vortex, centrifuge, micro tube, miniprep spin coloum.

T-RFLP analysis: Heating, 96-well plate, capillary electrophoresis system ABIprism™3100 Automated DNA Squencer (PE), labeled fragment length determined by program GeneScan ® (Perkin Elmer). The TRF size known is matched with a database on the *Ribosomal Database Project II* website (Marsh *et al*., 2000). Fragsort program (www.oardc.ohio-state.edu/trflpfragsort) is used to confirm the results of TRF cutting with restriction enzyme.

The substrates are derived from tofu industry waste; the inoculums are obtained from industrial waste that is fermented for about 2 weeks with a concentration of 20% of the digester working volume (330 ml), and water. DNA extracted using the UltraClean Soil DNA Kit MoBio as the manufacturers recommended procedure, electrophoresis using TAE buffer 10 times, distilled water, 0.8% of agarosa gel, Ethidium Bromide, loading dye. 16S sRNA gene amplification using forward primer 5'-(Ar109f) ACK GCT CAG TAA CAC GT -3 'and reverse primer 5'-(Ar 915r) GTG CTC CCC CGC CAA TTC CT-3', buffer (NEB, MA), dNTP Mix, U Taq DNA Polymerase (NEB, MA), and ddH2O. T-RFLP analysis using DNA isolates digestion, the HD-400 [ROX], and ice. Materials for the sequencing of genes encoding 16S rRNA: Ar109f primary and Ar 912r.

a) Sampling

This research uses tofu waste as substrate and the tofu industry waste that has been fermented out in a long period of time to form sludge (activated sludge) as the inoculums. In this research, the digester with a volume of 330 ml, which is 80% of the volume of the digester is used as the volume of work, while the rest (20%) as an air space. 80% (330 ml) of digester working volume filled by the source the inoculums with a concentration of 20%, 80% then the remaining volume is used for the substrate.

b) Biogas Production

Inoculums are poured first into the digester with a certain concentration (the research used a concentration of 20 % of the working volume of 264 ml, equivalent to 52.8 digester ml), then the substrate into the digester as the remaining volume of the digester working volume is 80 % of 264 ml, or approximately 211.2 ml), then the digester should be closed tightly. The fermentation process runs for 20 days, until the biogas formed. Once it is formed, the biogas will be supplied from the biogas digester tank (jerry cans) into the gas collection tank (330 ml volume bottle) through a small hose. Previously, the gas collection tank is full filled with water (330 ml). So when the gas flows into the gas collection tank, then the water will be pushed out and biogas will flow into the tank (replacing water). Thus, it can be seen that the volume of gas that flows into the gas collection tank equals to the volume of water coming out of the gas collection bottle. Agitation is done once a day. Sampling for measurement of the temperature, pH and molecular research conducted once every five days (days 0, 5, 10, 15, 20).

c) The Measurement of pH, temperature, and CH_4

Put the electrode pH meter in distilled water, wipe with a tissue and then put in a buffer solution of pH: 4, rinse with water, wipe with a tissue and put in Buffer pH: 7. Electrodes then inserted into 25 ml of sample in a beaker and the read pH meter. A thermometer is used to measure the temperature. CH_4 was measured by gas kromatrografi

i. *DNA Extraction Sample*

DNA extraction uses *UltraClean Soil DNA kit* (MoBio, CA).

ii. *Gen 16S rRNA Amplification*

Genes encoding 16S rRNA amplification performed with the forward (Ar109f) 5'-ACK GCT CAG TAA CAC GT -3' primer and reverse fam(Ar 915r) 5'-GTC CTC CCC CGC CAA TTC CT -3': 100 ng of DNA primer, 1x buffer (NEB, MA), 2 µl of 10 mM dNTP Mix, 2 U Taq DNA Polymerase (NEB, MA), 5 pmol of each primer, ddH2O to 50 µl. The PCR program consists of 1 cycle at 94°C for 3 min, 30 cycles at 94°C for 1 min, 48°C for 1 min, 72°C for 1 min, 1 cycle at 72°C for 7 min; ends with storage at 4°C. Part of the single-stranded DNA amplicons digested with Mung Bean Nuclease (NEB, MA) and then purified with QIAquick Gel Extraction Kit (Qiagen, Germany).

iii. *The PCR Digest Product of DNA Gen 16S rRNA Amplification Result*

The PCR product as a result of 16S rRNA gene DNA amplification was digested with restriction enzymes

that cut the high frequencies i.e. Alu1 (NEB, MA) separately to the reaction conditions: 5U enzyme, 1x buffer, 100-200ng of DNA, ddH2O to 20µl, and incubated at 37°C overnight. Desalting then performed with QIAquick Nucleotide Removal Kit (Qiagen, Germany). DNA digestion was dissolved in 30µl of elution buffer.

d) T-RFLP Analysis

DNA digestion was mixed with 1µl HD-400 [ROX] as an internal size standard. DNA was denatured at 95°C heating for 5 minutes and then immediately placed on ice for 5 minutes. Subsequently the mixture was inserted in a 96-well plate and inserted in the capillary electrophoresis system ABIprism™3100 Automated DNA Sequencer (PE Applied Bio systems). Labeled fragment length determined by Gene Scan® program (Perkin Elmer). TRF sizes known were matched with a database on the Ribosomal Database Project II website (Marsh et al., 2000). For the TRF identification compared with MICA database (http://mica.ibest.uidaho.edu).

e) Analisis data

Phylotype richness (S) is the total peak of different TRF/distinct restriction types found in each sample. Shannon-Wiener index (H') and evenness (E) was calculated to describe the diversity of the community in different instars and the relative importance of each filotipe in the whole community. H' is calculated by the following formula: $H' = -\sum pi \ln pi$ to discover the extent of each individual genus dominating the population used Eveness same index as follows: $E = \frac{H'}{H' \, maks}$ (Krebs, 1972)

III. Result and Discussion

The total 16SrRNA gene of the community was amplified with Ar915r primer labeled with 6-FAM and 109f primer that is not labeled. The DNA band as a result of PCR amplification of 16SrRNA encoding genes was obvious, namely a single band of DNA that measures approximately 750bp (Figure 1).

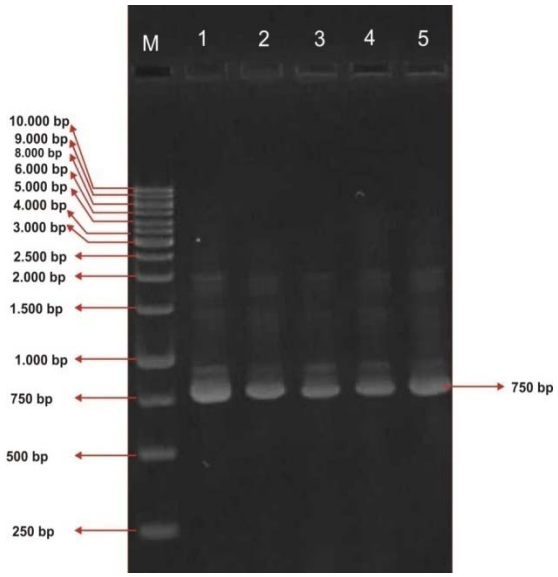

Figure 1 : The product of PCR amplification result of 16SrRNA gene DNA were 750bp sized at 0.8% Agarosa

Description: (M) DNA marker, Fermentation day (A) zero, (B) five, (C) ten, (D) fifteen, and (E) twenty.

T-RFLP profile of methanogenic community in this research showed a range of TRF sizes from 60-171bp, representing many different methanogenic populations (Figure 2). There were three fragments, namely 62bp, 136bp, and 167bp detected as a peak of TRF in the result on the electropherogram. Furthermore, the size of TRF on electropherogram was identified using the Microbial Community program analysis III (MICA) (http://mica.ibest.uidaho.edu/trflp.php).

MiCA was developed based on the Ribosomal Data Project II (RDP II) (Cole *et al*., 2003). TRF size details on each of the three filotipe are TRF peak size 62 bp, filotipe identified and classified from the Euryarchaeota phylum; TRF peak size 136bp, identified methanogenic belongs to Crenarchaeota phylum, whereas the TRF peak size 167bp, identified filotipe was closely related to Methanosphaerula palustris. The three filotipe detected entered in the Domain Archaea.

The three filotipe's population dynamics can be seen in Figure 2. The composition of the methanogenic filotipe detected based on the RDP database for each day observation is relatively stable, Euryarchaeote and *Methanosphaerula palustris* consistently detected from the beginning to the end of fermentation. This is presumably due to the biogas producer medium in a biodigester is highly influenced by the type of filotipe that has grown in the inoculums as a mud tofu waste. The consistency of those two filotipe growth shows that the digester used was able to support the growth of two filotipe.

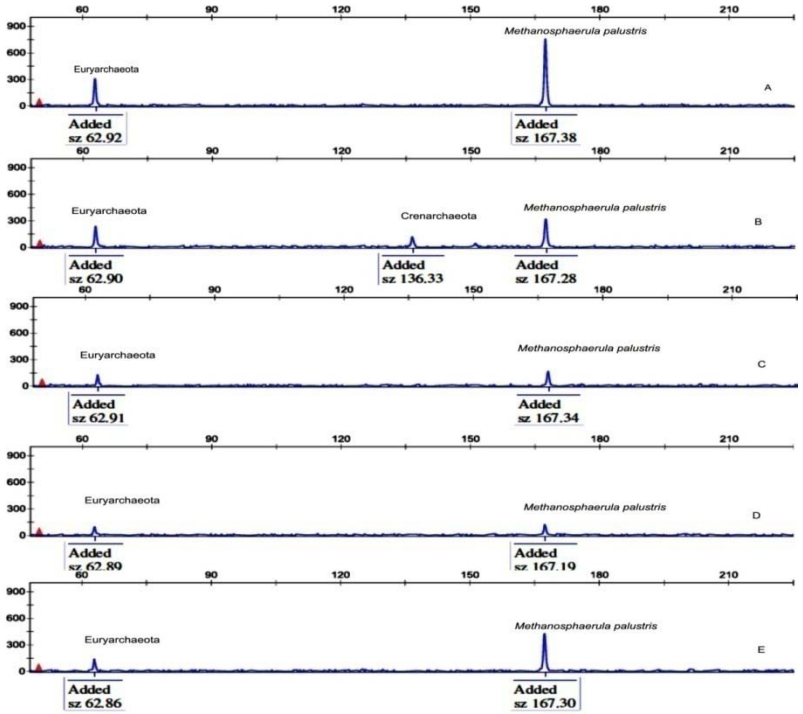

Figure 2 : Terminal Retriction Pryment of methanogenic archaea community uses restriction enzyme Alu1 in fermented Tofu liquid waste

Description: Fermentation day (A) zero, (B) five, (C) ten,(D) fifteen, and (E) twenty.

Methanospaerula palustris dominated in every observation and consistently grew from the beginning to the end of the fermentation process. The observation result in day 5 to day 15 showed that the abundant amount of *Methanospaerula palustris* was not stable, We assume that the changing condition of the digester was due to the additional liquid tofu waste which cause the minimum capability of methanogenic to grow the. Implying that on day 0 (zero) today 15 the growth of Methanospaerula palustris was still in lag phase. Liu *et al*., (2011) observed the amount of organic could carbon influence the population of methanogenic in a bog, if the amount of the organic carbon is available, it means that the population of the methanogenic will increase. However, they did not measure the amount of organic carbon and organic matter content (COD) contained in the digester. In this research, *Methanospaerula palustris* has the highest abundance on day 20 and we assume *Methanospaerula palustris* has stabilized and start with exponential growth.

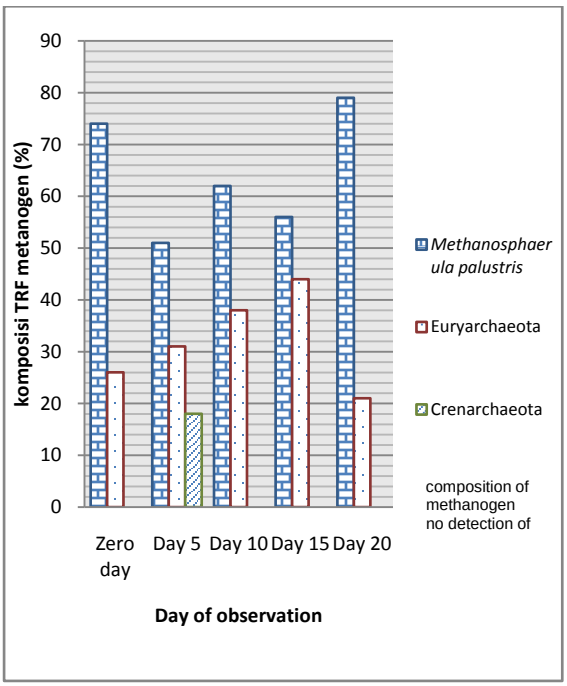

Figure 6 : TRF Metanogen Composition Using Restriction Enzyme *Alu1* during the Tofu Waste Anaerobic Fermentation

The Euryarchaeote abundance has increased significantly from day 0 to day 15, it is estimated that the Euryarchaeote easy to adapt medium in digester and used for growth medium. Euryarchaeote decreased on day 20, it could be due to growth competition with

Methanospaerula palustris as shown, by increase population of *Methanospaerula palustris*, while decreased of Euryarchaeote population (Cadillo et al., 2009). The filotipe at peak TRF 136, belonging to the Crenarchaeota phylum detected only on day 5 and was not successfully detected on day 10 until the end of fermentation, it may be influenced by the temperature of the fermenter's temperature that ranges between 30-31 °C and a pH in the range 7-8. That was the temperature for Archea mesofolik and pH that suit the methanogenic, where as Crenarchaeota phylum is hipertermofilik Archaea. According to Todar (2009) most of the Phylum Crenarchaeota composed of Archaea hipertermofilik. Phylum Crenarchaeota hipertermofilik requires a specific growth temperatures in range 80-105°C, grew in a habitat with a high sulfur content such as volcano area, geysers, and hot springs as in Yellowstone National Park area, United States of America. The pH of hipertermofilik Crenarchaeota growth is in the range of less than 2. This indicates that the tofu waste digester used in this research is not suitable for the growth of the Crenarchaeota phylum. Table 2 shows that the highest relative abundance from the beginning until the end of fermentation is *Methanosphaerula palustri*.

Table 2 : The Relative Abundance (%) of Methanogen Community during the Anaerobic Fermentation of Tofu Liquid Waste Using TRFLP Technique

Methanogen Community	Relative Abundance (%)				
	Zero day	Day 5	Day 10	Day 15	Day 20
Euryarchaeota	25.5	30.8	38.3	43.8	21.4
Crenarchaeota	0	18.4	0	0	0
Methanosphaerula palustris	74.5	50.8	61.7	56.2	78.6

The number of filotipe or Species Richness (S) detected in the methanogenic communities from all observations were two to three filotipe Alu1 using restriction enzymes (Table 3). Two filotipe were found from the beginning until the end of fermentation, except on the 5th day of observation there is an addition filotipe. The diversity index analysis (indicated by the Shannon-Weiner index/H') was the highest on day 5 of observation (1.02) and the lowest index values are shown on day 20 (0.52). The higher Methanogenic diversity on treatment day 5 showed that on day 5 there was a diverse methanogenic communities with equitable filotipe distribution, although evenness is not the highest value. This means that there was no filotipe relatively dominant on day 5. In contrast, based on the result of broad peak areas of T-RFLP, the estimation of the total number of methanogenic was not the highest. The lowest diversity found on day 20 (0.52), the value of evenness day 20 was also low, indicating that there was a very dominant filotipe. Based on the broad peak area of T-RFLP results, the estimation of the total number of methanogenic on the 20th day is not the highest or the lowest.

Table 3 : Diversity of methanogen community on the anaerobic fermentation of Tofu liquid waste by TRFLP Technic.

The day of Observation	The amount of Filotipe Richness	Shannon Weiner(H') Indeks	Evenness/E
0	2	0.57	0.82
5	3	1.02	0.93
10	2	0.67	0.96
15	2	0.69	0.99
20	2	0.52	0.75

The physic-chemical characteristics analysis as a concentration of CH_4, pH and temperature is intended to indicate the presence of methanogenic in accordance with the factors of physical-chemical in its growth. CH_4 concentration measurement was not performed on days 0, it is assumed that on 0 day, the CH_4 has not been formed yet for it has not been fermented. The CH_4 production on day 5, day 10, day 15, day 20, respectively for 1092.6 ppm, 570.2 ppm, 712.66 ppm, and 655.82 ppm, so the highest CH_4 production found on day 5 in the amount of 1092.61 ppm, while the population of *Methanospaerula palustris* on day 5 is not the highest abundance (Figure 7). It shows that the CH_4 production was not significantly associated or correlated with methanogen population abundance.

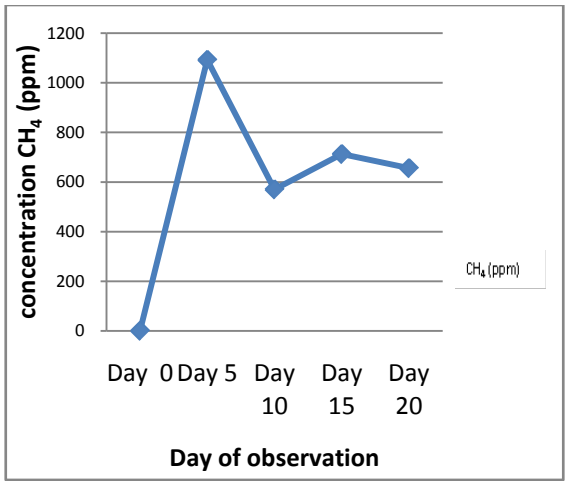

Figure 7 : The Graphic of CH4 concentration during the anaerobic fermentation of Tofu liquid waste

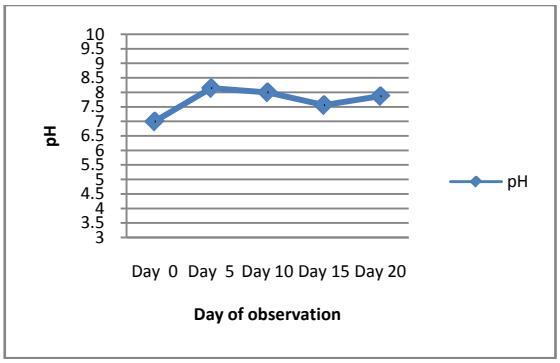

Figure 8 : The Graphic of pH during The Anaerobic Fermentation of Tofu Liquid Waste

Figure 8 shows the results of pH measurements. Measurement of pH on day 0 (zero), at the beginning of fermentation, pH was made to be neutral to 7 with NaOH, it is intended to equate the measurements at the beginning of fermentation. On day 5 was 8.146, day 10 was 8, the 15th day was 7.56 and 20th day was 7.87. The pH changes happened due to the fermented compound as well as the acetogenesis has been converted into H_2, CO_2, H_2O, and CH_4, as well as the breakdown of proteins into NH_4^+ which is then form into an alkaline compounds. The methane consuming acetic acid and convert it into methane and CO_2, so that the concentration of acetic acid in the waste water decrease and the pH increase (Suryandono dan Wagiman, 2004). The continued digestion process causes the concentration of NH_4^+ increased so that pH value increased. The NH_4^+ ions will form the alkaline compound and raise the pH in the digester to neutral. The result of pH measurement that ranging from 7 to 8.1 indicates that the pH produced is accordance with the terms of pH methanogenic growth.

The dominance of *Methanospaerula Palustris* and the diversity of Archaea population during the observation was not affected by temperature, because there was no much differences in the temperature measurement results from day 0 to day 20, ranging from 30°C to 31°C

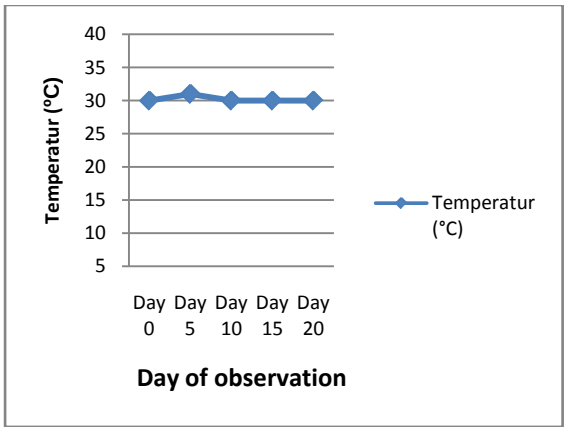

Figure 9 : Temperatures During Anaerobic Fermentation of Tofu Liquid Waste

According to Dubey (2005) most of the methanogens are mesophilic with an optimum temperature range between 20-40°C, but some methanogens can also be found in extreme environments such as hydrothermal vents that have temperatures up to 100°C.

In this research, the results of temperature measurements obtained 30°C and 31°C in the digester, it indicates that the methanogens that are closely related to *Methanospaerula palustris* is able to grow and produce CH_4.

The CH_4 production depends on the temperature of the digester, the research in peat lands, CH_4 production would be maximize dat a temperature between 20-35°C (Svensson, 1984; Segers, 1998; Kotsyurbenko et al., 2004; Metje and Frenzel, 2005).

IV. Conclusion

The methanogenic population in biogas production from tofu liquid waste for twenty days consit of two filotipe namely: methanogenic belongs to the phylum Euryarchaeota and methanogenic closely related to *Methanosphaerula palustris*. The third Filotipe detected is Crenarchaeota that may not belong to methanogens. Euryarchaeota and *Methanosphaerula palustris* found consistently from the beginning until the end of fermentation, whereas Crenarchaeota Phylum only detected on day 5. The methanogens dominated from the beginning to the end of the fermentation process was *Methanosphaerula palustris*.

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The Allure of Flora Species Diversity in the Tropical Rainforest Ecosystem: The Need for Concern in a Global Context

By Dr. Okpiliya F. I.
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Abstract- There is no doubt that the tropical rainforest and its floristic richness is being faced with enormous challenges. The rainforest is being destroyed by man for various purposes – agriculture, urbanization, fuelwood gathering and logging among others. Also, the increasing trend in the population structure of the people inhabiting the rainforest area has contributed significantly to its destruction. Thus, considering the inestimable value of the rich flora diversity of the rainforest, this paper therefore using relevant secondary sources of data tried to examine the rate of loss of the rainforest ecosystem and its rich flora diversity as well as examining the various forms of utilization of the flora species by the local people inhabiting the rainforest. So that their destruction becomes a very serious concern as there seem to be little or no effort to conserve these flora species for future generation.

Keywords: *allure, species, ecosystem, rainforest.*

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The Allure of Flora Species Diversity in the Tropical Rainforest Ecosystem: The Need for Concern in a Global Context

Dr. Okpiliya F. I.

Abstract- There is no doubt that the tropical rainforest and its floristic richness is being faced with enormous challenges. The rainforest is being destroyed by man for various purposes – agriculture, urbanization, fuelwood gathering and logging among others. Also, the increasing trend in the population structure of the people inhabiting the rainforest area has contributed significantly to its destruction. Thus, considering the inestimable value of the rich flora diversity of the rainforest, this paper therefore using relevant secondary sources of data tried to examine the rate of loss of the rainforest ecosystem and its rich flora diversity as well as examining the various forms of utilization of the flora species by the local people inhabiting the rainforest. So that their destruction becomes a very serious concern as there seem to be little or no effort to conserve these flora species for future generation.

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I. Introduction

Tropical rainforest is a term coined by Schimper (1903) in his great classic work 'Plant Geography'. His definition of rainforest was green hygrophilous in character at least 30m high rich in thick-stemmed lianes, and in woody as well as herbaceous epiphytes. Since then, this term has become so common that it can not easily be replaced. Myers (1988) defined tropical rainforest as evergreen or partly evergreen in areas receiving not less than 100mm of precipitation in any one month for two out of three years with mean annual temperature of more than 4^0c and frost free. The difficulty of drawing up worldwide definitions led Myers (1988) to consider the absence of seasonality as more critical than overall precipitation.

Despite the multifarious views of what constitute rainforest, a number of salient issues stand out that are quite acceptable in any given situation. That rainforest is conceptualized with the framework of high rainfall and characteristically evergreen vegetation and that it lies between the two tropics cancer in the north and Capricon in the southern hemisphere.

In the eighteen century, hundreds of scientists and natural philosophers set off from Europe to explore the tropical unknown. Distinct from earlier adventures, conquerors, and pirates, they had as their primary goals the discovery, documentation and the understanding of the diversity and abundance of tropical nature. The figure who best united these scientific concerns with artistic world was Baron Alexander Von Humboldt (1796-1859). In essence, factual accounts of tremendous diversity of life forms piqued the curiosity of biologists living in temperature land where nature had long seemed somewhat subdued. Nearly every ship returning from equatorial lands brought proof of the existence of previously unanticipated biological diversity (Putz and Holbrook, 1988). Naturalists accounts and illustrations like that of Goose, gave the public the impression of the tropics as a land teeming with life. In essence, biological diversity is one of the true riches of the tropics that have long attracted scientists. Many major developments in anthropology, ecology and systematics are based on the discoveries of the diversity of life forms made in the tropics. A common vision of tropical forest is that they are lands of biological marvels, sources of sociological insights and places where scientific reputations can be held for a song and some sweat (Putz and Holbrook, 1988).

Based on this curiosity to explore the area, many scientific studies have been undertaken in the tropical rainforest with the view to assessing the floristic richness of the area. For example, Richards (1952) study in Cameroon revealed a total of 109 species of 30m girth in Cameroon. Pore (1968) discovered 375 tree species belonging to upper canopy in 23ha of forest in Malaya, Granbrok (1988) estimated about 7900 plants in 1400 forest (28 endemic) in Malaya peninsula, Gentry (1987) noted 365 vascular plants in Riopulanque, Ecuador; Mabberley (1992) reported 6100 plant species in Madagascar and Okpiliya (2004) identified 91 flora species in 18 plots measuring 100m by 100m in six forest enclaves in Boki, Nigeria. Also, in Brunei Sastrapradja (1988) noted a total of 760 plant species in a plot measuring 45 hectares and 60 plants species in a plot of 2.5 acres in Sumatra.

It is not surprising therefore that considering the large numbers of flora species in the tropics, in the same manner, they are threatened as the tropical rainforest habitats are altered or destroyed for various purposes. We are made to understand that between 1990 and 2015, about ten percent of the flora of the tropical rainforest will become extinct, Briggs (1985). If this condition persists, then the basis for human existence will ultimately be questionable. It is this

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background that has necessitated this paper so that arising from here; human being can begin to appreciate the need to think on how to do little harm to the rich diversity of the tropical rainforest because of their relative importance in life sustenance.

II. Location of Tropical Rainforest

The tropical rainforest is found in all the three tropical land areas – America, African and Indo-Malaya. Most extensive are the American or neo tropical rainforest, about half the global total $4x10^6km^2$ in area and 1/6 of the total broad-leaf forest of the world. These occur in the parts of which the largest lies in the Amazon and Orinoco Basins. Second is a block, which lies across the Andes on the pacific Coasts of Equador and Colombia, extending northwards through Middle America as far as Venecruz in Southern Mexico (19^0N). The Atlantic Coast of Brazil has a third block extending to the west towards Rio de Janeiro (23^05).

The second largest block of tropical rainforest is found in the Eastern tropics and is estimated to cover $2.5x10^6km$. It is concentrated in the Malay Archipelago, the region known to Botarists as Malesia. Indonesia occupies most of the Archipelajo and is second to Brazil in the amount of rainforest it possesses. The Malesia forest extends northwards up the Malay Peninsula into Continental South East Asia, Burma, Thailand and Indo-China. There are further outliners in South West Srilanka.

Africa has the smallest block of tropical rainforest, $1.8x10^6km^2$. This is centered on the Congo Basin with outliners in East Africa. It extends as a central strip into West Africa. There are isolated pockets of rainforest on the east coast of Madagascar.

III. Rates of Disappearance of Tropical Rainforest

The tropical rainforest has been disappearing at an alarming rate for centuries now. As they disappear, so does the rich diversity of floral species found in them. Table 1 below shows the rate of tropical rainforest between 1981-1990.

Table 1 : Annual loss of tropical moist forest from 1981-90 as percentage (and million ha).

	Tropical Moist Forest				
	Lowland Rain	Lowland Seasonal	Hills and mountains	Total	All natural tropical rainforest
America	0.4 (1.9)	0.96 (3.18)	1.2 (1.66)	0.72 (6.74)	0.75% (7.4)
Asia	1.2 (2.23)	1.4 (0.68)	0.95 (0.49)	1.1 (3.4)	1.1% (3.9)
Africa	0.51 (0.47)	0.82 (2.25)	0..75 (0.29)	0.75 (3.0)	0.72% (4.1)
Global total	0.64 (4.6)	0.94 (6.1)	0.93 (2.4)	0.9 (13.1)	0.81% (15.4)

Source: FAN data analyzed in Whitemore (1997)

The overall global loss of all tropical moist forest during 1981-90 was estimated to be $13.1x10^6ha$ year or 0.9 percent. At the continental scale loss of lowland rain, lowland seasonal, and hill and mountain forests was at a rate of about 1 percent year or less and no where over 1.5 percent. This situation has continued drastically up to date.

IV. Why Concern for Flora Species Diversity

The relative significance of flora diversity cannot be overemphasized. To be able to appreciate the importance of flora diversity and hence showing much concern for its integrity, one needs to evaluate the products that can be used (both species and genes) and the ecosystem services that tend to support human development. A comprehensive evaluation of flora diversity should take into account the values of the direct use (products) and indirect use (services) and combine both consumption and non consumption use (Ogbe, 2012).

According to biodiversity support program (BSP) Report (1993), concern for diversity or any biological resource rests essentially on the individual value systems. The concept of values here rests on the constellation of social norms and individual attitudes all which may play a role in the utilization of resources. In the view of Walker (1989), people value biological resources like flora species in different ways: spiritually, economically and culturally.

Given this background, it becomes evident in recent times that there has been a serious call for concern about flora diversity because of the rate at which this valuable resource is being destroyed (Sawyer, 1992). It has been estimated that one species of plant become extinct every minute because of the destruction of the tropical rainforest. Flora species extinction has escalated with increasing human populations and domestication of natural ecosystems by intensive agriculture, forest management and urbanization. Maintaining the local, regional and global diversity of flora species has become an increasing focus of ecologists, managers and the public. An entire science of conservation management and planning has arisen in response to a desire to maintain species richness.

A greater concern about flora diversity arises around species that are considered rare, in danger of extinction, or endemic-limited in size and restricted to an

ecological region. Also, some flora species are keystone. These are species whose impact on its community or ecosystem is large and disproportionately large relative to its abundance (Power *et al,* 1996). If the destruction of this caliber of species and others continue unabated in the tropical rainforest ecosystem, then man kind is at the risk of survival. This has led some rainforest ecologists to attest to the fact that if this scenario persists, it could ultimately lead to the collapse of the entire earth's ecosystem. Others simply pointed out that 'we are destroying the rainforest and its rich diversity before we even know its potential to provide sustenance to man'.

According to Flint (1991), the recognition that human kind is part of nature; that all flora species have an inherent right to exist regardless of their natural value to humans; that human culture must be based on a respect for nature; and that present generations have a social responsibility to conserve nature for the welfare of future generations all provide a justification for concern about the status of flora diversity. Also, on ethical ground, Goudie (1989) asserted that flora species have a right to co-exist with us on our planet, and that we have no right to exterminate them the way we are currently doing.

Myers (1980) has argued that a great variety of flora species if not all contribute to the workings of climate through their impact on rainfall regimes not only at the local or regional levels, but also globally. He asserted that this situation therefore has an important effect not only on the agriculture of the millions of people inhabiting the wet tropics but that the rate at which they are degrading may also lead to disruption of climate patterns beyond the tropics. Despite popular views on impending disasters, meteorologists have been less unequivocal in that they continuously point to certain linkages, but the most significant interaction seems to be that flora species of all kinds exchange moisture and energy more intensely than they do to other types of land cover. The source of concern in this scenario is that the degradation of flora diversity would not only lead to self promotion of albedo enhancement but would also result in decrease in rainfall, evaporation and cloud. The consequence of which may be drought, desertification, hunger and death.

In recent times, it has been discovered that flora species is highly valued economically. In pharmaceutical sciences for example, plant products can be used directly or as raw materials to refine therapeutic derivatives or as the inspirations for synthesis of artificial analogues. For example in the USA, plant products were used in the manufacture of 255 drugs prescribed between 1953 and 1973. Also, 40 plant taxa estimated at over $200 million was used during this period (Jeffries, 1977). The returns to pharmaceutical prospectors from new drugs found in the Costa Rican forests have been cited at $4.5m per drug. In Cross River State, Nigeria, Obot and Anwana (1997) have identified several flora species used for pharmaceutical purposes such as *Garcinia manii, Piper guinensis, Afromomum daniella, the Afromomum melegueta, Lasianthera Africana, ocimun gratissimun* and *Ageratum cozyzoides.* Also, Obot (1997) identified certain medicinal plants such as *fumtumia elastica, Garcinia cola*, and *Erythrophlem ivorensis* used for curing cough, *piptadenastrium africanum* for chest and tooth ache, *parkia biglobosa* and *Arapiopsis soyauxii* for stomach ache and *fagas xanthrooxyloides* for sickle cell. In Amazon Basin, '*Curare' (chonodendon tomento-sum, stryhnos toxifera* are used as muscle relaxant employed in cardiac surgery. Amazonian Indians also use this species as arrow poison, while the insecticide plant, '*barbosco*' is used as fish poison. In Boki, Nigeria, plants used as fish poisoning include *cassia alata, erythrophloem ivorensis, strychnos aculeate, Albizia ferruginea, piptadenastrum africanum and tetrapleura tetraptera* (Obot, 1997). Also in Amazon Basin, '*leche caspi'* or '*chicle'* is used for stomach aches. (Caneiro, 1988).

In central Brazil, the Kuikuru used the root of *'netu'* plant to poison dogs. They also use Resin for medicine (Carneiro, 1988). It is this absolute utility of these flora species for this purpose that one begins to wonder that given the present state of degradation of these flora species, the pharmaceutical industry will suffer a great deal with the overall consequence on man since there seems to be little or no effort geared towards conserving any of these species in the tropical areas.

Also, the numbers of edible fruits is legion. Onyeagoche (1977) apines that in the rural areas of the tropics where the popular food eaten is mainly carbohydrates, indigenous fruit trees fulfill a very useful role in improving food quality by providing proteins, minerals, vitamins and fats especially during "hungry" periods when most of the storage foods are out of season. Okpei (1997), have identified certain flora species in Cross River State, Nigeria, used for food to include *Elaeis guinensis, irvinga gabonnensis, Raphio hookeri, Dacrodes eludes, Gnetum africanum, Mucuna sloaneil, Lasianthera hanburyi, Ocúmun gratissimum, Maranteceae, Heinsia Crinata Afronomum melegueta* among others. Okpiliya (2004) also identified in Boki, Nigeria certain flora species used for food to include *Garcinia kola, poge oleosa, Ceiba pentandra and cola acunimata.* The kuikuru in Brazil used the plant known as '*Piqui' (Caryocar brasiliese)* and '*Cocona' (Solamum sessiliflorum)* for eating. The Efe people inhabiting the Ituri forest in Congo Republic use some local plants known as '*ato*' (*aynometra alexandri)* and '*rofo' tree (Brachystesia laurentii)* to produce honey. They flower between February and March and May to August. In Orinoco Basin, 'Moriche palm' (*Mauritia Flexuosa)* is used to make palm wine, and beverage, (Carneiro, 1988). Okpiliya's (2004) study in Boki, Nigeria revealed

that the use of flora species for food ranks the highest among other forms of utilization. Given this situation, the value of flora species generally in any area can not be overemphasized so that any form of their destruction will imply hunger, starvation and subsequent death. Hence the need to accord concern to their state of being.

The relative importance of shelter to man cannot be overstressed. The corner stone of most housing construction in rural areas of the tropical rainforest are the varieties of flora species found here. They are used in various forms of building purposes. In the Congo-Zaire Basin for example, the Ngodingodi women in the Ituri forest used the local 'tilipi' leaf (*Meagaphrynuim Macrostataclyum)* to shingle the roof of their '*Mafika'* (kitchen shelter). In central Brazil, the Kuikuru living in the rainforest area use the native 'tafakin' *(Xylopia sp)* for lashings and wall posts. In San Alejandro in Brazil, the caboclos or Riberenos collect the leaves of 'Irapai' (*Lepidocaryum tesmanii)* to reroof house. The Matrytahuam also in Alejandro, Brazil use the trunk of 'huacrapona' palm (*Iriantea deltoids)* and 'Cashopoma' (*Sratea exharize)* for walls and floor. Other roofing wood species used here include: *Minquartia guianensis, Gualteria spp, G.microcarpa, Gnerium sagittatum* and *Heteropsis jenmanii* to tie the structure because nails are expensive. In Eastern Amazonia, Voucapoma Americana, the local 'huacarpin' is used for house post. In Cross River State, Nigeria, almost all the merchantable flora species are used for building construction. But the most commonly used ones are *Millethia excels, Khaya ivorensis celtis, Daniella orgea, fagara spp and Poga oleosa.* The destruction of these species have been so great in the area that most of them are beginning to go extinct. Okpiliya's (2004) study on the degradation of flora diversity in Boki revealed that there is high level of reduction in flora species richness owing to destruction by man. According to him, some of the flora species in low diversity owing principally to the utilization for construction purposes include *Afzelia spp, Dianiella ogea, Irvinga gabonensis, Pericopsis alata, Celtis, pterocarpus osun* etc. the source of worry in this case therefore is that the cost of having alternative for wood which may be rod is too high in the developing tropical rainforest region and the wood are not readily available due to destruction. This has made the building industry to suffer drastically in the face of extinction of these valuable flora species.

The end result is the call for conservation of these endemic flora species in order to guarantee continuous supply of wood from them. Most flora species are used as an aid to travelling. In Brazil, the 'Barnigud' (*Peltogyre paniculata*) and 'Jatoba' (*Hymenacea carbanil*) are used for making canoe. The mangrove is used in Cross River State and other riverine areas of Nigeria to make canoes and oars.

In Eastern Amazonia, *Tecomaviotacea* and *Bactrics gasipaces* are used for making bow and *Gnerium sagittatum* for arrow. They are beautiful plants that have a very strong elasticity. They are highly durable and can be bent to any shape. Some flora species are being reverenced in different parts of the tropics. In Indonesia for example, Banyan tree is seen to be sacred. This tree is located at the forest of Sanggi, Bali. Worshipers troop in here always to pay obeisance to the tree. Also, Okpiliya (2004) identified a tree in Borum, Boki locally called 'Nzob owum'. This tree is seen to be the oldest in the area which eventually earned it the nickname "elephantiasis tree". It is seen to harbor some deities and as such highly reverenced. People with ailments go there to pray for their healing.

Closely related to the above use of flora species is the fact that majority of the flora species in the tropical rainforest are used for cultural purposes. In Boki, Okpiliya (2004) equally noted the use of *Pterocarpus osun* for dyes. The dyes are derived from the root, bark and leaves of this tree. Here, dyes are used for decorations (tattooing and cicatrisation) during circumcisions locally called "etien". Also Ebony tree is being used to make masquerade for display during festive occasions. In Brazil, *Gneipa americanna* for piercing and decorating ear lobe. It is locally called 'arga' by the Kuikuru people inhabiting the jungle.

Through the Paleolithic and Neolithic age, human muscle was the major source of energy, but this was later replaced by wood. Firewood derived from flora species is the first type of fuel used by man and this scenario has come to stay with him over the ages. Indications in the tropical rainforest are that there is high pressure in the use of wood as sources of energy compared to other sources. For example, Okpiliya (2004) noted that about 80% of the people in Boki prefer fuelwood to other sources. He also identified ten flora species with excellent heating characteristics in the area, the best being *pterocarpus osun.* Others are *lovoa trichiliodes, Albizia lebbek, Pterocarpus mildbreadii, irvingia gabunensis, Khaya spp* among others. It is suffice to note that the steady increase in the cost of natural gas, petroleum, kerosene and even coal re-established the importance of wood for fuel, particularly for farmers and those communities located in or near the forest (Okpiliya, 2004). Also observations revealed that the cultural habits of the people inhabiting the jungle will continue to prolong the use of fuelwood to other sources of energy. This is because a greater percentage of these people relish roasted yams, cassava, plantain, peer and maize as the tropical rainforest is an agriculturally rich area. Given this background, there is therefore a high demand and pressure on flora species so that as observed by Okpiliya (2004), women in Boki now trek for reasonable distances in search for fuelwood. This is a major concern because apart from the degradation of these

flora species that have good heating qualities, the time used for other domestic chores by the rural women are now used in search of fuelwood.

Finally, it has been argued that generally due to the pressure that man has been placing on flora species for different purposes, there has arisen the need to be worried or concerned about their state of existence as most of flora species are very alluring and so tend to enrich our lives and cultural heritage

V. Conclusions

The tropical rainforest ecosystem is viewed not to be the only abode for great variety of beautiful plants, but also a place for people with diverse socio-cultural background. Very many people are found inhabiting this tropical rainforest and there is the tendency for an increased population growth in the years to come. The growing human population has many resource needs, most of which are derived from he utilization of the land. Vast tracts of natural forest land have been converted into farms and other uses to earn a living.

From the foregoing therefore, it seems factual that the tropical forest ecosystem is now being faced with the dilemma of how to preserve the beauty and treasure of the rich diversity of flora species for future generations, while encouraging economic expansion and undergoing rapid population growth. Unlike animals, plants cannot flee from a piece of land earmarked for development and often that piece of land contains the remaining habitat that is suited for a particular plant species (endemic plants). Despite great advances over the last century in our understanding, management and appreciation of these irreplaceable resources, there seems to be no headway. In sum, tropical rainforest derive value and concern not only as stronghold of diversity but also as repositories of mystery and the romance of the unknown.

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The "FARSC" is a dignified title which is accorded to a person's name viz. Dr. John E. Hall, Ph.D., FARSC or William Walldroff, M.S., FARSC.

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Note :

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- In case of "Difference of Opinion [if any]" among the Board members, our decision will be final and binding to everyone.

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1. General,

2. Ethical Guidelines,

3. Submission of Manuscripts,

4. Manuscript's Category,

5. Structure and Format of Manuscript,

6. After Acceptance.

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30. Think and then print: When you will go to print your paper, notice that tables are not be split, headings are not detached from their descriptions, and page sequence is maintained.

31. Adding unnecessary information: Do not add unnecessary information, like, I have used MS Excel to draw graph. Do not add irrelevant and inappropriate material. These all will create superfluous. Foreign terminology and phrases are not apropos. One should NEVER take a broad view. Analogy in script is like feathers on a snake. Not at all use a large word when a very small one would be sufficient. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Amplification is a billion times of inferior quality than sarcasm.

32. Never oversimplify everything: To add material in your research paper, never go for oversimplification. This will definitely irritate the evaluator. Be more or less specific. Also too, by no means, ever use rhythmic redundancies. Contractions aren't essential and shouldn't be there used. Comparisons are as terrible as clichés. Give up ampersands and abbreviations, and so on. Remove commas, that are, not necessary. Parenthetical words however should be together with this in commas. Understatement is all the time the complete best way to put onward earth-shaking thoughts. Give a detailed literary review.

33. Report concluded results: Use concluded results. From raw data, filter the results and then conclude your studies based on measurements and observations taken. Significant figures and appropriate number of decimal places should be used. Parenthetical remarks are prohibitive. Proofread carefully at final stage. In the end give outline to your arguments. Spot out perspectives of further study of this subject. Justify your conclusion by at the bottom of them with sufficient justifications and examples.

34. After conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print to the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects in your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form, which is presented in the guidelines using the template.
- Please note the criterion for grading the final paper by peer-reviewers.

Final Points:

A purpose of organizing a research paper is to let people to interpret your effort selectively. The journal requires the following sections, submitted in the order listed, each section to start on a new page.

The introduction will be compiled from reference matter and will reflect the design processes or outline of basis that direct you to make study. As you will carry out the process of study, the method and process section will be constructed as like that. The result segment will show related statistics in nearly sequential order and will direct the reviewers next to the similar intellectual paths throughout the data that you took to carry out your study. The discussion section will provide understanding of the data and projections as to the implication of the results. The use of good quality references all through the paper will give the effort trustworthiness by representing an alertness of prior workings.

Writing a research paper is not an easy job no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record keeping are the only means to make straightforward the progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear

· Adhere to recommended page limits

Mistakes to evade

- Insertion a title at the foot of a page with the subsequent text on the next page
- Separating a table/chart or figure - impound each figure/table to a single page
- Submitting a manuscript with pages out of sequence

In every sections of your document

· Use standard writing style including articles ("a", "the," etc.)

· Keep on paying attention on the research topic of the paper

· Use paragraphs to split each significant point (excluding for the abstract)

· Align the primary line of each section

· Present your points in sound order

· Use present tense to report well accepted

· Use past tense to describe specific results

· Shun familiar wording, don't address the reviewer directly, and don't use slang, slang language, or superlatives

· Shun use of extra pictures - include only those figures essential to presenting results

Title Page:

Choose a revealing title. It should be short. It should not have non-standard acronyms or abbreviations. It should not exceed two printed lines. It should include the name(s) and address (es) of all authors.

Abstract:

The summary should be two hundred words or less. It should briefly and clearly explain the key findings reported in the manuscript--must have precise statistics. It should not have abnormal acronyms or abbreviations. It should be logical in itself. Shun citing references at this point.

An abstract is a brief distinct paragraph summary of finished work or work in development. In a minute or less a reviewer can be taught the foundation behind the study, common approach to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Yet, use comprehensive sentences and do not let go readability for briefness. You can maintain it succinct by phrasing sentences so that they provide more than lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study, with the subsequent elements in any summary. Try to maintain the initial two items to no more than one ruling each.

- Reason of the study - theory, overall issue, purpose
- Fundamental goal
- To the point depiction of the research
- Consequences, including definite statistics - if the consequences are quantitative in nature, account quantitative data; results of any numerical analysis should be reported
- Significant conclusions or questions that track from the research(es)

Approach:

- Single section, and succinct
- As a outline of job done, it is always written in past tense
- A conceptual should situate on its own, and not submit to any other part of the paper such as a form or table
- Center on shortening results - bound background information to a verdict or two, if completely necessary
- What you account in an conceptual must be regular with what you reported in the manuscript
- Exact spelling, clearness of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else

Introduction:

The **Introduction** should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable to comprehend and calculate the purpose of your study without having to submit to other works. The basis for the study should be offered. Give most important references but shun difficult to make a comprehensive appraisal of the topic. In the introduction, describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will have no attention in your result. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here. Following approach can create a valuable beginning:

- Explain the value (significance) of the study
- Shield the model - why did you employ this particular system or method? What is its compensation? You strength remark on its appropriateness from a abstract point of vision as well as point out sensible reasons for using it.
- Present a justification. Status your particular theory (es) or aim(s), and describe the logic that led you to choose them.
- Very for a short time explain the tentative propose and how it skilled the declared objectives.

Approach:

- Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done.
- Sort out your thoughts; manufacture one key point with every section. If you make the four points listed above, you will need a least of four paragraphs.

- Present surroundings information only as desirable in order hold up a situation. The reviewer does not desire to read the whole thing you know about a topic.
- Shape the theory/purpose specifically - do not take a broad view.
- As always, give awareness to spelling, simplicity and correctness of sentences and phrases.

Procedures (Methods and Materials):

This part is supposed to be the easiest to carve if you have good skills. A sound written Procedures segment allows a capable scientist to replacement your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt for the least amount of information that would permit another capable scientist to spare your outcome but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section. When a technique is used that has been well described in another object, mention the specific item describing a way but draw the basic principle while stating the situation. The purpose is to text all particular resources and broad procedures, so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step by step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

- Explain materials individually only if the study is so complex that it saves liberty this way.
- Embrace particular materials, and any tools or provisions that are not frequently found in laboratories.
- Do not take in frequently found.
- If use of a definite type of tools.
- Materials may be reported in a part section or else they may be recognized along with your measures.

Methods:

- Report the method (not particulars of each process that engaged the same methodology)
- Describe the method entirely
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures
- Simplify - details how procedures were completed not how they were exclusively performed on a particular day.
- If well known procedures were used, account the procedure by name, possibly with reference, and that's all.

Approach:

- It is embarrassed or not possible to use vigorous voice when documenting methods with no using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result when script up the methods most authors use third person passive voice.
- Use standard style in this and in every other part of the paper - avoid familiar lists, and use full sentences.

What to keep away from

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings - save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part a entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Carry on to be to the point, by means of statistics and tables, if suitable, to present consequences most efficiently.You must obviously differentiate material that would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matter should not be submitted at all except requested by the instructor.

Content

- Sum up your conclusion in text and demonstrate them, if suitable, with figures and tables.
- In manuscript, explain each of your consequences, point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation an exacting study.
- Explain results of control experiments and comprise remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or in manuscript form.

What to stay away from

- Do not discuss or infer your outcome, report surroundings information, or try to explain anything.
- Not at all, take in raw data or intermediate calculations in a research manuscript.
- Do not present the similar data more than once.
- Manuscript should complement any figures or tables, not duplicate the identical information.
- Never confuse figures with tables - there is a difference.

Approach

- As forever, use past tense when you submit to your results, and put the whole thing in a reasonable order.
- Put figures and tables, appropriately numbered, in order at the end of the report
- If you desire, you may place your figures and tables properly within the text of your results part.

Figures and tables

- If you put figures and tables at the end of the details, make certain that they are visibly distinguished from any attach appendix materials, such as raw facts
- Despite of position, each figure must be numbered one after the other and complete with subtitle
- In spite of position, each table must be titled, numbered one after the other and complete with heading
- All figure and table must be adequately complete that it could situate on its own, divide from text

Discussion:

The Discussion is expected the trickiest segment to write and describe. A lot of papers submitted for journal are discarded based on problems with the Discussion. There is no head of state for how long a argument should be. Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implication of the study. The purpose here is to offer an understanding of your results and hold up for all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of result should be visibly described. Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved with prospect, and let it drop at that.

- Make a decision if each premise is supported, discarded, or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."
- Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work
- You may propose future guidelines, such as how the experiment might be personalized to accomplish a new idea.
- Give details all of your remarks as much as possible, focus on mechanisms.
- Make a decision if the tentative design sufficiently addressed the theory, and whether or not it was correctly restricted.
- Try to present substitute explanations if sensible alternatives be present.
- One research will not counter an overall question, so maintain the large picture in mind, where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

- When you refer to information, differentiate data generated by your own studies from available information
- Submit to work done by specific persons (including you) in past tense.
- Submit to generally acknowledged facts and main beliefs in present tense.

Administration Rules Listed Before Submitting Your Research Paper to Global Journals Inc. (US)

Please carefully note down following rules and regulation before submitting your Research Paper to Global Journals Inc. (US):

Segment Draft and Final Research Paper: You have to strictly follow the template of research paper. If it is not done your paper may get rejected.

- The **major constraint** is that you must independently make all content, tables, graphs, and facts that are offered in the paper. You must write each part of the paper wholly on your own. The Peer-reviewers need to identify your own perceptive of the concepts in your own terms. NEVER extract straight from any foundation, and never rephrase someone else's analysis.

- Do not give permission to anyone else to "PROOFREAD" your manuscript.

- Methods to avoid Plagiarism is applied by us on every paper, if found guilty, you will be blacklisted by all of our collaborated research groups, your institution will be informed for this and strict legal actions will be taken immediately.)
- To guard yourself and others from possible illegal use please do not permit anyone right to use to your paper and files.

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Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

INDEX

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