

PERSPECTIVES IN REGIONAL DEVELOPMENT IN NIGERIA.

A Festschrift In Honour of PROFESSOR ADEBISI FUNSHO ADEDAYO

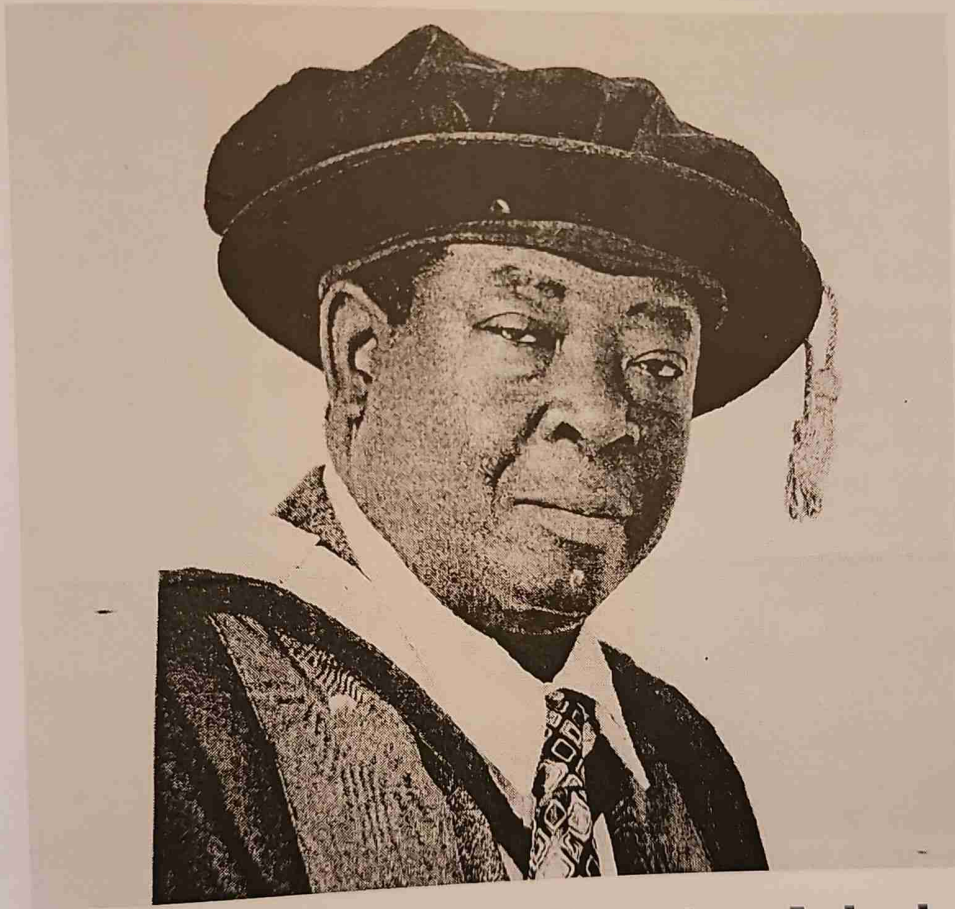
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Professor Adebisi Funsho Adedayo
B.A. (Hons) ABU, Zaria; M.Sc. (London), Ph.D. (Ilorin)

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CHAPTER SEVEN

Impact of Climate Variability on the Price of Staple Food in Major Markets in Ilorin, Kwara State, Nigeria.

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Abstract

The climate of Nigeria varies from tropical rainforest to tropical savannah to the mountain climate. The rainfall is highly variable in these spaces. Different weather conditions influence crop productivity which in turn affect prices of food. The aim of the study is to examine the effect of climate variability on the prices of staple foods in Ilorin, Kwara State. Data on rainfall minimum temperature and maximum temperature were gotten from the archives record of Nigerian Meteorological agency (NIMET) Ilorin Airport, while data on the prices of staple foods was gotten from the administration of 290 copies of questionnaires in some selected markets in the area. The data was analysed using mean, standard deviation coefficient of variation, line graph, tables, regression and correlation. The result of the study revealed that the mean rainfall recorded during the period was 1387.12mm, mean minimum temperature was 21.5°C while the mean maximum temperature was 32.1°C. Also the mean price of maize was ₦8,770, yam was ₦7,709, cassava ₦8,320 and rice was ₦12,091. The result also showed that maize is directly related to rainfall, minimum temperature and maximum temperature, Yam is directly related to minimum temperature and maximum temperature but inversely related to rainfall; cassava is directly related to rainfall, minimum temperature, and maximum temperature while rice is directly related to minimum temperature and maximum temperature but inversely related to rainfall. It was concluded that climatic variability has a direct relationship with the prices of staple foods. The study recommended that Government should support farmers by subsidizing the cost of fertilizers and providing resistant varieties of crops. This will boost the yield of crops thus leading to abundance of food and forcing down the prices of food in the area.

Key words: Climate Variability, Price, Staple food, Markets, Metropolis.

Introduction

The agricultural yield and productivity of an area is highly determined by its climate. It is fundamental that climate affects virtually all aspects of crop production (Adeniyi, 2013). Anju *et al.* (2014) explains that climate variability has had significant impacts on the agricultural sector, especially during the period of the last 40 years. Due to the quest for increased agricultural yield, climate variability has become extensively significant to academic researchers because climate is known to determine the quality and quantity of crop productivity. Olanrewaju (2012) declares that many of

the problems facing agricultural products are climate-related.

Staple foods are foods that are routinely taken and constitute a dominant portion of a standard diet. Staple food includes cereals, tubers, and fruits. Olarenwaju (2015) states that the leading staple crops produced in Ilorin include cassava tuber, yam, cocoyam, sweet potato, maize, rice, tomato, okra, groundnut, yam, maize and cassava, Adeyanju (2003) asserts that the rising temperatures of Ilorin has reduced the crop production in the long term especially arising from reduction in the number of reliable crop growing days while changes in the precipitation pattern

increased short term crop failure and long-term production declines. Ayanlade (2012) posited that staple foods are generally sensitive to environmental extremes, and thus high temperature is the major cause of low yields and will be further magnified by fluctuation of climate. He also noted that increasing temperature in Ilorin has reduced the availability of irrigation water, flooding and salinity which are the major factors enhancing the sustainability and productivity of staple foods in Ilorin. Climatic variability, especially erratic rainfall pattern and unpredictable high temperature spells in some months will reduce the productivity of crops. Ayanlade et al. (2012) further explains that high temperature stress disrupts the biochemical reactions fundamental for normal cell function in plants. It primarily affects the photosynthetic function of higher plants. In light of the above, this study seeks to examine the impact of climatic variability on the prices of staple foods in selected markets of Ilorin, Kwara State. This is with a view to establish the relationship between climate variability and the prices of staple foods. The specific objectives are to examine the trend of the prices of staple foods and climate variability of a period of ten years (2008-2018) so as to assess the relationship and effect between the prices of staple foods and climate variability.

Ilorin is the capital of Kwara State, Nigeria, situated above the equator between the latitude $8^{\circ}30'N$ and $8^{\circ}50'N$ and longitude $4^{\circ}20'E$ and $4^{\circ}35'E$ (Tunde, 2011). The climate of the study area is characterized by both the wet and dry season, for about six months each. The raining season begins at about the end of March and lasts till the end of October, while the dry season begins in November and ends early March. The total annual rainfall in the area ranges between 1000 millimeter and 1500 millimeter. Ilorin has grown tremendously in terms of physical and population size, the population having increased from about 570,000 in 1991 to 766,000 in 2006 with the growth rate of 2.6% (NPC, 2006). Over the years Ilorin has experienced spatial expansion due to rapid urbanization which has greatly influenced the growth of the state. There are basically four markets in Ilorin: Oja-Oba, Ipata, Mandate and Oja tuntun (Kwara State Diary, 2001). Oja-Oba is arguably the largest staple food market in Ilorin. Markets in Ilorin offer majorly tuber crops, fruits, vegetables and grains. Markets in Ilorin enjoy a congregation of different tribes particularly the Hausa, Fulani and the Yoruba (Kwara State Diary, 2013). See Fig. 1 for the map of the study area.

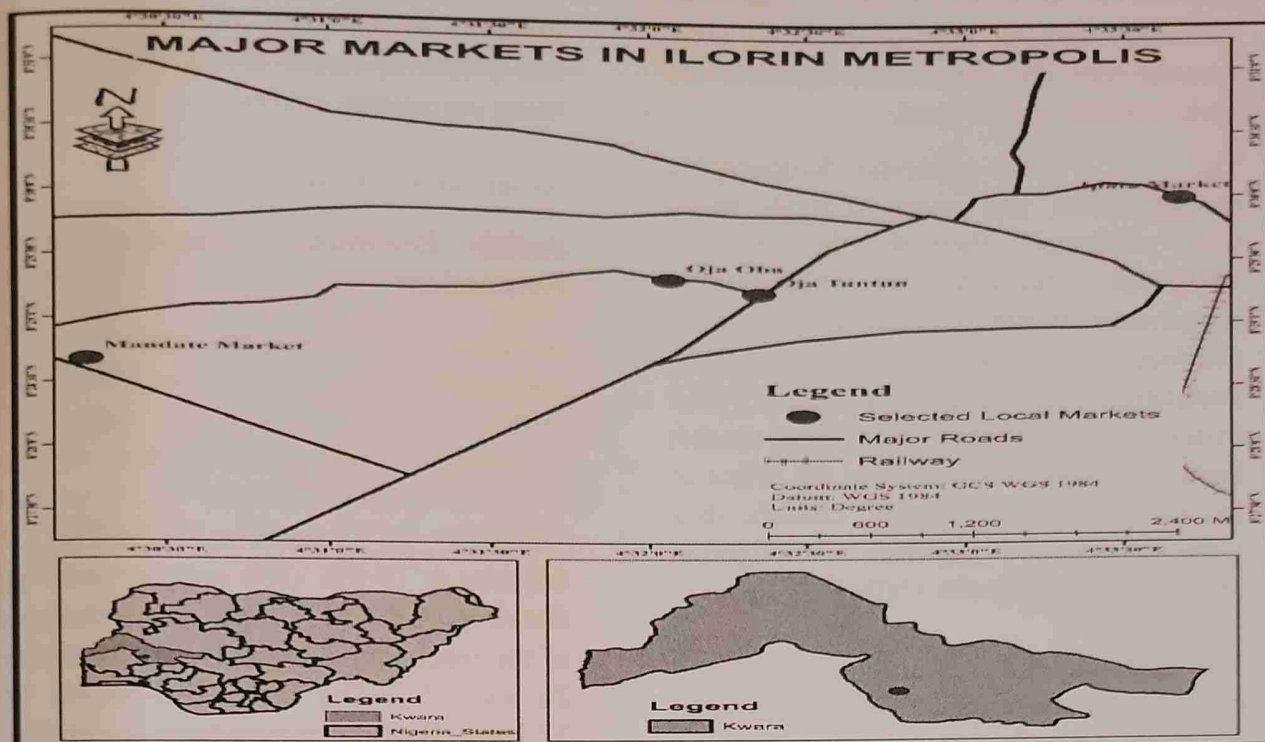


Figure 1. Major market in Ilorin Metropolis

The suitability of the environment to provide all life support systems and the materials for fulfilling all developmental aspirations of man and animal is dependent on the stability of the climate. The effect of constant changes on climate is posing threat to food availability and affordability in Nigeria. The Food and Agricultural Organization (FAO, 2008) reported that 48 countries, including Nigeria are likely to face food shortage in future. According to the National Population Commission (NPC, 2012), the population of Nigeria has risen from 150 million in 2006 to 168million in 2012. The implication of this, according to (FAO, 2008), is that there will be further pressure on available food resources.

Fluctuations in food prices may not necessarily be rapid, but can create pressure on wages, reduce people's real income, increase inflation, and decrease the demand for non-agricultural products. On the other hand, price decline could lead to a misleading allocation of inputs in the agriculture and agro-allied sectors, which could seriously damage production ability and international competitiveness of the

agricultural industry. Grega (2002) stated that if agricultural product prices were too low, the situation of the agricultural sector could be deteriorating by the consequent outflow of qualified labour force to other sectors of the economy and lead to the migration of rural population to the urban areas, therefore resulting in the depopulation of the rural areas. Over 45% (750,000 metric tonnes) of staple food produced in Nigeria is estimated as annual loss due to poor food supply chain management, price instability resulting from seasonal fluctuation in production and the supply preference of farmers and middlemen to urban market. The study seeks to answer the following questions: what is the trend of climatic elements and prices of food in Ilorin? What is the relationship between staple foods and climatic element?

Material and Methods

The study employs both primary and secondary sources of data. The primary sources are geographic coordinates of the selected major markets, socio-economic/demographic characteristics and

information on prices of staple foods. The secondary data are map of the study area, climatic data and population figure of the traders selling staple food.

The socio-economic/demographic characteristics, and prices of staple foods were collected through the use of structured questionnaire. Geographic coordinates of the selected markets were obtained through the use of handheld GPS. Population figures of the staple food traders was collected from the market head. Map was obtained from the office of the surveyor general, Ilorin, climatic data were sourced from Nigerian Meteorological Agency (NIMET), Ilorin.

The data for this research are analyzed using both descriptive and inferential statistical methods.

Descriptive statistical tool such as tables and percentages were used to summarize the data obtained on the prices of staple foods. Inferential statistic was used to analyse the effect and relationship between climate variability and prices of staple foods. Tables and graphs were employed to examine the prices of staple foods in Ilorin from 2008-2018. To identify the trend of climatic variables and prices of staple foods in the year under study, line graph was employed. The effect of climatic variability on the prices of staple foods in major markets in Ilorin was

analyzed using regression analysis. The relationship between climate variability and prices of staple foods was examined using correlation analysis.

Result and Discussion

Social Economic Characteristic of Respondent

As shown in table 1, the majority of the respondents are females which is 171 (59%) while 119 (41) are males. The percentage of respondents below 18 years is at 7.2% (21), between 18-25 years is 7.2% (21), 26-35 years is 51.7%(120), 36-46years is 19.0% (55) and, 46years and above is 14.8% (43). This shows that most of the respondents are between the ages of 26 and 35. The table also shows that 32.1% (93) of the respondents are married, 14.5% (42) are single, 29.0% (84) are widows/widowers, and 24.5% (71) are divorced. This implies that majority of the respondents are married while a few are single. The income characteristics of the respondents show that 24.8%(72) of the respondents earn within 10,000-20,000, 26.6% (77) earn within 20,000-30,000, 24.1% (70) earn within 30,000-40,000 and 24.5% (71) earn 50,000 and above monthly. This shows that the highest percentage of respondents earn within 20,000-30,000 monthly.

Table 1: Social Economic Characteristic of Respondent

Socio Economic Characteristics	Frequency	Percentage
Sex		
Male	119	41
Female	171	59
Total	290	100
Age of Respondents		
Below 18years	21	7.2
18-25years	21	7.2
26-35years	120	51.7
36-46	55	19.0
Above 46years	43	14.8
Total	290	100
Marital Status		
Single	42	14.5
Married	93	32.1
Widow/widower	84	29.0
Divorced	71	24.5
Total	290	100
Education		
Have you had formal education?		
Yes	171	59.0
No	119	41.0
Total	290	100
Highest level of education?		
Quranic	122	42.1
Primary	70	24.1
Secondary	56	19.3
Tertiary	42	14.5
Total	290	100
Income		
N10,000- N20,000	72	24.8
N20,001- N30,000	77	26.6
N30,000- N40,000	70	24.1
Above 50,000	71	24.5
Total	290	100

In addition, the table shows that 59% (171) of the respondents got formal education while 41% (119) didn't get any formal education. This implies that literacy level in the study area is low. It can be deduced from this data that 42.1% (122) of the respondents' highest level of education is

Quranic School, 24.1% (70) reached primary school, 19.3%(56) reached secondary school and 14.5% (42) reached tertiary level. This implies that majority of the respondents' highest level of education is Quranic School.

Table 2: Descriptive Statistics of Climatic Variables

Variables	Rainfall	Minimum Temp	Maximum Temp
Mean	1387.12	21.5	32.1
STD	190.1	0.271	0.328
CV%	13.7	1.26	1.02

Source: Author's Computation (2019)

As depicted in Table 2, the mean minimum temperature during the period of this study was 21.5°C with a standard deviation of 0.271 and a coefficient of variation of 1.26%, which implies that there were little fluctuations in the minimum temperature recorded in the area during the period of this study. Furthermore, the mean maximum temperature recorded in the area during the period of study was 32.1°C with a standard deviation of 0.328 and a coefficient of variation of 1.02%; this implies that there was little variation in minimum temperature in the area during the period of study.

Descriptive Characteristics of Staple Food Prices

The descriptive characteristic of staple food prices is presented in Table 3. The mean price of maize during the period under study was ₦8770 with a standard deviation of 2432.7 and a coefficient of variation of 27.7% which implies that the price of maize during the period under study was homogenous. Furthermore, the mean price of yam was ₦7709 during the period under study with a standard deviation of 2269.5 and a coefficient of variation of 29.4%; this implies that the price of yam during the period of study was homogenous.

Table : Descriptive Characteristics of Staple Food Prices

Variables	Maize	Yam	Cassava	Rice
Mean	8770	7709	8320	12091
STD	2432.7	2269.5	1735.9	1044.4
CV%	27.7	29.4	20.8	8.6

Source: Author's Computation (2019)

As depicted in Table 3, the mean price of cassava during the period of study was ₦8,320 with a standard deviation of 1735.9 and a coefficient of variation of 20.8% which implies that the price of cassava for the period under study was homogenous. Furthermore, the mean price of rice was ₦ 12,091 with a standard deviation of 1044.4 and a coefficient of variation of 8.6%; this reveals that the price of rice for the period of study was homogeneous.

Effect of Climatic Variable on Price of Food

Table 4 presents the results of the effect of climatic variables on the price of food in the area during the period of study. The regression coefficient ($R^2=0.074$) shows that 7.4% of the price of maize is

accounted for by the examined climatic variables while 92.6% of the price of maize is accounted for by other variables such as transport cost, cost of production, location of store of seller, rent paid on store among others. The regression coefficient ($R^2=0.213$) shows that 21.3% of the price of yam is accounted for by the examined climatic variables while 78.7% is accounted for by other variables. This corroborates Mbithi (2000), who using time series data for the period of 2007 to 2010, analyzed how maize and cassava production are influenced by output price, average annual rainfall, price of fertilizer before and after liberalization. Statistical analysis showed that with liberalization of input and output markets, maize production and yield increased. Maize and cassava production were found to be price

inelastic while average annual rainfall was found to influence cassava and maize

performance.

Table 4: Model Summary for the Effect of Climatic Variables and Price of Food

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
Maize	0.272	0.074	-0.323	2798.20688
Yam	0.462	0.213	-0.124	2405.74634
Cassava	0.422	0.178	-0.174	1880.91957
Rice	0.347	0.120	-0.257	1170.81661

Source: Author's Computation (2019)

The regression coefficient ($R^2=0.178$) shows that 17.8% of the price of cassava is accounted for by the examined climatic variables while 82.2% of the price of cassava is accounted for by other variables. Furthermore, the regression coefficient ($R^2=0.120$) shows that 12% of the price of rice is accounted for by the examined climatic variables while 88% of the price of rice is accounted for by other variables.

Table 4 presents the estimated model between climatic variables and prices of staple foods in the area during the period under study. It reveals that for every 1% decrease in rainfall, minimum temperature and maximum temperature, there are 2.063, 416.168 and 2370.067 decreases in the price of maize.

Estimated model for maize is given as

$$\text{Maize} = -61267.371 + 2.063_{\text{rainfall}} - 416.168_{\text{minimum temperature}} + 2370.06_{\text{maximum temperature}}$$

As indicated in Table 4, for every 1% decrease in rainfall, minimum temperature and maximum temperature, there are -1.418, 3191.137 and 831.217 decreases in the price of yam.

Estimated model for yam is given as

$$\text{Yam} = -85692.586 - 1.418_{\text{rainfall}} + 3191.137_{\text{minimum temperature}} + 831.219_{\text{maximum temperature}}$$

As shown in Table 4, for every 1% decrease in rainfall, minimum temperature and maximum temperature, there are 5.071, -2648.931 and 2621.876 decreases in the price of cassava.

Estimated model for cassava is given as

$$\text{Cassava} = -25937.304 + 5.071_{\text{rainfall}} - 2648.931_{\text{minimum temperature}} + 2621.876_{\text{maximum temperature}}$$

As depicted in Table 4 for every 1% decrease in rainfall, minimum temperature and maximum temperature, there are -1.035, 1534.430 and -210.592 decreases in the price of rice.

Estimated model for rice is given as

$$\text{Cassava} = -12727.373 - 1.035_{\text{rainfall}} + 1534.430_{\text{minimum temperature}} - 210.592_{\text{maximum temperature}}$$

This finding confirms the study of Agboola & Ojeleye (2007), which used a case study research design, to examine the impact of change in climatic variables on food crop supply using bivariate Chi-square and ANOVA in Ibadan. The study revealed that farmers have observed changes in climate condition over the last two to three decades. Further, farmers observed that food crop yield had been affected by rise in temperatures, reduction in rainfall and a drop in relative humidity. However, using chi-square and correlation analysis the study found that climate fluctuation had no significant effect on crop yield.

Relationship between Climatic Variables and Price of Food

Table 5 presents the relationship between climatic variables and price of food during the period of study. The result showed that maize (0.039) and cassava (0.277) are

directly related to rainfall. This implied that an increase in rainfall will lead to a corresponding increase in the price of maize and cassava. During periods of high rainfall, the prices of maize and cassava increase because excessive rain reduced the yield of these crops and low yield will force the prices of the available produce up. This finding is supported by Eregha et al., (2014) which examined the impact of climate change on crop production in Nigeria using an Error Correction Model. The study assessed the effect of temperature, rainfall and carbon emission on production of maize, rice, beans, cassava, cocoa, groundnuts, millet, potatoes, sorghum and yams. The study found that temperature had a negative impact on production of maize, rice, beans, cocoa and sorghum. However, temperature had a positive impact on the production of

groundnuts. Rainfall was found to have a positive effect on the production of beans, cocoa, yam, cassava and rice but a negative effect on groundnut production. Furthermore, the result showed that yam (-0.060) and rice (-0.061) are inversely related to rainfall. This implies that an increase in rainfall will lead to a decrease in the prices of these produce. During periods of rains there is abundance of yam and rice thus forcing the prices to reduce in the market. Lee *et al* (2012), support this finding that high temperature particularly in summer increases agricultural production. Even though the dynamics of how temperature may lead to crop increase is not clear, it is quite clear that an increase in rainfall may lead to an increase in yield especially with crops that need great amounts of rainfall like rice.

Table 5: Relationship between climatic variables and price of food

Variables	Rainfall	Min Temp	Max Temp
Maize	0.039	0.181	0.238
Yam	-0.060	0.420	0.382
Cassava	0.277	0.018	0.065
Rice	-0.061	0.311	0.230

Source: Author's Computation (2019)

The result in Table 6 showed that maize (0.181), yam (0.420), cassava (0.018) and rice (0.311) are directly related to minimum temperature. This implies that an increase in minimum temperature will lead to an increase in the prices of these food produce. This is in support of the result of Sowunmi & Akinola (2010) which examined the effect of climate variability on maize production in Nigeria. The study employed a two-way ANOVA and CV to analyze the dynamic link between changes in climate variables and agronomic parameters for maize production. The study identified seven ecological zones and data for the period 1980-2002. The results showed that with availability of sufficient water, maize can be grown in most parts of Nigeria, throughout the year with insignificant temperature variation. The study showed that water is a critical input in maize production. Furthermore, the result showed that maize (0.238), yam (0.382), cassava (0.065) and rice (0.230) are directly related to maximum temperature. This implies that an increase in maximum temperature will lead to an increase in the prices of these produce. Odhiambo (2000) analyzed the response of traders to food prices in Osun State, using Fisher lag scheme and inverted V-lag distribution models. The study found farmers' price expectation to be the major factor influencing coffee supply. In a similar study, Adesanmi (2009) estimated the response of small scale retailer to real producer prices using Nerlove Partial Adjustment model and Error Correction Model. The study incorporated amount of rainfall and number of wet days as regressors. Annual average rainfall had negative influence on price of food.

Conclusion

The study assessed the impact of climate variability on the prices of staple foods in major markets in Ilorin metropolis. The results obtained from the regression and correlation statistics reveal that climatic

variables have high significance on the prices of staple foods during the years under study. In other words, the result implies that, there are variation in climatic parameters within the years, which have considerable impact on the selected staple foods and the degree of the impact varies for different staple foods. For instance, the price of maize is more vulnerable to weather variability than any other staple food examined.

It can therefore be concluded that increase in rainfall, minimum temperature and maximum temperature recorded have influence on the prices of staple foods in the Ilorin metropolis causing it to increase over time. It could also be concluded that climatic variability has a direct relationship with the prices of staple foods. However, it should be noted that variation in food prices could also be as a result of other factors.

Recommendations and Policy Measures

Trees should be planted in various parts of the study area; this will help in the absorption of excess heat energy thus controlling rising temperature that could affect the yield of crops negatively. Government should support farmers by subsidizing the cost of fertilizers and providing resistant varieties of crops. This will boost the yield of crops thus leading to abundance of food and forcing down the prices of food in the area. Regular monitoring of the prevailing weather conditions so as to adopt the appropriate farming practice at different weather condition should be practiced.

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