TRENDS ANALYSIS OF AGRICULTURAL PRODUCTIVITY IN KWARA STATE, NIGERIA.

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Abstract

This study examines the trend analysis of agricultural productivity in Kwara State. Agricultural Agricultural Development Project (KWADP), Ilorin for a period of twenty two years (1992-2013). Descriptive statistics, mean, standard deviation and co-efficient of variation were used in data analysis.Standardized Anomaly Index was used to analyze fluctuation in crop yields. Semi-average method was used in the trend analysis of crop yield. The result of the descriptive statistics shows that production of sorghum was heterogeneous. The result of the Standardized Anomaly Index (SAI)also revealed that the crop yields fluctuated around the long –term mean. Annual sorghum and rice yields in 1999 to 2002 vary positively while maize and yam in 1995 to 2002 and 1997 to 2000 respectively varies negatively. 59.1% of the cassava yields fall below the long term mean. The result of the semi-average method shows that all the identified crops exhibit an upward trend. This implies that production of these crops will keep on increasing. The study therefore, suggests that both the State government and private organizations should encourage modern agricultural techniques like application of fertilizer and pesticides to sustain the increasing pattern of crop productivity in the State.

Key words: Trend, Agricultural Productivity, Crop yield, Fluctuations

1.   Introduction

Agriculture is of great importance for people in developing countries. According to Mozumdar, (2012) the livelihood of a major proportion of population in the developing nations is directly or indirectly connected with agriculture. EEG, (2011) also asserts thatabout 75% of all world poor people live in rural areas and 86% of them work in agricultural sector for their livelihood.Agriculture is the economic mainstay of most of households in Nigeria (Udoh, 2000)

and one of the important sectors in Nigeria economy.It provides staple food and employment for most of the people in the country. It also contributes to the gross domestic product (GDP) of the nation. According to Nwafor et al., (2011) agriculture has a critical role to play in poverty reduction in Nigeria because over 40% of the GDP comes from the sector and it employs about 60% of the working population.An increase in agricultural productivity brings about growth in agricultural sector especially in developing countries where agriculture employs large percentage of the population.Increase in farm output brings about increase in food supply and income of the farmers which eventually leads to reduce in poverty level and economic development.

Agricultural productivity is the measurement of the quantity of agricultural outputproduced for a given quantity of input (Mozumdar, 2012). There are different ways and reasons for measuring agricultural productivity. According to Wiebe (2003), yield or land productivity is commonly used to measure the success of new technology and evaluate the amount of land required to meet the future demands of food while labour productivity is used to measure the incomes and wellbeing of people involved in agriculture.

The levels of agricultural productivity inSub-Saharan Africa are far below that of other areas in the world, and well below thatwhich is needed for food security and poverty reduction(World Bank, 2007).However, the rate ofagricultural productivity growth since the early 2000s has been quite encouraging in some Africancountries (Kibaara, et. al, 2009).According to FAO (2009a) the growth of the yield of major food grains throughout the world is about 1% per year. For the developing countries, about 80% increase in food production will need to come from the increase in yields as well as cropping intensity while the remaining 20% will be obtained from the extension of arable land (FAO, 2009c).

Several factors affect agricultural productivity. Some of these factors include climate change, soil fertility and changes in farming techniques.Agriculture production in Nigeria depends mainly on climate. Increase or decrease in rainfall, temperature and other climatic parameters can affect crop yields. Generally, changes in climatic elements affect crop productivity. Climate is one of the major factors that determine the trend of agricultural productivity of an area. According to Adeniyi, (2013), it is so fundamental that it affects virtually all aspects of crop production. The type of crop grown, time of planting and harvesting of crops in an area are climate determined. Variations in climatic elements affect crop

productivity.According to Ziska, et. al. (2016) changes in the occurrence and severity of droughts and floods could pose challenges for farmers and threaten food safety.Furthermore, soil is also an important factor in agriculture productivity. Soil is a medium through which plant growth. According to Hatfield, (2006) the capability of a soil to produce crop yield depends on its fertility. Therefore, variations in the fertility of soil in an area or over a period of time will cause variations in the agricultural productivity.

However, this paper focuses on trend analysis of agricultural productivity with the view of determining whether there is an increase or decrease in productivity of common agricultural crops in terms of yield per hectare of land. This becomes imperative because of the present drive by the Government at all levels to diversify the nation's economy by engaging agricultural sector. Therefore, in order to know the kind of measure to put in place, there is need to ascertain the current level of agricultural productivity in the countries. It is against this background that this paper is being put forward to investigate the trend of agricultural productivity in Kwara State.

2.   Case Study Area

The study area is Kwara State. It is located on longitude 2^0 6^1E and $5^0 2^1$E and latitude $7^0 30^1$N and $9^0 40^1$N. Kwara State shares boundary with Republic of Benin and with five states in Nigeria. In the North it is bounded by Niger State, in the South by Oyo, Osun and Ekiti States, and in the East by Kogi State. Kwara state is referred to as the "gateway" between the Northern and the Southern part of Nigeria.In term of political location, Kwara State is located in North Central Zone of Nigeria. It comprises of sixteen local government areas. Yoruba, Fulani, Bariba and Nupe are the major ethnic groups in the State. According to Nigeria Galleria, (2015) Kwara State occupies 36,825 square kilometers. In term of population, according to 2006 population census the population of Kwara state was 2.37 million (NPC, 2006). Figure 1 shows the map of Kwara State.

The climate of Kwara State is characterized by two major seasons. These are wet and dry seasons. The rainy season begins towards the end of April and last till October while the dry season begins in November and end in April. The temperature of the state ranges from 33^0C to 35^0C from November to January while from February to April it ranges from 34^0C to 37^0C. The

total annual rainfall ranges from 990.3mm to 1318mm. the rainfall exhibits double maximal pattern. Relative humidity ranges from 75% to 88% from May to October and 35% to 80% during the dry season.

The geology of the area consists of pre-Cambrian basement complex rock. The soil in the area especially in Ilorin the State headquarters supports the growth of cereal crops (Adeniyi, 2013) and vegetables. The dominant vegetation in the State is derived savanna. Grasses in the State includes spear grass, elephant grass and goat weeds while the trees includes acacia, shear butter and locust beans trees.

Majority of the people in the State are farmers. The common food crops grown in the State mainly for domestic consumption includes Maize, rice, Sorghum, Millet, Beans, Yam, Cassava, Guinea-corn and Vegetables.
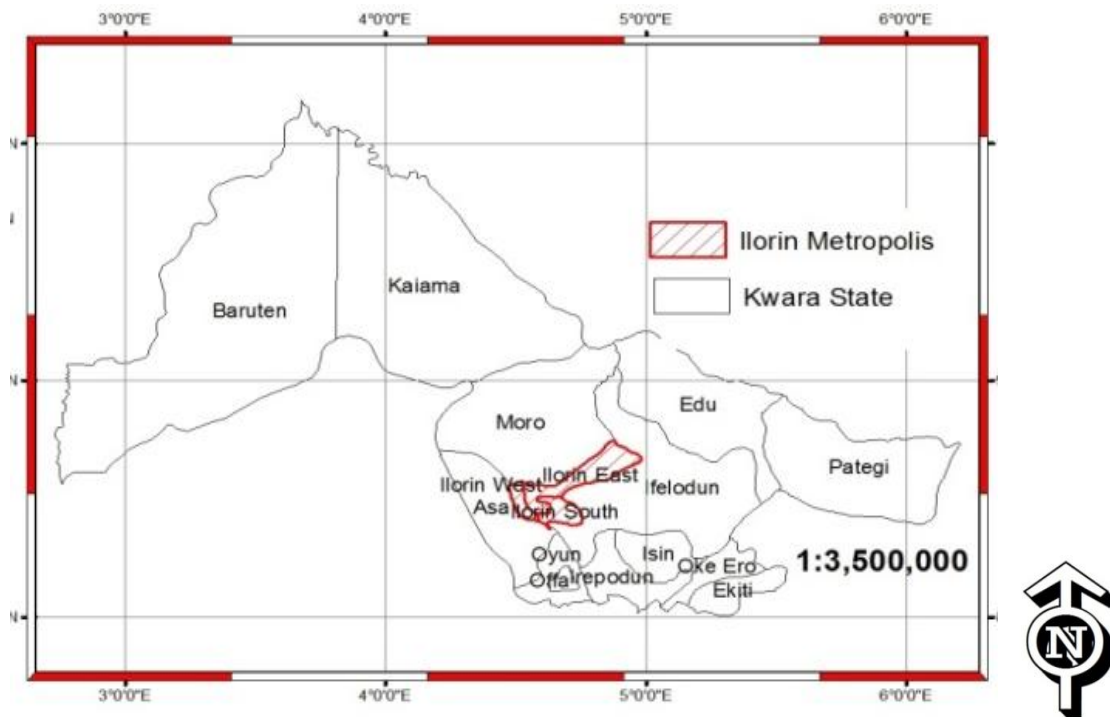
Figure 1: Map of Kwara State showing the LGA and the State Capital

3. Material and Method

Agricultural productivity is the measurement of the ratio of agricultural output to inputs. There are two major ways of measuring agricultural productivity. These are partial measures of productivity (PMP) and total factor productivity. While partial measures productivity compares agricultural output to input (for example yield per hectare of land), total factor productivity compares an index of agricultural inputs to an index of outputs. According to Reddy, (2013) the most commonly used term for representing agricultural productivity is the average yield per hectare of land. Therefore,for this study, agricultural data on maize, sorghum, rice, millet, yam and cassava yields were collected from Kwara Sate Agricultural Development Project (KWADP), Ilorin for a period of twenty two years (1992-2013). Mean, standard deviation and co-efficient of variation were used in the descriptive characteristics of crop yields. Semi- average method was used in the trend analysis of crop yield. This method was adopted becauseit is objective than fitting a line by eye to the plotted series (Ayoade, 2008) and the set of agricultural data is even (22years). In addition, Standardized Anomaly Index (SAI) was used to examine the changes in the values of crop yields over the period of 1992 -2013. The SAI of each climatic parameter was calculated for individual station. The Standardized Anomaly Index was calculated using the following equation:

$$SAI = \frac{X_i - \bar{X}}{S.D}$$

Where:

X_i = annual total of crop yield, $\bar{X}$ = mean value of crop yield for the period of study

S.D= standard deviation from the mean value of crop yield for the period of study.

4. Discussion of Results

Table 1 shows the results of the descriptive analysis of crops production in Kwara State (1992-2013). From the table, cassava has the highest mean per yield (13.38) followed by yam (12.25) while maize has the lowest mean per yield (1.33). This implies that from 1992 to 2013 cassava has the highest yield value. This suggests that production of cassava is relatively high in the state compare with other identified crops. The highest standard deviation which shows the measure of the dispersion of the crop value from its mean was also recorded in cassava (2.78). The implication is that values of cassava production within the years under review were relatively more spread apart from the mean than the values of other crops. The co-efficient of variation

which measures the relative variability between crop yields revealed that sorghum was heterogeneous. This is because a value of the co-efficient of variation was greater than 33%. This implies that production of sorghum from 1991 to 2013 differs significantly. These deviations could be as a result of climatic or other non-climatic factors like edaphic factors.

Table 1: Descriptive Analysis of Crop Productivity (1992-2013)

Crop	Mean (Yield)	Standard Deviation	Co-efficient of Variation
Maize	1.33	0.19	14.29
Sorghum	1.52	0.55	36.18
Rice	2.34	0.69	29.49
Millet	1.48	0.40	27.02
Yam	12.25	1.00	8.16
Cassava	13.38	2.78	20.78

Source: Author's Computation, 2017

Figures 2 (a-f) shows the fluctuations of crop yields in Kwara State for the period of 22 years (1992-2013). The annual crop yields fluctuated around the long - term mean. The figure revealed that annual sorghum and rice yields fall below the long –term mean in the years between 1992 to 1998. Millet and cassava fall below the long – term mean from 1992 to 1999 and 1992 to 2005 respectively. On the other hand, sorghum and rice fall above the long term –mean between the years 1999 to 2002 while millet and cassava fall above long –term mean between the years 1998 to 2001 and 2006 to 2013 respectively. However, maize and yam fall below the long term- mean between the years 1995 to 2002 and 1997 to 2000 respectively. The years with maize and yam yields above long-term mean were 2007 to 2013 and 2008 to 2013 respectively.This implies that the annual sorghum and riceyields in 1999 to 2002 vary positively while maize and yam in 1995 to 2002 and 1997 to 2000 respectively varies negatively. 59.1% of cassava yields fall below the long- term mean.
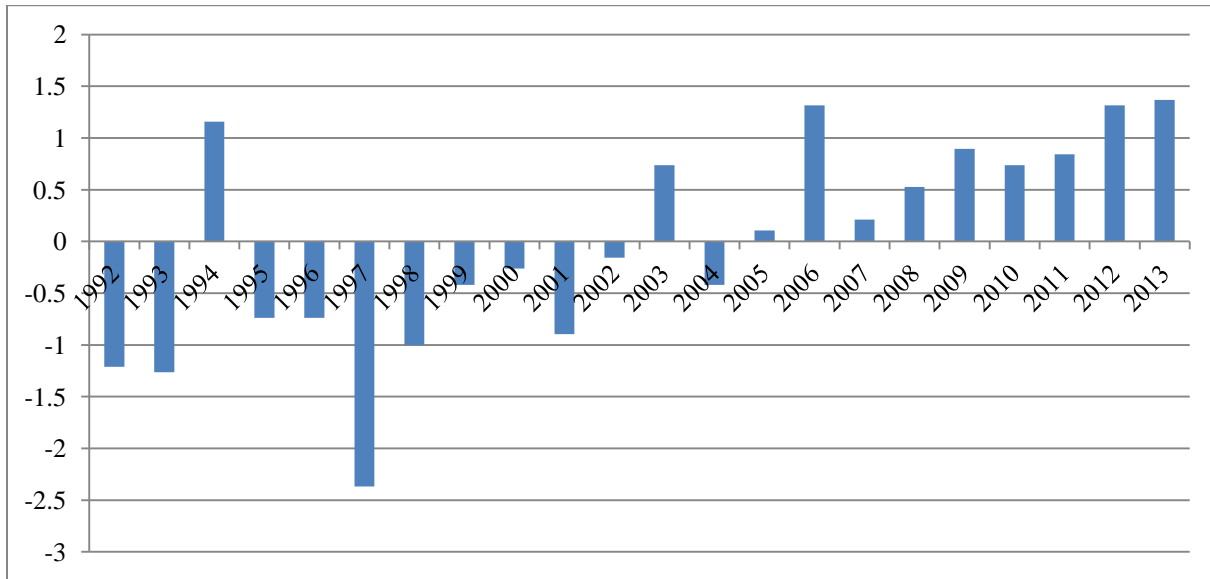
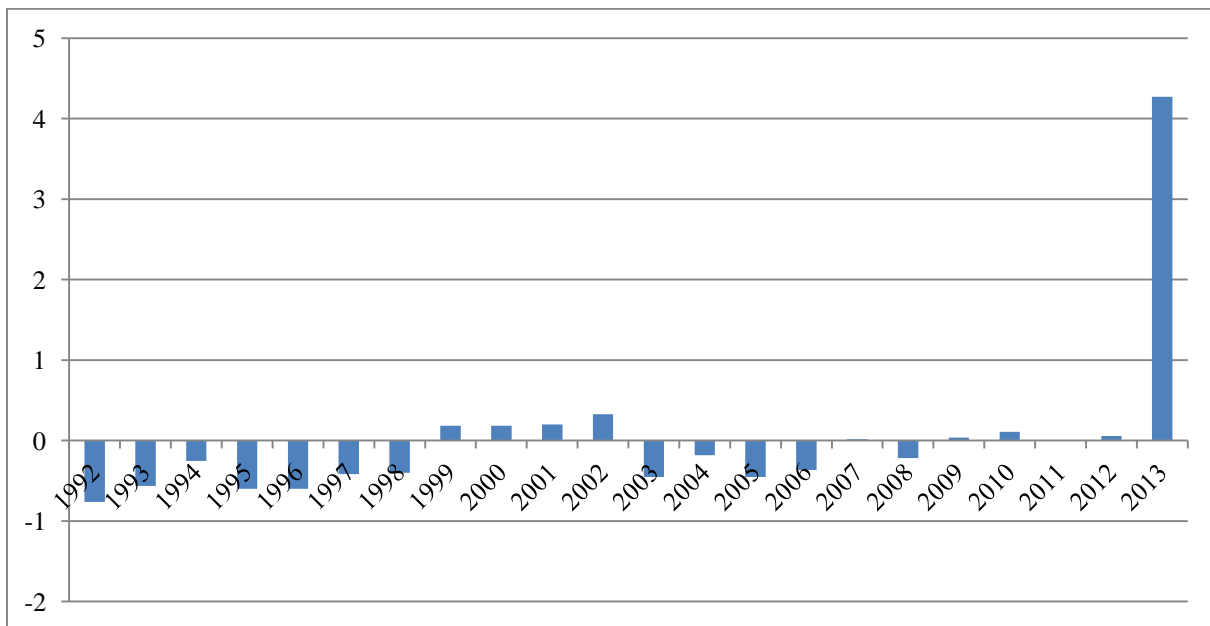**Figure 2a: Annual Maize Yield Fluctuations for Kwara State**

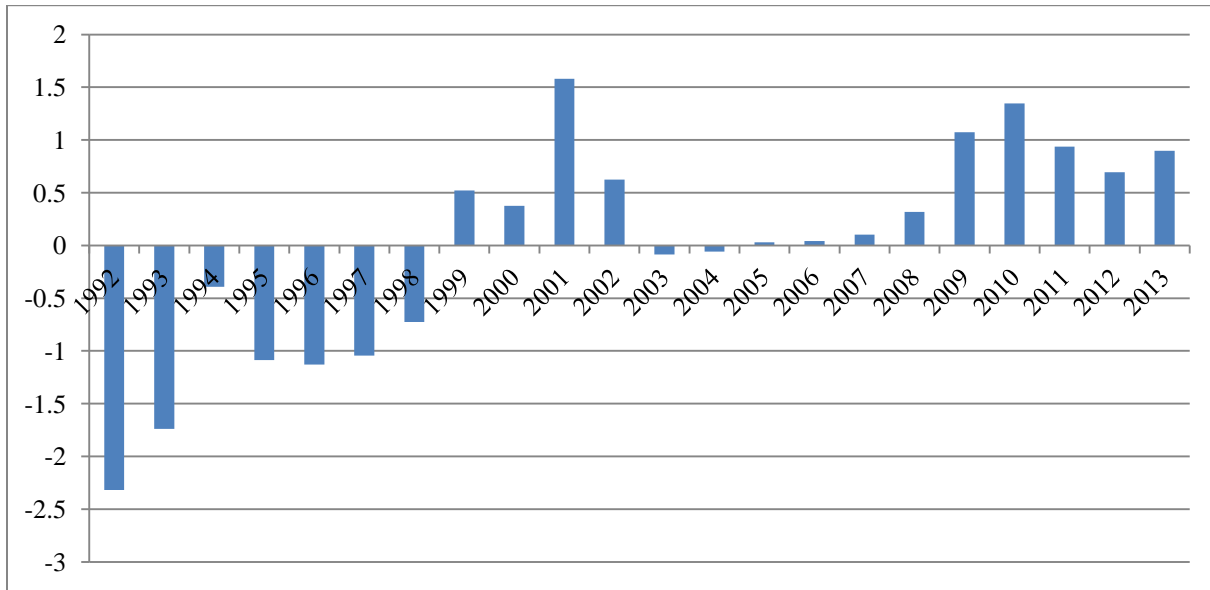**Figure 2b: Annual Sorghum Yield Fluctuations for Kwara State**

Figure 2c: Annual Rice Yield Fluctuations for Kwara State
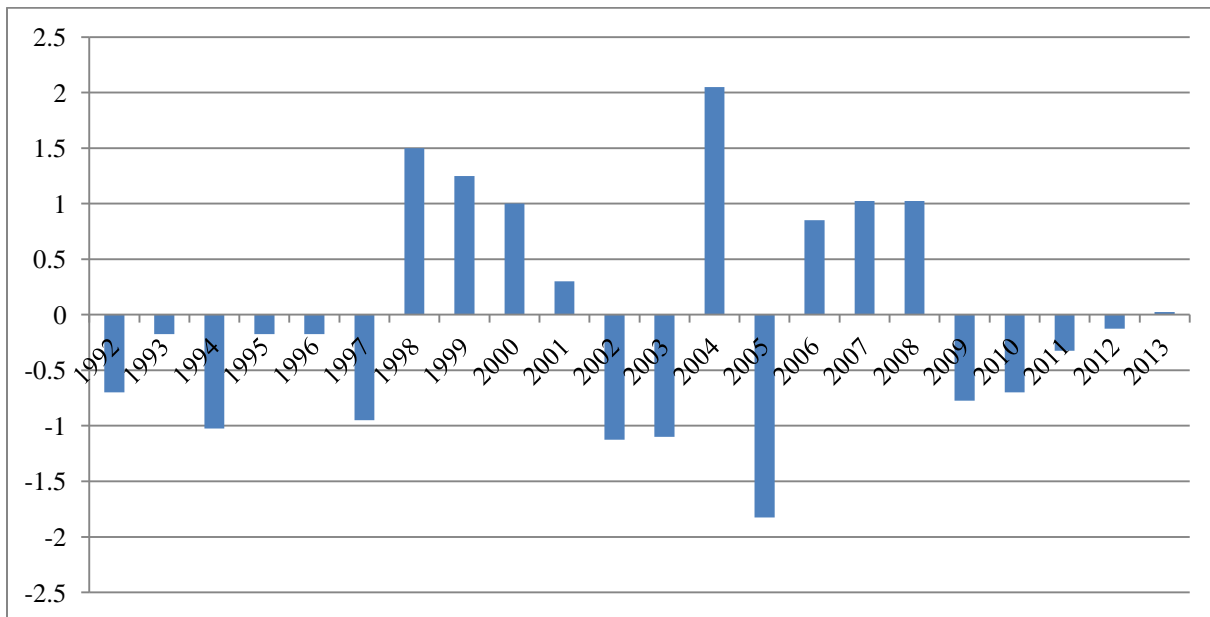

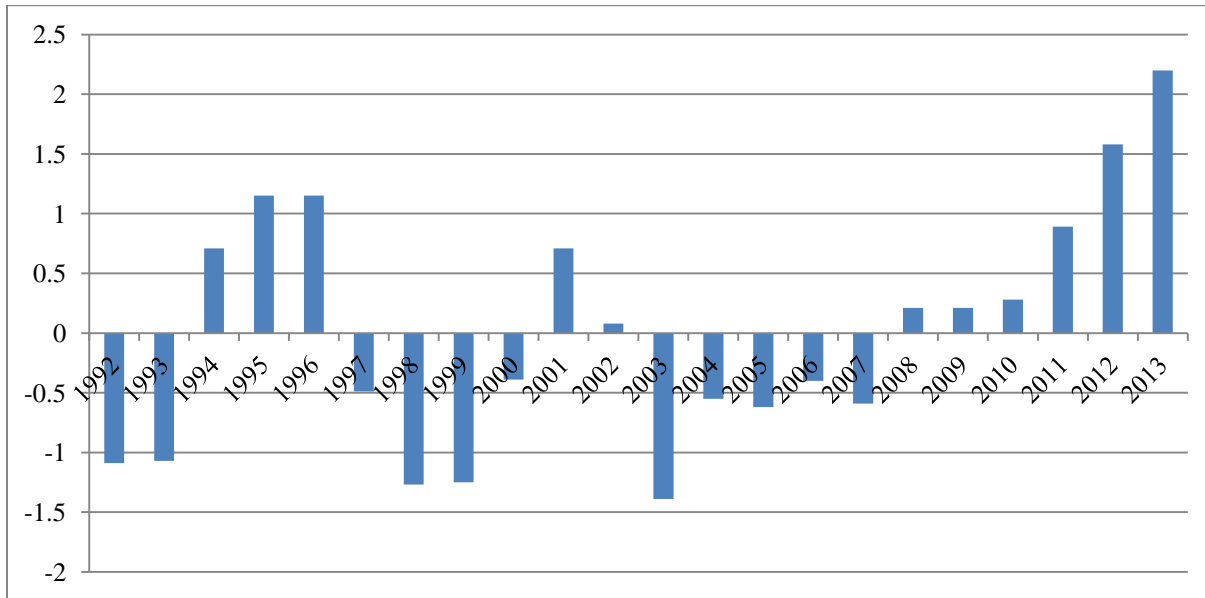**Figure 2d: Annual Millet Yield Fluctuations for Kwara State**
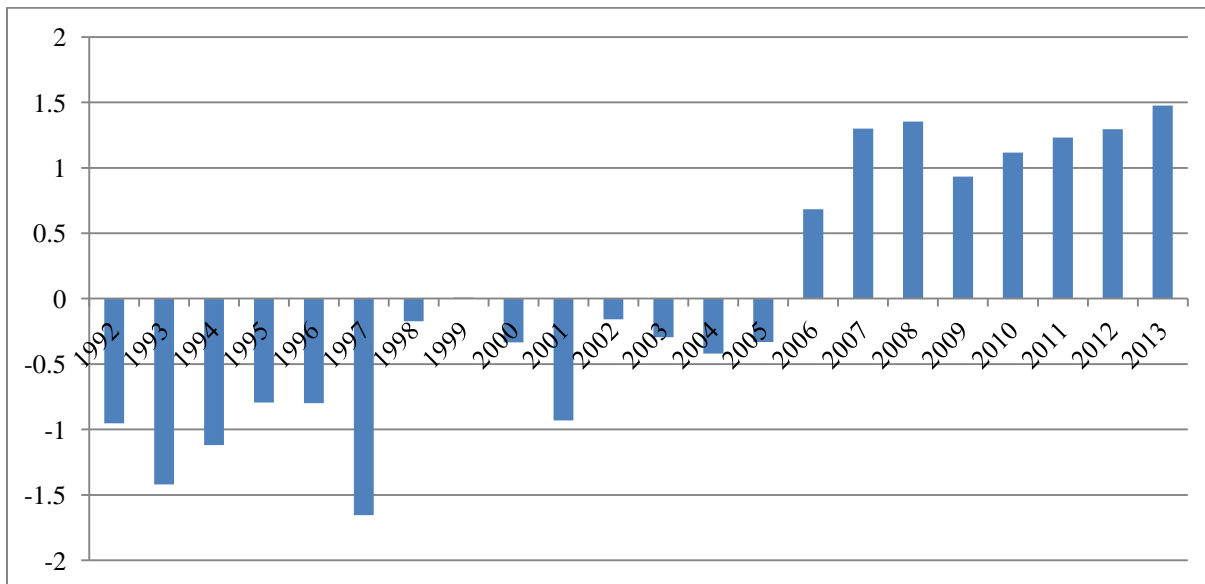
Figure 2e: Annual Yam Yield Fluctuations for Kwara State

Figure 2f: Annual Cassava Yield Fluctuations for Kwara State

The results of the trend analysis using semi- average method were computed in table 2. Semi-average method was adopted because, according to Ayoade (2008), it is more objective than fitting a line by eye to the plotted series. From the table crop productivity in Kwara State from 1992 – 2013 exhibits an upward trend. This implies that productivity of maize, sorghum, rice, millet, yam, and cassava will likely keep on increasing. In other word, increased productivity of the identified crops in Kwara State has been identified. This suggests that variability in climate

may have little impact on crop productivity in Kwara State. Adeniyi, (2013) also reported that climate has a weak impart on crop productivity in Ilorin.In addition, the result suggests that modern pattern of agricultural practices were adopted throughout the years under review. These include application of fertilizer and insecticides to improve soil fertility and reduce effects of pest on crop productivity. Figures 3a-f shows the graphical trend line of the crop yields in Kwara State.

Table 2: Trends in Crop Productivity in Kwara State (1992-2013)

Crop	First Part Average	Second Part Average	Trend
Maize	1.19	1.46	Upward Trend
Sorghum	1.38	1.66	Upward Trend
Rice	2.01	2.67	Upward Trend
Millet	1.47	1.48	Upward Trend
Yam	12.09	12.41	Upward Trend
Cassava	11.27	15.49	Upward Trend

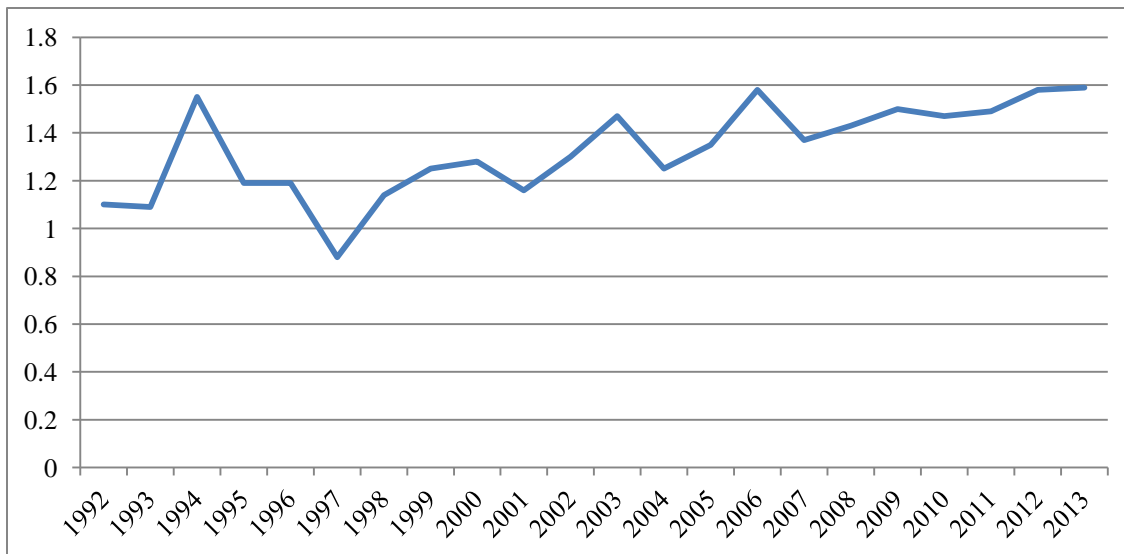**Source, Author's Computation, 2017**

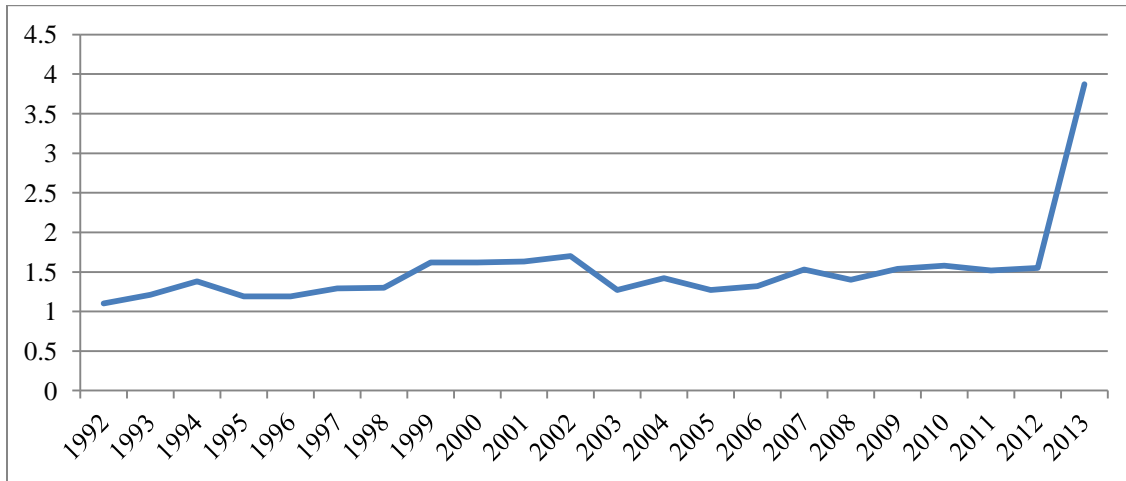**Figure 3a: Trend of Maize Yield in Kwara State (1992-2013)**

Figure 3b: Trend of Sorghum Yield in Kwara State (1992-2013)
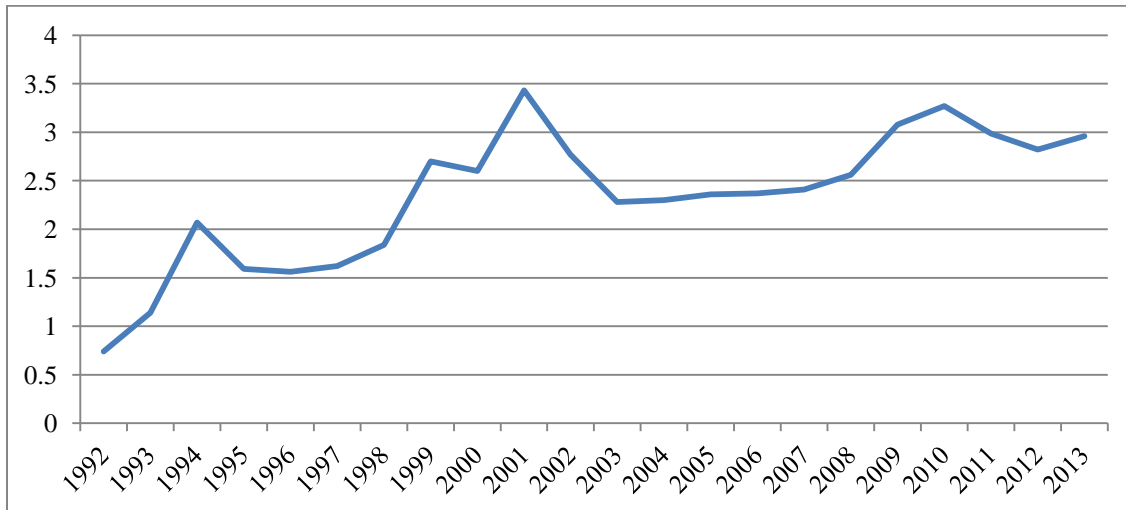

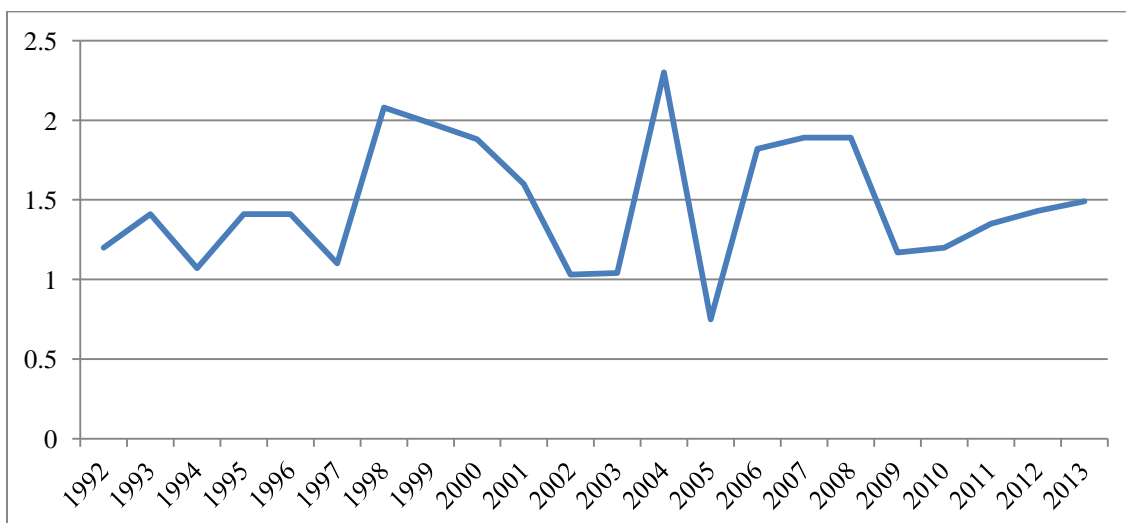**Figure 3c: Trend of Rice Yield in Kwara State (1992-2013)**

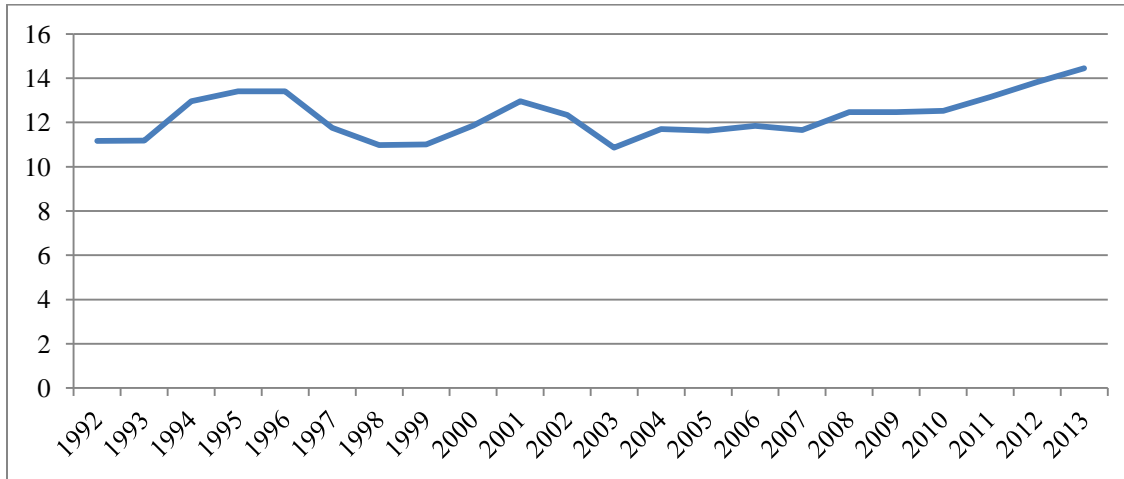**Figure 3d: Trend of Millet Yield in Kwara State (1992-2013)**

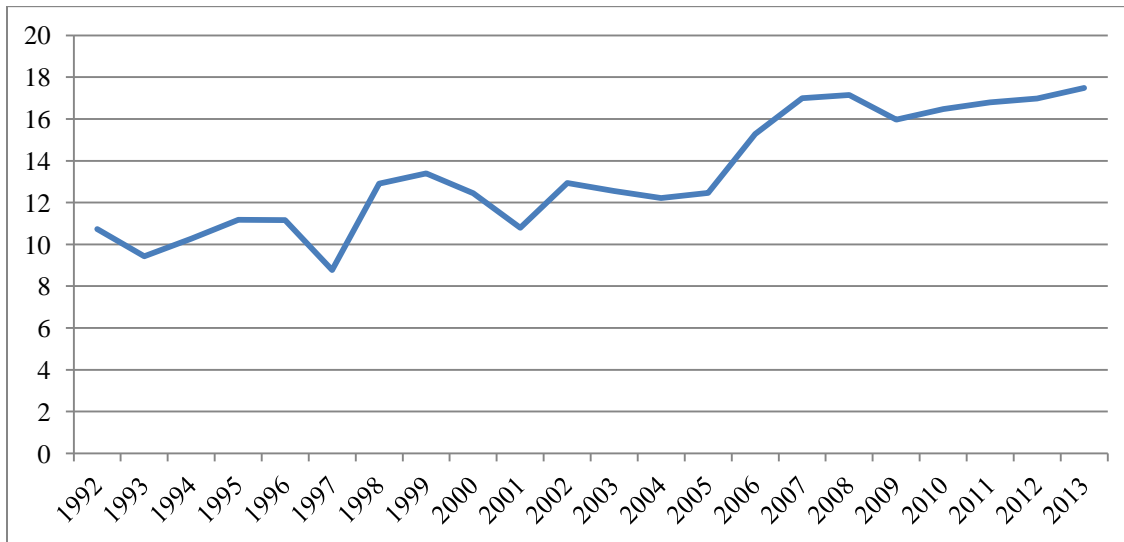**Figure 3e: Trend of Yam Yield in Kwara State (1992-2013)**

Figure 3f: Trend of Cassava Yield in Kwara State (1992-2013)

5.   Conclusion

Trend analysis of agricultural productivity in Kwara State revealed that annual yield productivity of maize, sorghum, rice, millet, yam and cassava fluctuated around the long- term mean. In other word, the crop yields show both below and above long term mean pattern. However, the crop yields exhibits an increasing trend. The increasing trend could be as a result of use of modern agricultural practices and input like use of fertilizer and insecticides.Therefore, the study recommends that both the state government and private organizations should encourage

modern agricultural practices to sustain the increasing trend of crop yields in the State.

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